

Health Informatics and Health Information Management

Human Resources Report

November 2009





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- Canada Health Infoway
- Canadian Health Information Management Association
- COACH – Canada's Health Informatics Association
- Information and Communications Technology Council
- Information Technology Association of Canada – Health

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Executive Summary

Purpose of Report

The purpose of this Report is to estimate the current supply of, and five-year requirements for, Health Informatics (HI) and Health Information Management (HIM) professionals who have formal training or experience in working with electronic health information systems (EHIS). Based on these estimates, the Report identifies where there are serious risks of skills shortages and proposes initiatives to avert these shortages.

Central Conclusions

There is a serious risk that labour shortages and skills shortages will constrain the successful implementation of EHIS technologies in Canada.

System-based, human resources planning measures should be a priority to ensure that the substantial investments that governments at all levels are making in EHIS technologies deliver the promised benefits.

Background to the Report

Across Canada, governments have made commitments to substantially accelerate their investment in EHIS technologies. As a result of these investments, the health system is poised to realize improvements in productivity, patient safety, service quality, planning efficiency, and cost control.

By 2010, the federal government, through Canada Health Infoway, will have invested over \$1.97 billion in EHIS initiatives. Over two-thirds of these monies have been invested since 2007. Planned investments by provincial governments are also substantial. In some jurisdictions, these investments are a multiple of federal investments. As well, many hospitals and other health delivery agencies have made, and will continue to make, significant investments in EHIS technologies. The important features of these investments are both their magnitude and their acceleration.

This study was motivated by an uneasiness expressed by leaders in both the public sector and the private sector that the successful implementation of EHIS investments could be jeopardized by labour shortages and skills shortages. A recent study by the Ontario Hospital Association supports these apprehensions.¹ As a result of these concerns about



the risk labour shortages, five organizations that play key roles in supporting implementation of EHIS technologies came together to commission this report.

Methodology²

The report uses a taxonomy of HI & HIM professionals that is based on COACH's Health Informatics Professional Core Competencies and the Health Informatics Professional Career Matrix. Estimates are developed for both the current employment of HI & HIM professionals and the future requirements for those professionals, based on three EHIS investment scenarios. These investment scenarios reflect announced and expected investments by governments in EHIS technologies, recent changes in the fiscal position of governments and the possible impact of these changes on investment plans, and a market study undertaken by IDC Canada (a private research firm.)

Replacement rates are based on estimated retirement rates developed by Statistics Canada for comparable professions.

¹ Ontario Hospital Association, *Supporting Transformation: A Vision for eHealth Human Resources for Ontario*, January 2009, p. 3. A survey by the OHA found that 55% of hospitals identified skills shortages as a barrier to adopting electronic health information systems. See 2006 OHA *eHealth Readiness Survey*.

² The methodology of the report is discussed in more detail in 'Appendix A: Technical Appendix'.

Technology adoption projections are based on IT spending data provided by the Canadian Institute for Health Information, expert advice, and EHS adoption patterns as modelled and analyzed by HIMSS Analytics.

The current employment estimates set out in the report are based on the 2006 *Census, Labour Force Survey* data, administrative data supplied by the Canadian Health Information Management Association, a 2008 survey conducted by the Ontario Hospital Association, and a custom survey that was developed for this report and administered in both the private sector and the public sector. It is estimated that the 45 private sector returns in this custom survey represent approximately 15% of companies with a significant presence in supplying EHS technologies and expertise and around 15–20% of HI & HIM employment in the private sector. The 35 public sector returns provided information on approximately 20–25% of the estimated HI & HIM employment in those provinces and territories covered by the survey and 10–15% of national employment. The samples were sufficiently large to develop employment estimates for most HI & HIM occupational groups on a national basis, but not on a regional basis.

This is the first national report to estimate the human resource impacts of the adoption of electronic health information systems and as such the limitations of being first, of unevenness in the regional application of the survey, as well as in occupational

coverage and assignment and a lack of skill gap estimates should all be taken in to account when reviewing the findings and conclusions of the report. It is essential to see this work as a strong and beginning step in system-based human resources planning for HI & HIM.

Human Resources Impacts of EHS Technologies

The implementation of large-scale investments in EHS technologies has two consequences for human resources. The first is to increase the number of HI & HIM professionals who are required. The second is to increase the proportion of HI & HIM professionals whose skills will need to be broadened as a result of the implementation of EHS technologies.

As used in this report ‘skill broadening’ refers to the need to acquire additional theoretical knowledge and practical insight in other domains of professional expertise beyond that for which an individual was originally prepared. For example, information technology professionals will require additional theoretical knowledge and practical insight into health information management. Similarly, HIM professionals will require additional theoretical knowledge and practical insight into information technology systems and applications. *The skill broadening that is required exceeds the learning that is associated with normal working experience. Formalized professional development will be required.*



Key Findings

Hiring Requirements

Figure No. S-1 summarizes the 2009 estimated employment of HI & HIM professionals and the projected employment, based on three EHIS investment scenarios.

It is estimated that there are currently around 32,540 HI & HIM professionals working in the public sector and the private sector. Depending on the EHIS investment scenario, overall employment of these professionals will increase over the next five years by 2,480 persons to 8,490 persons. In addition to this employment growth, there will be a need to

replace approximately 3,840 persons who will retire from the labour force. *These estimates imply a five-year hiring requirement ranging from 19.4% of the estimated 2009 employment to 37.9%.*

Current Vacancy Rates

The significance of the projected hiring requirements should be interpreted in light of current vacancy rates. Survey data indicate that the vacancy rate currently exceeds 10% in six of the 27 occupational groups. *Under any of the three investment scenarios, the projected hiring requirements will exacerbate the recruitment difficulties that are reflected in these vacancy rates.*

Figure No. S-1

Current and Projected Employment of HI & HIM Professionals, 2009–2014
Prism Economics and Analysis

	Estimated Employment 2009	Employment Forecast: 2014		
		Low Growth	Moderate Growth	High Growth
HI & HIM Employment				
Total: All HI & HIM Occupation Groups	32,540	35,020	37,200	41,030
Five Year Increase in Employment		2,480	4,660	8,490
Five Year Percentage Increase in Employment		7.6%	14.3%	26.1%
Five-Year Replacement Demand				
Replacement Rate		11.8%		
Replacement Requirement		3,840		
Five Year Hiring Requirement (Employment Growth + Replacement)				
Hiring Requirement		6,320	8,500	12,330
Hiring Requirement as percent of 2009 Employment		19.4%	26.1%	37.9%

Skill Broadening and Professional Development Requirements

Figure S-2 summarizes the estimated proportion of current HI & HIM employment that has acquired broadened skills, or needs to do so, and the proportion of projected HI & HIM employment in 2014, based on three EHIS investment scenarios. It is characteristic of these scenarios that, as the rate of investment increases and the adoption of EHIS technologies both expands and deepens; the proportion of HI & HIM professionals who require broader skills also increases.

At present it is estimated that approximately 27.3% of HI & HIM professionals either have acquired broader skills or need to do so. This professional development requirement will increase significantly over the next five years. By 2014, the number of HI & HIM professionals who will require broader skills will increase from 8,880 in 2009 to between 13,690 and 32,170. It is likely that these professional development requirements will exceed the resources that are currently available to professional associations.

Recommendations

Among the steps recommended are:

1. A national initiative to monitor the human resources implications of implementing electronic health information systems. Among other trends, this initiative should track HI & HIM employment, capital spending on implementing EHIS technologies, IT spending related to the health care sector, and enrolments and graduations in post-secondary institutions that offer HI & HIM programs.
2. An ongoing forecast of HI & HIM human resource requirements supported by expert consultations, strengthened data sources, and systematic industry validation.
3. The formulation of strategies to address skills shortages including: strengthening the capacity of professional associations to develop and deliver professional development training, expanding the role of skill certification by building on certification programs that are already in place, expanding co-op and internship programs to accelerate the integration of recent graduates into the HI & HIM professional work force, and strengthening efforts to more effectively integrate internationally trained HI & HIM professionals.

Figure No. S-2

Current and Projected Employment of HI & HIM Professionals and Estimated Proportion that will require Broader Skills as a Result of the Adoption of EHIS Technologies, 2009–2014
Prism Economics and Analysis

	2009	2014		
		Low Growth	Moderate Growth	High Growth
Total HI & HIM Employment	32,540	35,020	37,200	41,030
Skill Broadening Requirement	8,880	13,690	21,800	32,170
Skill Broadening as a Percent of HI & HIM Employment	27.3%	39.1%	58.6%	78.4%

1. Introduction

Key Findings

The central conclusion of this Report, which is supported by leaders in the field, is that *there is a serious risk that labour shortages and skills shortages will constrain and undermine the successful implementation of electronic health information systems. System-based, human resources planning measures should be a priority to ensure that the substantial investments that governments at all levels are making in electronic health information systems deliver the promised benefits.*

Purpose of the Report

The purpose of this Report is fourfold:

- First,** to estimate the current supply of Health Informatics (HI) and Health Information Management (HIM) professionals, in both the public sector and the private sector, who have formal training or experience in working with electronic health information systems (EHIS);
- Second,** to project the impact on human resources requirements, over the next five years, of announced and expected investments in these technologies;
- Third,** to estimate the imbalances that will develop if human resources requirements exceed the likely supply of HI & HIM professionals with formal training and experience in implementing and working with EHIS technologies; and
- Fourth,** to recommend strategic human resources planning initiatives to address these imbalances.

Background to the Report

The federal and the provincial governments have recognized the central importance of modernizing health information management by adopting EHIS technologies. Since 2001, the federal government, through Canada Health Infoway, has invested over \$1.57 billion in these technologies. By 2010, this will increase to an estimated \$1.97 billion.³ Over two-thirds of these monies have been invested since 2007. To these investments must be added the investments by provincial governments which, in some

jurisdictions, are a significant multiple of federal investments. As well, many hospitals and other health delivery agencies have made, and will continue to make, substantial investments in EHIS technologies.

The successful implementation of EHIS investments requires a range of specialized human resources. These include:

- information technology professionals with in-depth knowledge of both the business and clinical needs of the health system,
- health information management professionals with knowledge of EHIS technologies,
- clinicians who understand these technologies and can apply them to clinical practice,
- planners who know how to utilize electronic health information systems to address system management issues, and
- specialists in process re-engineering and change management.

Electronic health information systems will also create a greater need for privacy controls⁴, standardized clinical vocabularies, and more extensive coding and classification systems.

The implementation of large-scale investments in EHIS technologies has two consequences for human resources. The first is to increase the required number of HI & HIM professionals. The second is to increase the proportion of HI & HIM professionals who will need to have formal training or experience in implementing or working with EHIS technologies.

*This study was motivated by the concerns expressed by leaders in both the health system and the private sector that the successful implementation of EHIS investments could be jeopardized by labour shortages and skills shortages. Two senior health informatics professionals expressed this concern in an November 2008 article in *Healthcare Information Management & Communications*.⁵ ITAC Health, Canada Health Infoway and others have raised similar concerns about labour shortages and skills shortages. A recent study by the Ontario Hospital Association (OHA) concluded that “the inadequate supply of eHealth human resources in Ontario presents a major challenge in meeting current and future demands for eHealth adoption across the system.”⁶*

³ Canada Health Infoway, *Annual Report 2008/2009*.

⁴ In its *2008/2009 Annual Report*, Canada Health Infoway assigns a “high” risk to privacy and security breaches and describes the mitigation strategies that it has adopted.

⁵ Charles LaFlèche and Neil Gardner, “Hitting the Health Informatics (HI) Wall: A call to collaborative action on human resources,” *Healthcare Information Management & Communications*, 3rd Quarter (November 2008).

⁶ Ontario Hospital Association, *Supporting Transformation: A Vision for eHealth Human Resources for Ontario*, January 2009, p. 3. A survey by the OHA found that 55% of hospitals identified skills shortages as a barrier to adopting electronic health information systems. See *2006 OHA eHealth Readiness Survey*.

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Partners

This Report was undertaken by a partnership of five organizations that play key roles in supporting and enabling the health care system to implement electronic health information systems. Funding and support for this Report was provided by Human Resources and Skills Development Canada (HRSDC) and the Report's five partners:

Canada Health Infoway (*Infoway*):

Canada Health Infoway (*Infoway*) is an independent, not-for-profit organization funded by the federal government. *Infoway* jointly invests with every province and territory to accelerate the development and adoption of electronic health record projects in Canada. Fully respecting patient confidentiality, these secure systems will provide clinicians and patients with the information they need to better support safe care decisions and manage their own health.

Canadian Health Information Management Association (CHIMA):

CHIMA is a not-for-profit professional association. Through the Canadian College of Health Information Management, CHIMA certifies professionals in the field of health information management and accredits academic programs. CHIMA represents more than

3,700 certified Health Information Management (HIM) professionals from across Canada, as well as 1,300 affiliate, student and retired members.

COACH – Canada's Health Informatics Association:

COACH is the diverse community of accomplished, influential professionals who work passionately to make a difference in health informatics. COACH's members are dedicated to realizing their full potential as professionals and advancing health informatics through access to information, talent, credentials, recognition programs, and a broad range of services and specialized resources.

Information and Communications Technology Council (ICTC):

ICTC is a not-for-profit sector council focusing on human resources planning to support the Canadian ICT industry and ICT workforce. ICTC tracks labour market trends for information and communications technology professionals, including estimates of future supply and demand trends. ICTC also promotes careers in information and communications technology and works with employers, post-secondary institutions and professional organizations to assist in the more effective integration of internationally trained ICT professionals.

Information Technology Association of Canada (ITAC) – Health:

ITAC Health is an industry association representing more than 120 ICT companies in Canada that are actively engaged in supporting the application of information and communications technologies in the health sector. ITAC Health is part of the Information and Technology Association of Canada, which represents a diverse ICT community spanning telecommunications and internet services, ICT consulting services, hardware, microelectronics, software and electronic content. ITAC's community of companies employ more than 360,000 Canadians.

The members of the Report's Steering Committee can be found in Appendix B. In addition to the guidance of the Steering Committee, the Report also benefited from the contributions provided by the Expert Advisory Group whose members are listed in Appendix C. As a member of the Steering Committee, the Canadian Institute for Health Information (CIHI) provided data expertise and guidance. Please note that the analyses, conclusions and views expressed in the present document do not necessarily represent the views of CIHI.

Canadian Institute for Health Information (CIHI): CIHI is an independent, not-for-profit organization that provides data and analysis on Canada's health system and the health of Canadians. CIHI's databases and reports focus on trends in health care services, health spending, health human resources, and population health. Governments, hospitals, health authorities, and professional associations use CIHI's databases and reports to assess the effectiveness of different parts of the health system and plan for the future. CIHI's databases and reports are also used by researchers, the media, and the general public.

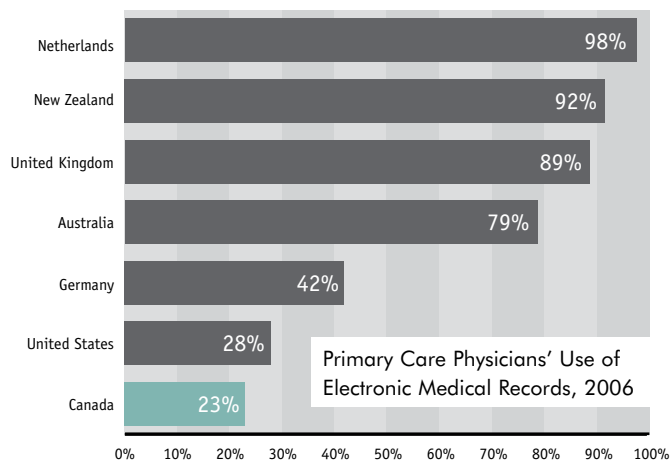
Electronic Health Information Systems

Across Canada, governments have made commitments to substantially accelerate their investment in EHR technologies. As a result of these investments, it is expected that the health system will realize gains similar to those achieved by the adoption of information and communications technologies in the private sector and in other branches of the public sector. In the health system, these gains will include improvements in productivity, patient safety, service quality, planning efficiency, and cost control.

In comparison with other countries, Canada leads in several areas in the implementation of electronic health information systems, but lags on other fronts. Canada's has made significant progress towards achieving its stated objectives for interoperability, standardization, and information sharing amongst clinicians and across administrative boundaries. However, Canada is behind in other areas. For example, comparative studies show that Canada lags many OECD countries in implementing electronic medical records at the family practice level.⁷ Also for example, a study commissioned by Canada Health Infoway found that, in contrast with Canada, there are virtually no hand-written prescriptions in the 10 jurisdictions covered by the study. In five of those jurisdictions—again in contrast with Canada—the study found that the majority of family practice physicians record patient progress notes electronically.⁸ Similar findings were reported

Figure No. 1

Primary Care Physicians' Use of Electronic Medical Records, 2006 (based on: Commonwealth Fund, *National Scorecard on US Health System Performance, 2008*)



in a 2006 study by the US-based Commonwealth Fund. The Commonwealth Fund study compared 'use rates' for electronic medical records by primary care physicians across seven jurisdictions.⁹

Canada Health Infoway has estimated some of the impacts on Canadians from the under-utilization of EHR technologies. For example, in the absence of a comprehensive electronic health record system:

- for every 1,000 hospital admissions, 75 people will suffer an adverse drug event,
- for every 1,000 laboratory tests performed, up to 150 will be unnecessary, and
- for every 1,000 emergency room visits, 320 patients will have an information gap, resulting in an average increased stay of 1.2 hours.¹⁰

⁷ Two comparative studies of note are:

Dennis Protti, "Comparison of Information Technology in General Practice in Ten Countries", *Healthcare Quarterly*, vol 10, no. 2, pp 107–116 (2007).
G. F. Anderson, B.K. Frogner, R. A. Johns, and U.E. Reinhardt, "Health Care Spending and Use of Information Technology in OECD Countries", *Health Affairs*, vol. 25, no. 3, pp 819-831 (2006).

⁸ Protti, *op. cit.* p 110, Table 2. The jurisdictions included in Protti's study were: Australia, Austria, Denmark, England, Germany, the Netherlands, New Zealand, Norway, Scotland, and Sweden.

⁹ Commonwealth Fund, *National Scorecard on US Health System Performance, 2008* www.commonwealthfund.org.

William Pascal, Chief Technology Officer of the Canadian Medical Association, estimated that in 2006 only 15% of Canadian doctors used electronic medical records. "Investment in Health IT", *Healthcare Information Management & Communications*, 1st Qtr, vol. 20, no. 1 (February 2006).

¹⁰ Canadian Broadcasting Corporation, 'Digitizing Healthcare', May 27, 2009.

The implementation of electronic health information systems will require, among other changes:

- upgrading IT infrastructure,
- implementing and supporting new software applications, and interfacing these applications with medical devices,
- re-engineering health information management systems,
- integrating health information managements within and across diverse care settings, and across various administrative and jurisdictional boundaries, and
- applying new and more sophisticated methods of data analysis to support both clinical and planning decisions.

When implemented, these new electronic health information systems will need to be maintained and supported in a mission-critical environment.

At present, the attention of policy makers and planners is focused primarily on the financing and technical aspects of implementing investments in EHS technologies. There is only limited understanding of the human resources requirements that these substantial investments will generate. This is a serious gap which this Report seeks to address.

Labour Market Risk

Labour market risk refers to the consequences of an under-supply of the skills required to implement major investments. For electronic health information systems, the consequences of an under-supply of professional skills can include:

- unexpected delays,
- significant cost over-runs as a result of higher than anticipated salaries, overtime costs, recruitment fees, or payments to third parties,
- sub-optimal implementations that yield significantly lower than expected gains in productivity or service quality,
- staffing challenges arising from higher turnover rates and difficult recruitment conditions,
- organizational disruptions that diminish overall morale and performance, and
- risks to patient safety and patient care from a lack of understanding of increasingly complex and inter-related information systems.

Capital spending cycles introduce a significant destabilizing factor into labour markets. *In the absence of system-based human resources planning, the demand and supply for the professional skills required to implement major capital*



projects are almost never in balance. The source of these imbalances lies in the asymmetry between the investment cycle and the human capital cycle. Investment spending leads to an increase in the demand for persons with specific types of professional training and experience. If, as is common, this training and experience is in short supply, then salaries and professional charges rise. So also does staff turnover. Skill shortages result in projects being delayed, running over budget, or being implemented in a sub-optimal manner. Weaknesses in operational efficiency and reliability ensue.

With a lag—usually of two to three years (and often more)—tighter labour market conditions trigger a supply response. Immigration of qualified professionals increases. So also do post-secondary enrolments and graduations. However, by the time these supply responses become effective (usually a further two to four years from when the supply response was first triggered), dissatisfaction with the consequences of tight labour market conditions has led to a slowing down of investment plans. As a result, skill shortages are replaced by over-supply conditions. These over-supply conditions lead to a series of predictable, but perverse, responses. First and foremost, immigration of qualified persons and post-secondary enrolments decline in response to the now unfavourable labour market conditions. Academic programs may lose support as their graduates report difficulty in finding employment in the professions for which they were trained. Inevitably, many of these graduates drift into other fields. The cycle then repeats itself when the pendulum swings back and there is a resumption of investment

spending. This pattern broadly describes the recurrent and wasteful cycles of shortage and over-supply that are endemic in many engineering, technology and IT occupations. The essence of the problem is that the technology investment cycle and the human capital investment cycle are 'out of sync'. Eliminating these imbalances in their entirety is impractical. However, *system-based monitoring of the demand and supply for qualified professionals can anticipate the imbalances. Proactive human resources planning can reduce the severity of these imbalances and thereby reduce significantly the risk that skill shortages will undermine the implementation of major technology investments.*

Conceptual Framework

Electronic Health Information Systems (EHIS)

For the purpose of this study, the definition of electronic health information systems is the application of informatics technologies to the acquisition, management, delivery, and utilization of health data so as to improve the quality of patient care and the efficiency of the health care system. Electronic health information systems (EHIS) is, therefore, a global term to encompass all types of digitized data in the health system including, for example, diagnostic images, laboratory, clinical and pharmaceutical records, system administration data, and relevant demographic and other personal data. EHIS technologies also encompass the systems that deliver the right data safely and securely to the right health care providers at the right time and in the right place.

Broadening of Skills

The adoption of electronic health information systems broadens skill requirements across a range of occupational fields in the health care sector. *Skill broadening refers to the need to acquire additional theoretical knowledge and practical insight in other domains of professional expertise. For example, as a result of implementing EHIS technologies, information*

technology professionals will require additional theoretical knowledge and practical insight into health information management. Similarly, HIM professionals will require additional theoretical knowledge and practical insight into information technology systems and applications. The skill broadening that is required exceeds the broadening that results from normal working experience. The skill broadening which is the focus of this Report will require formal training.

By way of illustration, Dominic Covey describes the skill broadening impact of EHIS technologies on a database manager:

"Being qualified as a database manager means the person has mastered database theory and practice, especially the capabilities and idiosyncrasies of different database tools like Oracle and Sybase. Take a person with these competencies and add on top of this the competencies of an applied health informatician. Now you have a person who understands not just the tool, but the entire health system context, the nature and issues of health information, vocabularies, and ontologies, the systems and their roles in improving information management, and all the other matters addressed by Applied Health Informatics."¹¹

In HIM occupations, the implementation of EHIS technologies requires more stringent security, privacy and confidentiality policies and procedures, as well as measures to ensure the quality of data that is integrated across different platforms. Electronic health information systems are often implemented in tandem with the introduction of new coding and classifications systems (e.g., SNOMED-CT and ICD-10-CA).¹²

Figure No. 2 describes some of the skill broadening implications of EHIS technologies across the major occupational fields addressed in this study.

¹¹ H. Dominic Covey, "Going Back to Basics: the Applied Health Informatician" *Healthcare Information Management & Communications*, 2nd Qtr, vol. 20, no.2 (April 2008). [Emphasis added.]

¹² The Systematized Nomenclature of Medicine-Clinical Terms (SNOMED-CT) is a collection of medical terminology covering most areas of clinical information such as diseases, findings, procedures, microorganisms, pharmaceuticals etc. SNOMED-CT provides a consistent nomenclature for indexing, storing, retrieving, and aggregating clinical data. The International Statistical Classification of Diseases and Related Health Problems, 10th Revision (ICD-10) is an international standard for reporting clinical diagnoses developed by the World Health Organization. ICD-10-CA is an enhanced version of ICD-10 developed by CIHI for morbidity classification in Canada. ICD-10 was released in 1992. The release of ICD-11 is planned for 2015. ICD-11 will incorporate Web 2.0 technology.

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Figure No. 2

Impact of Electronic Health Information Systems (EHIS) Technologies across Occupational Fields
(Prism Economics and Analysis)

Occupational Field	Impact of EHIS Technologies	Scope and Magnitude of Impact
Information Technology	<p>The adoption of EHIS technologies changes significantly the skills required by occupations engaged in system and application architecture, and application implementation and support.</p> <p>Occupations focused on infrastructure support are less affected, although standards for data and network security are significantly more demanding.</p>	<p>EHIS technologies will have significant effects on the skill requirements for the vast majority of information technology professionals in the health system.</p>
Health Information Management	<p>EHIS technologies will reshape virtually all aspects of health information management. As well, EHIS technologies also will increase the need for standard terminologies, privacy controls, and compliance with policies and regulations.</p>	<p>EHIS technologies will eliminate a significant number of non-professional, clerical occupations while altering the skill requirements for virtually all professionals in the Health Information Management occupational group.</p>
Management of the Health System	<p>EHIS technologies fundamentally reshape the skill and experience needs of Business Analysts who constitute half or more of the professionals in this occupational group.</p> <p>EHIS technologies also generate data that enable resources to be allocated more efficiently.</p>	<p>EHIS technologies will alter the skill requirements for Business Analysts employed in the health system. This includes both Business Analysts employed directly by the health system and those in the private sector who are focused on health system projects.</p> <p>To interpret EHIS data correctly, system planners will need to understand the concepts and procedures that stand behind health system data.</p>
Project Management and Organizational and Behavioural Management	<p>All EHIS adoptions require significant investment in project management and change management.¹³</p>	<p>Organizations implementing EHIS technologies will require a core of project managers and change managers who understand the principles that underlie these technologies and their organizational and process implications. This will include Project Managers and Change Management Specialists who are employed directly by the health system, as well as those employed in the private sector who undertake health system projects.</p>

¹³ Kevin J. Leonard, "Critical Success Factors Relating to Healthcare's Adoption of New Technology: A Guide to Increasing the Likelihood of Successful Implementation", *Electronic Healthcare*, vol. 2, no. 4 pp 72–81 (2004). Leonard describes the central role of change management strategies in successful implementation and the adverse consequences of under-investing in change management strategies.

Occupational Field	Impact of EHIS Technologies	Scope and Magnitude of Impact
Clinical Informatics	EHIS technologies change the way that data is collected, stored, retrieved, analyzed, and correlated with other data.	Clinical informatics specialists will require higher levels of technical competence in both information technology and health information management.
Analysis and Evaluation	Analysis and evaluation is data driven. Occupations in this field will need to understand new types of data and the procedures that generate those data and determine their reliability.	Persons doing analysis and evaluation that relies on data generated by electronic health information systems will need to understand the concepts and principles that govern these systems.

The impact of EHIS technologies on skill requirements is important in both the private sector and the public sector. As will be discussed later in this report, the private sector plays a key role in the public sector's capacity to adopt EHIS technologies. Skill shortages in the private sector will have a direct impact on the public sector.

Occupational Taxonomy

Based on discussions with stakeholders, and COACH's Health Informatics Professional Core Competencies (and

the Health Informatics Professional Career Matrix)¹⁴, the Steering Committee identified seven occupational categories and 27 occupational groups within these categories. The 27 occupational groups categorize positions based on their key characteristics. These 27 occupational groups are the primary focus of analysis in this study. Figure No. 3 lists the seven occupational categories and their corresponding occupational groups:

Figure No. 3

Occupational Categories (7) and Occupational Groups (27) used in this Study

Information Technology	Health Information Management	Management of the Canadian Health System
<ul style="list-style-type: none"> • Senior IT Management • Architecture/Development • Application Implementation/Support • Security • Quality Assurance/Testing • Help Desk • Network, Storage and Other Infrastructure Support 	<ul style="list-style-type: none"> • Senior Health Information Management • Privacy • Standards • Data Quality Management • Decision Support • Health Records Management • Coding and Classifications 	<ul style="list-style-type: none"> • Policy and Strategic Planning • Risk Management • Business Analysis

¹⁴ COACH, *Health Informatics Professional Core Competencies, Version 2.0, (March 2009)*
http://www.coachorg.com/career_development/professionalism/core_competencies.htm.

Project Management	Organizational and Behavioural Management	Analysis and Evaluation	Clinical Informatics
<ul style="list-style-type: none"> • Senior Project Management • Project Management 	<ul style="list-style-type: none"> • Account Executives • Program Management • Product/Service Management • Change Management • Training and Development 	<ul style="list-style-type: none"> • Research, Analysis and Evaluation 	<ul style="list-style-type: none"> • Senior Medical Information Officers • Clinician-Analysts

The occupational taxonomy set out in Figure No. 3 is not a fixed paradigm. The taxonomy will evolve over time, as new functions and roles emerge.

Supply

Supply is both a static and a dynamic concept. As a static concept, supply is the number of persons currently qualified by their training and experience to work in HI & HIM occupations. Supply, in this sense, is difficult to measure. For this reason, static supply is proxied by an estimate of the number of persons currently working in HI & HIM. Dynamic supply estimates the flows into and out of the HI & HIM work force.

The principal channels through which the supply of HI & HIM professionals is increased are:

1. recruiting professionals with no previous health system experience and training them to be HI & HIM professionals,
2. increasing the number of post-secondary graduates from specialized health informatics and health information management programs,
3. increasing the immigration of HI & HIM professionals, and
4. using professional training to augment the proportion of currently practising HI & HIM professionals who are qualified to implement and work with electronic health information systems.

The relative importance of these channels varies across occupational groups and across regions. The role of immigration, for example, is much more important in some regions than others. There are also regional differences in the capacity of the post-secondary system to meet skill requirements and in the propensity of graduates to seek employment in the same region in which they completed their studies. The resources available to this study were sufficient only to construct a national picture of available supply for HI & HIM professionals. Future studies of supply trends will need to give more attention to regionally specific factors.

Retirement is the principal, though not the only, factor determining exit rates from the HI & HIM professional labour force. Gender factors also come into play; in many professions, entry, retention, and retirement patterns are different for women. A large majority of IT professionals are male, while HIM professionals are predominantly female. A complete analysis of supply trends would need to take account how gender affects patterns of labour force participation in HI & HIM occupations.¹⁵

A comprehensive analysis of supply requires both an estimate of static supply in 2009 and an analysis of how that supply will change as a result of new entrants and exits. This phase of the supply-side analysis, however, is focused only on developing an estimate of the current supply, that is to say, the number of persons who are currently working in HI & HIM occupations. These estimates are broken down, as far as practical, into the 27 occupational groups. Subsequent reports should analyze the new entrant and exit dynamics and how these alter the supply picture.

¹⁵ *Labour Force Survey* data show that, over the last decade, the male participation rate was about 10.8% above the female participation rate between the ages of 25 and 54. After age 55, however, the gap widened significantly although in the latter part of the decade, an increase in the female participation rate was evident. This implies that there could be significantly different (and possibly unstable) retirement dynamics for IT and HIM occupations.

Demand

There are two principal determinants of human resources requirements for HI & HIM professionals. The first is the impact of EHIS investments on the number of HI & HIM professionals who will be required. The second is the impact of adopting EHIS technologies on the skill requirements of HI & HIM professionals. This Report terms the first of these impacts the 'employment effect' and the second, the 'skill broadening effect'. The 'skill broadening effect' was discussed earlier.

The 'employment effect', together with replacement demand, determines the *hiring requirement* for HI & HIM professionals. The 'employment effect' has two components. The first of these is the 'implementation requirement'. The second is the 'operations requirements'.

The 'implementation requirement' comprises those HI & HIM professionals who are engaged *primarily* in analyzing requirements, designing and installing EHIS applications, and managing the change processes associated with their adoption. The principal driver behind increases in the 'implementation requirement' is increases in the rate of investment in EHIS technologies.

The 'operations requirement' comprises those professionals whose core professional functions revolve around managing, maintaining, and utilizing electronic health information systems. The principal driver behind changes in the 'operations requirement' is increases in the installed base of electronic health information systems.¹⁶

On the operations side, HI & HIM professionals are found primarily, but not exclusively, in the public sector. On the implementation side, these professionals are found in both the public sector and private sector.

Given the central role of public policy in determining the pace of investment in EHIS technologies, the demand for HI & HIM professionals can be modelled only on the basis of projected investment scenarios. Policy-makers can change their investment plans, and the possibility of such changes must be taken into account in any forecast.

It is also important to bear in mind that every demand scenario is based on both stated and implied assumptions. The subsequent passage of events will validate some of

these assumptions, but require others to be altered. Moreover, *to the degree that stakeholders alter their human resources strategies in light of a forecast (as is the intent of this study), the forecast itself will need to be updated.* Forecasting should be understood, therefore, as an ongoing, iterative process.

Validation

Developing an evidence based scenario to forecast demand and supply is not a purely empirical exercise. Significant gaps in data and uncertainties about technology adoption rates require that judgements be made. It is impossible to construct a forecast of demand and supply without such judgements. It is essential, therefore, that scenarios be reviewed and validated by informed stakeholders. The analysis and conclusions set out in this study were reviewed by the Study's Steering Committee, an Expert Advisory Group, and ad hoc validation and review committees.

Skills Shortages vs. Labour Shortages

In professional labour markets, there are two distinct types of shortages: labour shortages and skills shortages. A labour shortage arises when, relative to demand, there is an absolute insufficiency in the number of people with the formal educational or certification qualifications to fill employers' hiring requirements. By contrast a skills shortage exists when applicants (or incumbents) have the required educational qualifications and certifications, but lack the specific experience or training that employers need.

A labour shortage always exacerbates a skills shortage. However, a skills shortage often exists even in the absence of a labour shortage.

The distinction between a labour shortage and a skills shortage is important when formulating human resources strategies. The strategies to address a labour shortage focus on measures to increase the number of new entrants into the professional labour force. By contrast the strategies to address a skills shortage focus on post-professional training and qualifications.

Methodology

Forecasting or scenario construction is not a formula-driven process. Rather, forecasting is based on judgements that are guided by, but not mechanically driven by, empirical

¹⁶ In economic terms, the demand for 'implementation' professionals is driven by a 'flow variable', namely annual investment. Increases in the rate of investment determine increases in the demand for 'implementation' professionals. By contrast, the demand for 'operations' professionals is determined by a 'stock variable', i.e., the installed base of electronic health information systems. Increases in the demand for 'operations' professionals are determined by increases in the installed base of electronic health information systems.

data, and which are situated within a theoretical framework. In many instances, uncertainties about the quality of data or sampling limitations make judgement-based interpolations or extrapolations unavoidable. The analysis in this study draws on several sources.

Public Sector/Private Sector

In this Report, 'public sector' refers to the acute care system (hospitals), regional administrative bodies, government established organizations with mandates for implementing EHS technologies, ministries and departments with planning responsibilities in the health care system, and national bodies, such as Canada Health Infoway and CIHI.

'Private sector' refers to organizations that supply technology and expertise pertaining to EHS technologies to the health system. Most, though not all, of these organizations operate on a 'for profit' basis.

HI & HIM Human Resources Survey – Public Sector

A key empirical input into this study is the HI & HIM Human Resources Survey that was completed by a number of ministries, regional administrative bodies, and agencies engaged in supporting or promoting the adoption of electronic health information systems. For reasons of resource limitations, the survey omitted:

- clinics and doctors' offices,
- pharmacies,
- public health services,
- health services outside physicians' services (e.g., chiropractors, psychologists, physiotherapists, etc.), and
- long-term care and rehabilitation centres (in some jurisdictions).

Survey coverage varied. In some provinces and territories, virtually all regional bodies provided data, while in others, only a health segment of the system was covered.

In 2008, the Ontario Hospital Association conducted a survey of its member hospitals.¹⁷ This Report relies on the results of the OHA survey for a portrait of HI & HIM employment in the Ontario acute care system.

There were 35 survey returns from the public sector. These survey returns provide information on approximately 20–25% of the estimated HI & HIM employment in the provinces and territories covered by the survey and 10–15% of national employment.¹⁸

HI & HIM Human Resources Survey – Private Sector

The collection of human resources data from the private sector posed distinct challenges. In the first place, there is uncertainty about the size of the private sector. The membership of ITAC Health and studies by the Branham Group were helpful in establishing a list of firms that supply or implement EHS technologies. However, as business opportunities expand, companies that are not currently active in the health system market may seek to establish a presence. Hence, there is a degree of indeterminacy in the size of the private sector. Second, many international companies have a presence in the Canadian market which they can expand or contract by drawing on international resources. Conversely, some Canadian companies undertake assignments outside Canada. The factors add considerable elasticity to supply. For these reasons, *in the private sector, the concept of 'supply' is different than in the public sector.*

At the close of the survey, there were 45 survey returns from the private sector. It is estimated that these returns represent approximately 15% of firms in the private sector and around 15–20% of HI & HIM private sector employment.¹⁹ While these data provide some basis for analysis, the profile of supply and demand trends in the private sector is necessarily more limited. Future studies will need to focus more directly on the distinct features of the private sector and the implications of those features for estimating and interpreting supply trends.

Estimates for Investments in Electronic Health Information Systems

Estimates for investments in electronic health information systems are based on Canada Health Infoway data, provincial budgets, historical data compiled by CIHI, and projections formulated by IDC Canada (a private research firm). Linking current spending estimates to current employment estimates provides a basis for constructing scenarios that link future spending to future human resource requirements.

¹⁷ Based on the 2006 Census, the OHA survey would appear to have coverage of approximately 40–45% of hospital-based IT employment.

¹⁸ Refer to Technical Appendix for the basis for this estimate.

¹⁹ Refer to Technical Appendix for the basis for this estimate.

Technology Adoption Model

As electronic health information systems are adopted, a greater proportion of IT professionals, health information management professionals, clinical informatics specialists, and organizational management professionals come within the definition of HI & HIM. For purposes of constructing scenarios that reflect this pattern, we have drawn on a technology adoption model developed by the Healthcare Information and Management Systems Society (HIMSS). This is known as the 'HIMSS Analytics Electronic Medical Records Adoption Model'.²⁰ The HIMSS model has been applied in Canada, though differences between the US and Canadian health care systems require the model be re-calibrated to yield usable results. HIMSS Analytics is currently working with CIOs in the Canadian health system to develop a more comprehensive profile of adoption trends in Canada.

Employment Forecasts

Employment forecasts reflect judgements based on five factors:

1. recent employment changes in pertinent occupations, per the 2001 and 2006 Census and the *Labour Force Survey*,
2. data from the HI & HIM Human Resources Survey,
3. investment spending on electronic health information systems. These reflect (a) announced investment intentions by Canada Health Infoway and, where available, by the provincial governments or agencies and (b) IDC Canada's projections of the size of the vendor market for IT products and services in the health system,
4. an assessment of the fiscal position of governments during the period 2009-2014 and its potential impact on the rate of investment in EHIS technologies, and
5. generic retirement rates.

Data were sufficient to support estimates of current employment and forecasts for most HI and HIM occupational groups. For some occupational groups, data were insufficient

to support either current employment estimates or forecasts of future requirements.

Impact of EHIS Technologies on Skill Requirements

EHIS technologies lead to a re-profiling of the skills required by HI & HIM professionals. The key questions are what proportion of HI & HIM professionals have made this skill adjustment, and what proportion will need to make the adjustment. These estimates draw on the seven-stage technology adoption model developed by HIMSS Analytics. The human resources implications of this model, together with a technology adoption scenario, are based on judgements developed by Prism Economics and Analysis which were then reviewed in the validation process.

Retirement Rates (Replacement Demand)

Estimates of replacement demand are based on the Prism Economics Replacement Demand Model and an HRSDC study of projected retirement rates.²¹ It should be noted, that *except for CHIMA's administrative data, there were no demographic data available that were specific to the work force being studied*. Consequently, replacement demand, where it has been estimated is based on rates applicable to the general labour force. This is a weakness that future studies should endeavour to correct, since, for many occupations, the demographic profile of the public sector differs from that of the population at large.

It should be borne in mind that 'replacement demand' is not the same as 'turnover'. Replacement demand operates at the level of the labour market. Turnover operates at the level of individual organizations.

Statistics Canada: Census and Labour Force Data

Special tabulations for *Census* and *Labour Force Survey* data were provided by Statistics Canada. These tabulations provide information on broad employment trends, demographics, and educational qualifications.

Contribution and Limits of this Report

This is the first national study to estimate the human resources impacts of the adoption of electronic health information systems. It is also the first study to focus on the private sector, as well as the public sector. The Ontario Hospital Association's

²⁰ A detailed description of the 'HIMSS Analytics Electronic Medical Records Adoption Model' can be found in HIMSS Analytics, *The EMR Adoption Model* (4th Edition) available at: www.himssanalytics.org/hc_providers/emr_adoption.asp It should be noted that HIMSS uses the term 'electronic medical records' (EMR) to refer to types of electronic data that in Canada are captioned as 'electronic health records' (EHR).

²¹ Kevin Dunn, Estimating and Forecasting Aggregate Retirement Flows in the Canadian Labour Market – December 2005, Policy Research & Coordination Directorate, HRSDC, SP-785-12-05E.

HRSDC, *Looking-Ahead: A 10-Year Outlook for the Canadian Labour Market (2006–2015)* provides occupation-specific retirement estimates. http://www.hrsdc.gc.ca/eng/publications_resources/research/categories/labour_market_e/sp_615_10_06/page07.shtml.

recent survey provides important and useful insights, but these are limited to the hospital sector in Ontario. The private sector was not included in the OHA's studies. As will be discussed later in this report, the survey data collected for this study show that the public sector relies on the private sector for human resources in a number of key occupational groups.

This was the first field application of the HI & HIM Human Resources Survey. There was unevenness in the regional application of the survey, as well as in its occupational coverage. As well, survey participants may sometimes have assigned individuals to different occupational groups. This is especially likely when respondents were reporting on individuals who perform multiple roles. It should also be noted that there are no estimates for skill gaps that may already exist. Notwithstanding these limitations, the Report provides insights into important trends that will affect a number of key HI & HIM occupational groups. *While this Report does not provide precise measures of the human resources impacts of adopting EHIS technologies, it does develop estimates that indicate the approximate orders of magnitude, especially for the larger HI & HIM occupational groups.* These estimates confirm that there is a serious human resources challenge. The estimates also provide a basis for identifying planning priorities. Finally, the study also identifies areas where data were lacking and which should be made the focus of future work.

Outline of Study

Chapter Two of this Report presents estimates of the current employment of HI & HIM professionals.

Chapter Three discusses the factors that shape the five year demand outlook for HI & HIM occupations. These include technology adoption, projected investments in EHIS technologies, and the fiscal situation of governments. The technology adoption scenario is based on the HIMSS Analytics model. Chapter Three then presents estimates of the proportion of HI & HIM professionals who currently have training or experience in working with EHIS technologies and the proportion that will require this training or experience. Lastly, Chapter Three includes estimates of the future employment for HI & HIM professionals and EHIS skill requirements, based on three investment scenarios.

Chapter Four discusses the potential supply and demand imbalances and the labour market risks that are indicated by the estimates developed in Chapter Three. Chapter Four also considers the degree to which these imbalances will arise from labour shortages or skills shortages.

Chapter Five presents recommendations arising from the analysis of supply and demand trends and from some of the key data gaps which future studies might address.

2. HI & HIM Supply Trends

This chapter develops estimates of the currently employed work force in Health Informatics & Health Information Management, based on seven occupational categories and 27 occupational groups described in Chapter One. The occupational categories are:

1. Information Technology
2. Health Information Management
3. Canadian Health System Management and Administration
4. Project Management
5. Organizational and Behavioural Management
6. Analysis and Evaluation
7. Clinical Informatics

Chapter Three sets out estimates of the proportion of HI & HIM professionals who have formal training or experience in implementing or working with electronic health information systems (EHIS).

Following the discussion of each occupational category, a summary table is presented that sets out the estimates of current employment for each occupational group (where this is feasible). At the end of the chapter there is a compilation of these estimates. For some occupational categories, the public sector and the private sector are discussed separately.

Information Technology

For purposes of this study, Information Technology encompasses seven occupational groups:

1. Senior IT Management
2. Architecture/Development
3. Application Implementation/Support
4. Security
5. Quality Assurance/Testing
6. Help Desk
7. Network, Storage and Other Infrastructure Support

Business Analysts, who often work in IT departments or IT practices are discussed under the Canadian Health System Management category. Risk Managers are also included in the Health System Management category. Project Managers are a distinct occupational category.

Information Technology Work Force in the Public Sector

Organizational structures in the public sector have a particularly significant impact on where IT professionals work. Some are employed directly by the hospital system. Many, however, are employed by regional health bodies, provincial or national agencies, and ministries. These organizational complexities make it challenging to develop estimates, especially since there is no common organizational model across the country.

The Census is helpful, but only in identifying IT professionals who work in the three health care delivery 'industries' as defined in the North American Industry Classification System (NAICS). The relevant NAICS codes are:

- ambulatory health care services (e.g., clinics, doctor's offices) (NAICS 621),
- hospitals (NAICS 622), and
- nursing and residential care facilities (NAICS 623).

Also, the most recent Census data are from 2006.

Public sector returns in the HI & HIM Human Resources Survey were received from regional administrative bodies, ministries, and public agencies. By contrast, the Ontario Hospital Association's survey was confined to hospitals.

Based on the Census, the HI & HIM Human Resources Survey, and the OHA survey, it is estimated that 30–40% of IT professionals are employed in regional health bodies, provincial or national agencies, and ministries. Taking these three data sources into account, it is estimated that the number of health system-related IT professionals in the public sector (excluding Business Analysts, Risk Managers and Project Managers who are discussed below) ranges from 10,900 to 13,100 persons.

Information Technology Work Force in the Private Sector

Determining the size of the information technology work force in the private sector is complex. It is estimated that the HI & HIM Human Resources Survey covered roughly 15–20% of employment in the private sector. Not all of the IT professionals identified in the survey are engaged in implementing or supporting EHIS technologies. Nor do all of these IT professionals work exclusively on health system accounts. As noted in Chapter One, supply has a different meaning in the private sector.

It is estimated that the size of the work force in the private sector that is employed solely or substantially on health sector accounts is approximately 5,000 to 6,000 persons. This estimate does not include Business Analysts who are discussed below.

The survey found that public sector employers augment their direct on-site resources by approximately 14% using persons supplied by the private sector. This implies that somewhere around 30% of information technology human resources in the private sector are deployed on-site in the health care sector. *Skill shortages in the private sector therefore will have a direct impact on project implementation in the health care system.*

Figure No. 4 compares the distribution of information technology employment across occupational groups in the public sector and in the private sector. It is noteworthy that the greatest proportion of human resources in both the public sector and the private sector are committed to Application Implementation and Support. The private sector commits a greater proportion of its professional human resources to architecture and development, quality assurance and testing. These functions account for 21% of the private sector's human resources in the information technology category, compared to 6% of the public sector's human resources in this category.

Based on the HI & HIM Human Resources Survey, it is estimated that, out of the total employment in the information technology occupational category, the private sector accounts for:

- 55–60% of the human resources in architecture and development,
- approximately the same proportion in security,

- around 70% of the human resources in quality assurance and testing, and
- approximately 25–30% of the human resources engaged in application implementation and support.

These data confirm that the supply of human resources in the private sector is a critical component of the overall human resources required for successful deployment of EHIS technologies. Consequently, it is important to take account of the human resources needs of the private sector, as well as the public sector.

Educational Background:

Survey respondents had the option to provide information on the educational background of their information technology employees. Data were collected for approximately 15% of the employees covered in the survey returns. These data show, not surprisingly, that 88% of employees in these occupational groups had qualifications in computer science, engineering, or information technology studies. Survey returns suggest that around 5% of employees in these occupational groups have training in project management.

Census data (Figure No. 5) indicate that roughly three-quarters of workers in information technology occupations have post-secondary qualifications. Those without post-secondary qualifications are distributed across the various IT occupations, though a greater proportion are in help desk and network technician occupations. These data, it should be noted, refer to all sectors, not just the health system-related public sector and private sector.

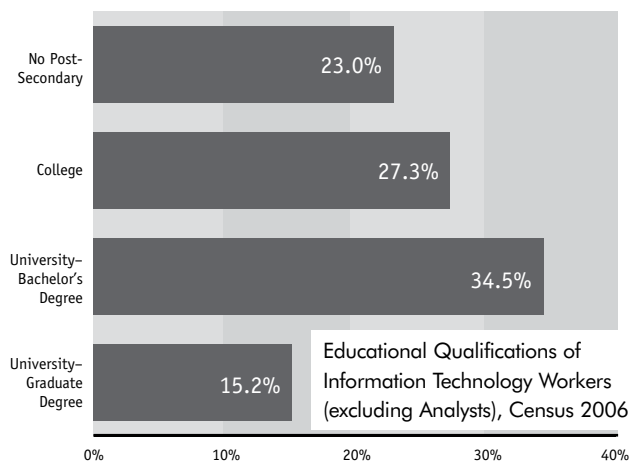
Figure No. 4

Comparison of the Distribution of Health System Related IT Employment across Occupational Groups in the Public Sector and the Private Sector (HI & HIM Human Resources Survey)

Occupational Group	Percent of Health System Related IT Employment in the Public Sector	Percent of Health System Related IT Employment in the Private Sector
Senior IT Management	8%	4%
Architecture/Development	4%	12%
Application Implementation and Support	59%	49%
Security	1%	3%
Quality Assurance/Testing	2%	9%
Help Desk	14%	14%
Network, Storage, and Other Infrastructure Support	12%	9%
Total	100%	100%

Figure No. 5

Educational Qualifications of Workers in Information Technology Occupations Census 2006



Demographics:

Census data confirm that, compared to the total labour force, the work force in information technology occupations is younger. The proportion of workers over age 55 ranges from 5.2% to 8.3% depending on the occupation. This national pattern is likely indicative of demographic trends in the private sector. However, in the public sector, the demographic profile tends to diverge from the national trend. A 2004 Statistics Canada survey commissioned by the ICTC found that *in the public sector, IT workers were 3.6 to 6.8 years older than workers in the private sector, depending on the region.*²²

While there is not sufficient data to project exit rates from the professional work force in the public sector, the marked difference in the average age of the public sector work force (in 2004) suggests that demographically driven exits are likely to be a more significant factor in the public sector and will add to the human resources challenges in that sector.

Summary of Employment Estimates:

Figure No. 6 summarizes the estimate of current employment of health system-related IT professionals.

Figure No. 6

Estimates of Current Employment of Health System-Related IT Professionals Public Sector and Private Sector
Prism Economics and Analysis

Information Technology – Public Sector	Low	High
Senior IT Management	870	1,050
Architecture/Development	440	520
Application Implementation/Support	6,430	7,730
Security	110	130
Quality Assurance/Testing	220	260
Help Desk	1,530	1,830
Network, Storage and Other Infrastructure Support	1,310	1,570
Totals	10,910	13,090
Information Technology – Private Sector	Low	High
Senior IT Management	200	240
Architecture/Development	600	720
Application Implementation/Support	2,450	2,940
Security	150	180
Quality Assurance/Testing	450	540
Help Desk	700	840
Network, Storage and Other Infrastructure Support	450	540
Totals	5,000	6,000

²² Information and Communications Technology Council, *the Information Technology (IT) Labour Market in Canada: Results from the National Survey of IT Occupations* (April 2005).

Health information Management (HIM)

In this study, the Health Information Management (HIM) occupational category includes seven occupational groups:

1. Senior Health Information Management
2. Privacy
3. Standards
4. Data Quality Management
5. Decision Support
6. Health Records Management
7. Coding and Classifications

Developing estimates of the HIM work force poses distinct challenges. Historically some of these occupations began as predominantly clerical functions. Within the health care system two trends have been important. The first is

the professionalization of health information management functions. The second is an expansion of the responsibilities of HIM professionals. These changes have been reflected in the emergence of specialized programs in health information management in both the college/CEGEP system and the university system. In 1952, the Canadian Health Information Management Association introduced a system for professional certification. Statistical coding procedures, however, have not kept pace with these changes in the skill requirements and roles of HIM professionals. As a result, the Census provides no foundation for an employment estimate.

Based on administrative data provided by CHIMA and data from the HI & HIM Human Resources Survey, it is estimated that there are 4,300 to 5,800 HIM professionals. Roughly 95% of these professionals are employed in the public sector.

Health Information Management (HIM) Work Force in the Public Sector

Figure No. 7 summarizes survey data on the distribution of HIM employment across occupational groups in the public sector.

Figure No. 7

Distribution of Health Information Management Employment across Occupational Groups in the Public Sector
(HI & HIM Human Resources Survey)

Occupational Group	Percent of Employment in Health Sector
Senior Health Information Management	2%
Privacy	8%
Standards	6%
Data Quality Management	9%
Decision Support	22%
Health Records Management	38%
Coding and Classifications	15%
Total	100%

Health Information Management (HIM) Work Force in the Private Sector

The *HI & HIM Human Resources Survey* indicates that approximately 5% of HIM professionals are employed in the private sector. Roughly half of these professionals work in health records management. While there are specialized firms that provide health information management expertise, the private sector does not figure prominently into the supply of human resources in this field.

Educational Background:

Data were collected on the educational background of approximately 50% of the HIM professionals covered by the survey. These data were estimates provided by the individuals responsible for completing the survey for an organization. Few respondents would have checked administrative records to provide a precise count. As well, respondents were allowed to indicate multiple qualifications. For all of these reasons, the data on educational background provides only broad indicators. That being said, it is evident that CHIMA qualifications and general science qualifications predominate among HIM professionals. Comparatively few (approximately 10%) report health

informatics or computer science/IT/engineering qualifications. Still fewer (<3%) report clinical training.

The 3,700 currently certified HIM professionals have either a two year college or four year baccalaureate in Health Information Management.

Demographics:

CHIMA administrative data indicate that the average age of their membership (which accounts for approximately 60-65% of HIM professionals in the hospital system) is 46.5. In Atlantic Canada, the average is slightly higher—approximately 47.7.

Based on CHIMA's administrative data, approximately 16% of HIM professionals are over age 55. This suggests that *exits from the HIM labour force will be an important human resources planning consideration over the next five years and especially over the next ten years.*

Figure No. 8 summarizes the proportion of CHIMA members who are over the age of 55 in each province. (Data for Quebec were not available).

Figure No. 8

Percent of Members of the Canadian Health Information Management Association (CHIMA) who are Over Age 55 (CHIMA Administrative Data)

Province	Percent > Age 55
Alberta	17%
British Columbia	18%
Manitoba	10%
New Brunswick	15%
Newfoundland and Labrador	15%
Nova Scotia	19%
Ontario	16%
Prince Edward Island	6%
Quebec	not available
Saskatchewan	13%
Average	16%

Summary of Employment Estimates for HIM Occupational Groups:

Figure No. 9 summarizes the estimate of current employment of for the HIM occupational category. While CHIMA's administrative data were used in developing these estimates, there is no simple relationship between CHIMA certification and the employment in HIM occupational groups. As noted earlier, some professionals in the HIM occupational groups hold CHIMA certifications, while other have different qualifications. As well, many CHIMA-certified professionals are employed in other HI & HIM occupational groups outside of this occupational category.

Canadian Health System Management and Administration

The 'Canadian Health System Management and Administration' category includes three occupational groups which were judged by the Steering Committee to be significantly affected by the adoption of EHR technologies. The three occupational groups are:

1. Policy and Strategic Planning
2. Risk Management
3. Business Analysis

The survey samples for all three of these occupational groups were small. The OHA survey also identified only a small number of Business Analysts. However, these survey results should not be taken at face value. The Census

suggests a quite different picture. Data from the 2006 Census indicate that there were approximately 3,300 Business Analysts employed in the health delivery system. Indeed, between 2001 and 2006, Census data indicate that the number of Business Analysts in the health delivery system more than doubled. It is unlikely that both the HI & HIM Human Resources Survey and the OHA survey missed these professionals. It is more likely that in the public sector, health system-related Business Analysis functions are associated with other occupational groups, such as Analysis and Evaluation. Respondents may also have included Risk Management Analysts in this occupational group.

As a result of low sample sizes and the likelihood that the functions in these occupational groups are more often associated with other occupational groups, it was not feasible to develop employment estimates for the 'Health System Management and Administration' occupational groups.

Project Management

The 'Project Management' category includes two occupational groups:

1. Senior Project Management
2. Project Management

Project Managers are not a distinct occupation within the National Occupational Classification system. Consequently, Census data cannot be used to estimate the number of Project Managers.

Figure No. 9

Estimates of Current Employment of HIM Professionals Public Sector and Private Sector
Prism Economics and Analysis

Health Information Management	Low	High
Senior Health Information Management	90	120
Privacy	340	460
Standards	260	350
Data Quality Management	390	520
Decision Support	950	1,280
Health Records Management	1,630	2,200
Coding and Classifications	650	870
Totals	4,310	5,800

Based on the HI & HIM Survey, it is estimated that there may be 750–900 persons employed in project management positions in the public sector health system and a further 1,100–1,300 in the private sector who have health system experience and expertise. Overall, approximately 20% of these professionals are Senior Project Managers.

The health care system augments its project management resources by drawing on the private sector. *Survey data suggest that the public sector was employing roughly one on-site project manager supplied by the private sector for every two project managers that were directly employed.* This implies that the availability of experienced project managers in the private sector is an important factor in the capacity of the health care system to implement EHS technology projects.

The HI & HIM Human Resources Survey suggests that approximately one third of project managers have project management qualifications, such as certification by the Project Management Institute. Approximately one-fifth have qualifications in administrative studies disciplines. Since multiple responses were permitted, the qualifications in project management could overlap with qualifications in administrative studies.

Figure No. 10 summarizes current employment estimates in the project management occupational groups. These estimates should be treated with caution. It is possible that many organizations associate project management functions with other occupational groups. Some organizations may assign individuals on a temporary basis to project management duties. Alternatively, individuals may have project management responsibilities assigned to them in addition to other duties.

Figure No. 10

Estimates of Current Employment in Project Management Public Sector and Private Sector
Prism Economics and Analysis

Project Management – Public Sector	Low	High
Senior Project Managers	130	150
Project Managers	630	750
Totals	760	900
Project Management – Private Sector	Low	High
Senior Project Managers	280	330
Project Managers	830	980
Totals	1,100	1,310

Organizational and Behavioural Management

The 'Organizational and Behavioural Management' category encompasses five occupational groups:

1. Account Executives
2. Program Management
3. Product/Service Management
4. Change Management
5. Training and Development

Change Management professionals and Training and Development professionals with HI & HIM experience will be particularly important in implementing EHS technologies.

The HI & HIM Human Resources Survey suggests a number of observations:

- There appear to be fewer than 100 Change Management professionals directly employed by the health care system. This estimate is consistent with the findings of the

OHA survey, which suggests an even lower estimate. This could reflect either dearth of persons in the Change Management occupational group or the assignment of these functions to persons in other occupational groups.

- The health care system appears to rely heavily on the private sector to provide Change Management expertise. Overall, 80% or more of Change Management professionals are supplied to the health care system by the private sector.
- The health care system also appears to rely on the private sector to supply around half or more of its training and development needs in HI & HIM.

Figure No. 11 summarizes current employment estimates in the 'Organizational and Behavioural Management' category. These estimates should be treated with caution, since many organizations may associate some of the functions in this occupational category with other occupational groups.

Figure No. 11

Estimates of Current Employment in 'Organizational and Behavioural Management' Public Sector and Private Sector
Prism Economics and Analysis

Organizational and Behavioural Management – Public Sector	Low	High
Account Executives*	80	100
Program Management	350	400
Product/Service Management	430	500
Change Management	80	90
Training and Development	180	210
Totals	1,120	1,300
Organizational and Behavioural Management – Private Sector	Low	High
Account Executives	710	850
Program Management	100	110
Product/Service Management	600	720
Change Management	290	350
Training and Development	210	250
Totals	1,910	2,280

* In the Public Sector, 'Account Executives' can be found in agencies mandated to identify and implement investments in EHS technologies.

Analysis and Evaluation

This category contains only one occupational group—Analysis and Evaluation Professionals.

The HI & HIM Human Resources Survey identified a significant number of individuals in this occupational group. There is, however, some ambiguity in the interpretation of this finding. The representative job titles provided to respondents included:

- Research and Analysis VP
- Senior Methodologist
- Senior Researcher
- Benefits & Evaluation Analyst
- Business Intelligence Analyst
- Information Analyst
- Research Analyst

It is likely, however, that many public sector respondents included in this occupational category are persons who perform Business Needs Analysis and Risk Analysis functions. This interpretation goes some way towards reconciling the HI & HIM Human Resources Survey results with Census data. (See the earlier discussion regarding Business Analysts). Figure No. 12 summarizes estimates for this occupational

group. Data for the private sector were insufficient to support an estimate of current employment.

Clinical Informatics

This category includes two occupational groups:

1. Senior Medical Information Officers
2. Clinician-Analysts

Extrapolating from the HI & HIM Human Resources Survey suggests that there are 460–540 persons in Clinical Informatics roles in the public sector. Extrapolating from the OHA survey suggests a somewhat higher number, approximately 700. As noted earlier, public sector respondents in the HI & HIM Human Resources Survey were predominantly regional administrative bodies, ministries, and public agencies. This may have led to an under-estimation of the number of Clinical Informatics specialists in some regions. For this reason, the employment estimates have been adjusted upwards from those that would otherwise have been indicated by the HI & HIM Human Resources Survey.

It is also noteworthy that the private sector respondents to the HI & HIM Human Resources Survey also reported a significant number of Clinical Informatics specialists.

Figure No. 12

Estimates of Current Employment in 'Analysis and Evaluation' – Public Sector and Private Sector
Prism Economics and Analysis

Analysis and Evaluation – Public Sector	Low	High
Analysis and Evaluation*	3,270	3,920
Analysis and Evaluation – Private Sector	Low	High
Analysis and Evaluation	xxx	xxx

* This occupational group may also include a significant number of persons who perform Business Needs Analysis functions and Risk Management Analysis functions.

Health Informatics and Health Information Management: Human Resources Report

Figure No. 13

Estimates of Current Employment in 'Clinical Informatics' – Public Sector and Private Sector
Prism Economics and Analysis

Clinical Informatics – Public Sector	Low	High
Senior Medical Information Officers	90	110
Clinician Analysts	510	600
Totals	600	710
Clinical Informatics – Private Sector	Low	High
Senior Medical Information Officers	80	100
Clinician Analysts	300	350
Totals	380	450

Figure No. 14

Summary of Estimates of Current Employment
(Prism Economics and Analysis)

Information Technology – Public Sector	Low	High
Senior IT Management	870	1,050
Architecture/Development	440	520
Application Implementation/Support	6,430	7,730
Security	110	130
Quality Assurance/Testing	220	260
Help Desk	1,530	1,830
Network, Storage and Other Infrastructure Support	1,310	1,570
Sub-Totals	10,910	13,090
Information Technology – Private Sector	Low	High
Senior IT Management	200	240
Architecture/Development	600	720
Application Implementation/Support	2,450	2,940
Security	150	180
Quality Assurance/Testing	450	540
Help Desk	700	840
Network, Storage and Other Infrastructure Support	450	540
Sub-Totals	5,000	6,000

Health Information Management	Low	High
Senior Health Information Management	90	120
Privacy	340	460
Standards	260	350
Data Quality Management	390	520
Decision Support	950	1,280
Health Records Management	1,630	2,200
Coding and Classifications	650	870
Sub-Totals	4,310	5,800
Canadian Health System Management and Administration*	Low	High
Policy and Strategic Planning	xxx	xxx
Risk Management	xxx	xxx
Business Analysis	xxx	xxx
Sub-Totals	xxx	xxx
Project Management – Public Sector		
Senior Project Managers	130	150
Project Managers	630	750
Sub-Totals	760	900
Project Management – Private Sector		
Senior Project Managers	280	330
Project Managers	830	980
Sub-Totals	1,110	1,310
Organizational and Behavioural Management – Public Sector		
Account Executives (Vendors)*	80	100
Program Management	350	400
Product/Service Management	430	500
Change Management	80	90
Training and Development	180	210
Sub-Totals	1,120	1,300

* Persons in these occupation groups may have been reported in 'Analysis and Evaluation'.

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Organizational and Behavioural Management – Private Sector		
Account Executives (Vendors)	710	850
Program Management	100	110
Product/Service Management	600	720
Change Management	290	350
Training and Development	210	250
Sub-Totals	1,910	2,280
Analysis and Evaluation		
Analysis and Evaluation – Public Sector**	3,270	3,920
Analysis and Evaluation – Private Sector	xxx	xxx
Clinical Informatics – Public Sector		
Senior Medical Information Officers	90	110
Clinician Analysts	510	600
Sub-Totals	600	710
Clinical Informatics – Private Sector		
Senior Medical Information Officers	80	100
Clinician Analysts	300	350
Sub-Totals	380	450
Total	29,370	35,780

** This occupational group may also include a significant number of persons who perform Business Needs Analysis functions and Risk Management Analysis functions.

3. HI & HIM Demand Trends

Introduction

The purpose of this chapter is to estimate the number of HI & HIM professionals that will be required over the next five years and who will need to have formal training or experience in implementing or working with electronic health information systems (EHIS).

Any employment forecast must recognize the uncertain economic climate in which we are operating. While there is a consensus that the global economy is no longer contracting, forecasters disagree on both the durability and the extent of the turnaround.²³ Equally there is no consensus on the degree to which the deterioration in the fiscal position of governments will repair itself or require some combination of tax increases and expenditure retrenchment. To take account of the uncertainties that surround any forecast this Report projects future HI & HIM employment on the basis of three scenarios in which the main variable is the rate of increase of investment in EHIS technologies by the federal and provincial governments.

Demand 'Drivers'

The requirement for HI & HIM professionals with formal training or experience in EHIS technologies is determined principally by two factors. The first of these is investment in EHIS technologies. Increases in the rate and level EHIS investment primarily affects the *number* of HI & HIM professionals who are required to implement and subsequently to maintain electronic health information systems. This is termed the 'employment effect'.

The second demand driver is the impact of adopting EHIS technologies on broadening the skill requirements of HI & HIM professionals. As noted in Chapter One, 'skill broadening' refers to the need to acquire additional theoretical knowledge and practical insight in other domains of professional expertise. This skill broadening exceeds the learning that results

HUMAN RESOURCES IMPACTS OF INVESTMENTS IN EHIS TECHNOLOGIES

Employment Effect:

- Arises from increases in the level and rate of investment in EHIS technologies.
- Two components: 'implementation requirement' and 'operations requirement'.
- The 'implementation requirement' is tied to increases in the rate of investment.
- The 'operations requirement' is tied to the size of the installed base of electronic health information systems.
- The 'employment effect' creates the risk of a 'labour shortage'.

Skill Broadening Effect:

- Arises from the impact of adopting EHIS technologies on skill requirements.
- Primarily affects the *proportion* of HI & HIM professionals who will require formal training or experience in EHIS technologies because of changes in their jobs.
- The 'skill broadening effect' creates the risk of a 'skills shortage'.

from normal working experience. The 'skill broadening effect' primarily affects the *proportion* of HI & HIM professionals who will require formal training or experience in EHIS technologies because of changes in their jobs.²⁴

All HI & HIM occupational groups experience both an 'employment effect' and a 'skill broadening effect'. However, the relative importance of these effects differs

²³ The Bank of Canada is its *Monetary Policy Report* (July 2009) projected growth of 3.0% in 2010 and 3.5% in 2011. The major chartered banks are projecting somewhat slower growth in 2010. Their forecasts for 2010 range from 2.0% (CIBC) to 2.8% (Scotiabank and TD Bank). Those that have offered projections for 2011 anticipate growth in the same range as the Bank of Canada.

²⁴ There is also a third effect, namely the 'productivity effect'. The 'productivity effect' refers to the labour saving consequences of investments in technology. In the case of EHIS technologies, the experience of other jurisdictions suggests that there is no short or medium-term reduction in professional human resources requirements arising from EHIS investments. On the contrary, requirement for professionals tends to increase. Where there are productivity effects on professionals (for example on the clinical professions), these usually lead to more efficient use of professional time, rather than to a reduction in the number (or rate of growth) of professionals. The principal impact of the 'productivity effect' is on clerical occupations, many of which are eliminated by the adoption of electronic health information systems. In this regard it is notable that between 2001 and 2006, the Census shows that employment of records clerks (B513) in the hospital system *declined* by 1.5% while overall employment in the hospital system increased by 8.2%. The 'productivity effect' of information and communications technologies in the health system therefore appears to be similar to the impact of these technologies in other sectors, *i.e.*, the professional share of employment increases while the non-professional share decreases. There is an extensive economic literature that documents the skill biases of information and communications technologies.

across the 27 occupational groups. This distinction between the 'employment effect' of capital spending on EHS technologies and the 'skill broadening effect' lies behind the difference between a 'labour shortage' and a 'skills shortage'. The 'labour shortage' risk arises from the challenge of meeting the need to increase the number of HI & HIM professionals. The 'skills shortage' risk arises from the need HI & HIM professionals to have broader skills after EHS technologies are adopted.

Implementation Requirements vs. Operations Requirements

Implementation requirements refer to the human resources that are engaged in:

- defining business needs,
- selecting, customizing and installing a technology solution,
- re-engineering organizational processes to maximize the gains from the new technology,
- integrating the new technology and new business processes with existing technologies and business processes,
- managing the overall process of change, and
- designing and delivering training in the new technology and new business processes.

Implementation requirements are inherently cyclical, although organizations that have ongoing investment projects (or assignments) may move from one implementation cycle to another. The demand for these human resources reflects, therefore, the technology investment cycle. Some of these resource requirements may be met by assigning permanent staff to implementation projects or hiring project-specific staff. Other resources requirements will be met by drawing on the private sector. As the previous chapter showed, the private sector plays an especially important role in meeting the public sector's requirements for certain occupational groups.

Operations requirements refer to the human resources that are engaged in the ongoing support, management, utilization and analytical roles associated with electronic health information systems. These requirements are predominantly non-cyclical because they arise from the ongoing activities of the health system. The demand for these human resources increases more or less in line with the growth of the health care system, and more particularly, with the growth in the

installed base of electronic health information systems. Because operations requirements are both more stable and more predictable, the health system tends to meet these requirements internally, although some functions may be outsourced for cost reasons.²⁵

Hiring for all occupational groups is affected, to some degree, by changes in implementation and operations requirements. However, some occupations are significantly more affected by changes in implementation requirements, while others are more affected by changes in operations requirements. Categorizing employment changes in an occupational group as primarily determined by operations requirements emphatically does *not* imply that professionals in these occupational groups have no role in implementation. On the contrary, many of these professionals will have significant input into implementation projects as part of their regular duties. Rather, the categorization in the 'operations' column implies that new hiring requirements are primarily (though not exclusively) driven by long-term operations requirements. Figure No.15 categorizes the 27 occupational groups in relation to which of these types of requirements is of primary importance. In a few cases, the two types of requirements are approximately equal in importance.



²⁵ There are also 'echo effects', that is to say investments that are required to upgrade systems and applications after they have been installed. This Report does not explicitly factor in 'echo effects' since, at this time, we do not have good information on the expected lifespan of systems and applications before major upgrades are required.

Figure No. 15

Primary Driver of Changes in Human Resource Requirements
(Estimates by Prism Economics and Analysis)

Primary Driver of Changes in Human Resource Requirements		
Implementation Requirements	Operations Requirements	Both Requirements Approximately Equal
<p>Information Technology</p> <ul style="list-style-type: none"> • Architecture and Development • Quality Assurance/Testing <p>Management of the Health System</p> <ul style="list-style-type: none"> • Business Analysis <p>Project Management</p> <ul style="list-style-type: none"> • Senior Project Management • Project Management <p>Organizational & Behavioural Management</p> <ul style="list-style-type: none"> • Account Executives • Change Management • Training and Development 	<p>Information Technology</p> <ul style="list-style-type: none"> • Senior IT Management • Help Desk <p>Health Information Management</p> <ul style="list-style-type: none"> • Senior Health Information Management • Standards • Data Quality Management • Decision Support • Health Records Management • Coding and Classifications <p>Management of the Health System</p> <ul style="list-style-type: none"> • Policy and Strategic Planning <p>Organizational & Behavioural Management</p> <ul style="list-style-type: none"> • Program Management • Product/Service Management <p>Analysis and Evaluation</p> <ul style="list-style-type: none"> • Research, Analysis and Evaluation <p>Clinical Informatics</p> <ul style="list-style-type: none"> • Senior Medical Information Officers • Clinician-Analysts (public sector) 	<p>Information Technology</p> <ul style="list-style-type: none"> • Application Implementation/Support • Network, Storage and Other Infrastructure Support • Security <p>Health Information Management</p> <ul style="list-style-type: none"> • Privacy <p>Management of the Health System</p> <ul style="list-style-type: none"> • Risk Management <p>Clinical Informatics</p> <ul style="list-style-type: none"> • Clinician-Analysts (private sector)

Investment in EHS Technologies

At the federal level, Canada Health Infoway is the national vehicle for accelerating investment in EHS technologies. Since 2001, Canada Health Infoway has allocated over \$1.57 billion to investments in electronic health information systems. By 2010, this will increase to an estimated \$1.97 billion.²⁶ The January 2009 budget allocated a further \$500 million to Canada Health Infoway to support investments over and above this amount. Roughly \$1.0 billion of these monies was invested in the last two to three years.

Provincial governments and their agencies are partnering with Canada Health Infoway on a shared-cost basis and also supporting investments in EHS technologies entirely from their own resources. Figure No. 16 shows Canada Health Infoway's estimate of the progress made as of March 31, 2009 on the implementation of EHS technologies in six priority areas. Progress is assessed in terms of Infoway's stated objective that "by 2010, 50% of Canadians will have their electronic health records available to their authorized professionals who provide their health care services."²⁷

²⁶ Canada Health Infoway, *Annual Report 2008/2009*.

²⁷ *ibid.*, p 14.

Figure No. 16

Jurisdictional Progress towards Achievement of Canada Health Infoway's '50% Goal'
March 31, 2009
(Canada Health Infoway, Annual Report 2008/2009)

Jurisdictional Progress to March 31, 2009

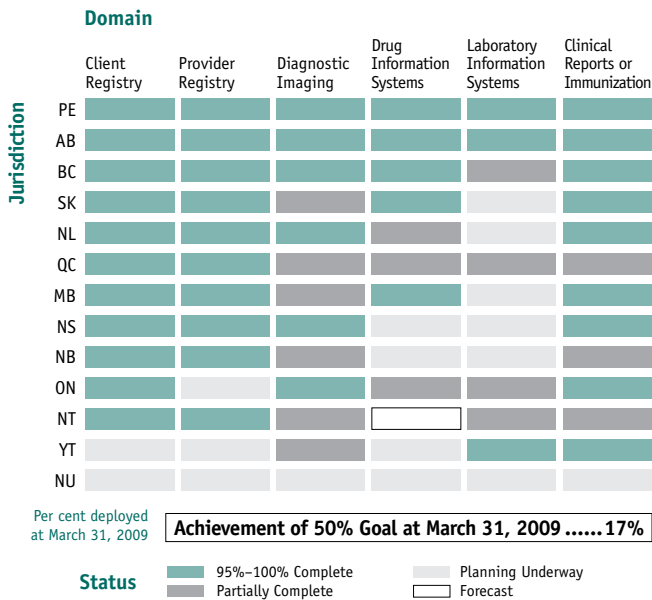


Figure No. 16 shows that while progress has been made, there is still a substantial way to go to meet the '50% goal'. From a human resources planning perspective, this implies that *the preponderance of both the implementation requirements and the longer term operations requirements has yet to be felt*. The HI & HIM human resource pressures that the public sector is currently experiencing will be multiplied as large-scale investment plans are carried out over the next five years.

Tracking the health care system investment spending on information technology generally, or on EHS technologies more specifically, is exceedingly complex. At the facility level (e.g., hospitals) spending may appear in capital budgets or in operating budgets. Some hospitals may assign all of their IT spending to their IT department. Others may apportion some of this spending to clinical departments. In some jurisdictions, some IT services may be provided at a regional or provincial level. These services may apply to other segments of the health care system, in addition to the acute care sector. To further complicate matters, some spending announcements include Canada Health Infoway funds, while others do not. Monies may also be shifted from one year to another and announced in the same manner as new commitments.

The following table summarizes announced and reported spending commitments, drawn from various sources. No claim is made that the table is complete or that the estimated spending commitments will not be revised either upwards or downwards.



Figure No. 17

Summary of Announced and Reported Spending Commitments on EHS Technologies
(Compiled by Prism Economics and Analysis)
(\$Millions)²⁸

	2005–06	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13
Newfoundland	\$7.3	\$5.9	\$12.2	\$9.5				
Nova Scotia		\$18.8	\$23.6	\$31.5	\$41.0			
New Brunswick	\$3.6	\$2.1	\$15.7					
PEI				\$3.5	\$5.9			
Quebec	not available			\$177.4	Projected: additional \$384.6			
Ontario					\$2,133.0			
Manitoba	\$18.0	\$20.0	\$23.0	\$25.0	\$150.0 over 3–5 years commencing 2007–08			
Saskatchewan	\$25.2	\$40.0	\$41.3	\$48.1				
Alberta			\$118.5	\$67.1	\$98.1			
B.C.	\$9.0	\$38.1	\$41.9	\$56.7	\$37.2			

What is notable about Figure No. 17 is the *rapid acceleration* of spending on EHS technologies as jurisdictions develop their commitments to these investments:

- In Nova Scotia, spending increased from \$18.8 million in 2006–07 to \$41.0 million in 2009–10.
- Saskatchewan shows a similar acceleration pattern. Revenues of the Saskatchewan Health Information Network increased from \$25.2 million in 2005–2006 to \$48.1 million in 2008–09.

- Other jurisdictions have made significant spending commitments which will lead to similar acceleration patterns in investment spending.

As can be seen in Figure No. 18 the *acceleration pattern* that is evident in provincial implementation of EHS investments is mirrored (and, in part, attributable to) the acceleration of investments by Canada Health Infoway.

²⁸ Sources:

- Newfoundland and Labrador: Centre for Health Information, *Annual Reports* (expenditures per financial statements)
- Nova Scotia: Estimates – Minister of Finance, *Nova Scotia Estimates – Supplementary Detail 'Information Technology Initiatives for the Department of Health' – Estimates and Supply*
- New Brunswick: Ministry of Health, *Annual Report, 2007–2008*
- Prince Edward Island: Budget, 2009 – Estimates of Revenue and Expenditure – Integrated Electronic Health Records
- Quebec: Website – Santé et services sociaux – sommaire budgétaire
- Ontario: eHealth Ontario web site
- Manitoba: estimates provided. \$150.0 spending announcement – April 11, 2007
- Saskatchewan: Saskatchewan Health Information Network, *Annual Reports* (revenues per financial statements)
- Alberta Minister of Finance, Budget – Estimates 2009–2010 – Health Information Systems
- British Columbia Canada: provided by Project Management Office, Ministry of Health

Figure No. 18

Summary of Spending Commitments by Canada Health Infoway (Canada Health Infoway, Annual Report, 2008/2009)

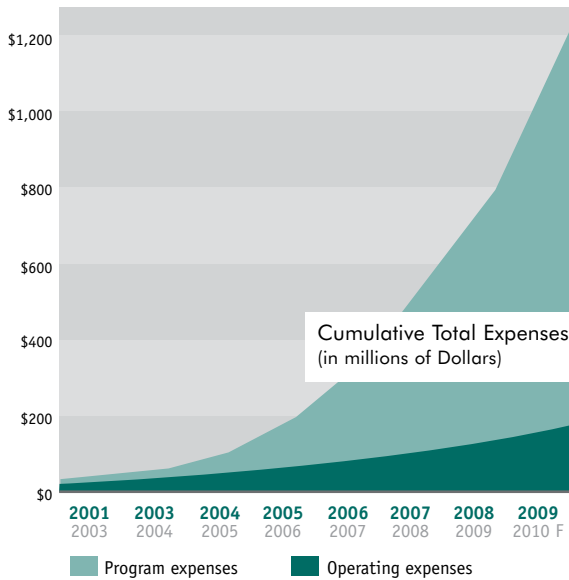
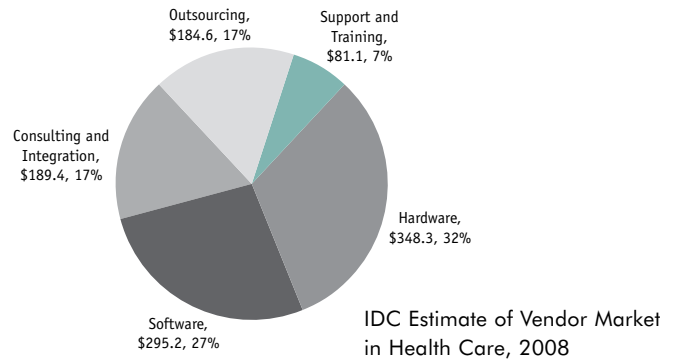


Figure No. 19

Estimated Health Care Sector purchases from Vendors, 2008 (IDC Canada)



In May 2009, IDC Canada estimated growth rates for the major expenditure categories in the vendor market over the five year period 2008 to 2013. *IDC Canada anticipates that the dollar value of the overall vendor market will increase by 12.9% in nominal terms. Adjusting for inflation, these projections suggest real growth of approximately 7.5%.* Figure No. 20 summarizes these projections.

Vendor Market

IDC Canada estimates that the value of the 2008 vendor market in the Canadian health care system was approximately \$1.1 billion. Figure No. 19 shows the approximate distribution of these expenditures across major vendor categories.

Figure No. 20

Estimated Five Year Increases in the Public Health Care Sector's Purchases from Vendors, 2008–2013 (Expenditure Estimates: IDC Canada. Inflation Estimates: Prism Economics)

	Increase in Nominal Expenditure (IDC) (Five Years)	Estimated Inflation (Prism) (Five Years)	Increase in Real Expenditure (Five Years)
Hardware	-2.6%	2.5%	-5.1%
Software	16.3%	5.0%	11.3%
Consulting and Integration	25.8%	7.5%	18.3%
Outsourcing	26.1%	7.5%	18.6%
Support and Training	6.4%	7.5%	-1.1%
Total Vendor Market	12.9%	5.4%	7.5%

IDC's projections, it should be noted, apply to all types of IT purchases, not just to purchases related to the adoption of EHS technologies. In these projections, the major human resources drivers are the projected expenditures in consulting and integration, outsourcing, and support and training. The projections in Figure No. 20 suggest that human resources requirements in the private sector will increase by around 10–15%. This includes HI & HIM professionals as well as other technical and professional staff. However, in light of the EHS investment plans that were described above, the demand which vendors will be called upon to meet will be strongly biased toward HI & HIM skill requirements. Consequently, *in the private sector, we anticipate that the five-year growth in human resources requirements for professionals with HI & HIM skills will be 15–20%*. Deferrals or delays in EHS investment plans would reduce this growth projection.

Deteriorating Fiscal Position of Governments

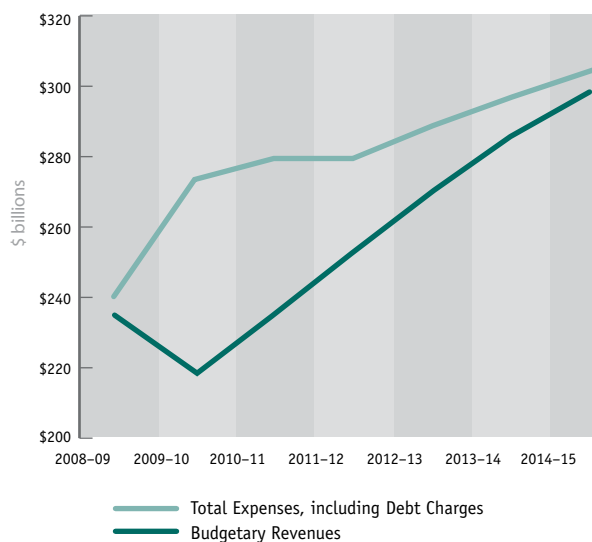
In its September update, the Department of Finance projected a deficit of \$55.9 billion in 2009–10 and \$45.3 billion in 2010–11. The current fiscal plan envisions the deficit being reduced to \$5.2 billion in 2014–15.²⁹ This requires holding increases in 'program expenses' to 1.6% per year. Many of these 'program expenses' are entitlement programs, such as Old Age Security and the Guaranteed Income Supplement. Keeping overall increases in 'program expenses' to 1.6% could entail more severe restraints on discretionary spending.

Figure No. 21 shows the deterioration in the federal government's fiscal position, based on the most recent projections published by the Department of Finance.

The deterioration in the fiscal position of the federal government is mirrored at the provincial level. In light of these changes in the fiscal situation of governments, a period of expenditure restraint is a distinct possibility. There is already evidence that this is taking place. Expenditure restraint could affect capital spending plans for EHS technologies.³⁰ Much of the capital spending that will drive human resource requirements over the next few years is already committed. Nevertheless, *in constructing demand projections, some account must be taken of the possible impact of changes in the fiscal position of governments*. As noted earlier, three

Figure No. 21

Projected Revenues and Expenses of the Federal Government (Department of Finance, *Fiscal Outlook*, September 2009)



demand scenarios are developed in this chapter. The 'high demand scenario' assumes no deferrals or delays in EHS investments. The 'low demand scenario' anticipates that investment spending will be reduced by approximately one-half as a result of deferrals and delays. The 'moderate demand scenario' is intermediate between these scenarios.

Technology Adoption

HIMSS Analytics has developed a seven-stage adoption model to gauge progress in the adoption of electronic medical records in hospitals. There are both strengths and drawbacks in this model. The model's most important strength is that it is the most comprehensive technology adoption model currently available and permits comparisons with trends in the US. The HIMSS model is currently being applied in Canada. As the model is applied in Canada, it will be refined to better suit specific Canadian conditions.

²⁹ Department of Finance, *Fiscal Outlook*, September 2009. TD Economics projects higher deficits. See TD Economics, *Observation*, June 2, 2009: www.td.com/economics/gov_finances.jsp.

³⁰ The recently released report by the federal government on the implementation of the Action Plan (i.e., stimulus plan) stated: "As part of the Action Plan, the Government announced an investment of \$500 million in Canada Health Infoway. Due diligence on this project will not be completed prior to the start of Fiscal year 2010–11." Some have read this as drawing out of the investment plan. Government of Canada, *Canada's Economic Action Plan: a Third Report to Canadians* (September 2009), p 106.

It is important, however, to be mindful of the limitations of the HIMSS model:

- The HIMSS adoption model reflects US organizational structures. These do not take account of the regional and ministerial roles that are important in the Canadian context.
- The HIMSS model is limited to the acute care system. The HIMSS model does not take account of technology adoption in ambulatory clinics, free-standing diagnostic laboratories, and medical offices.
- EHS technologies embraces a broader range of systems and applications than 'Electronic Medical Records (EMR)' as that term is used by the HIMSS model.
- Some jurisdictions in Canada are proceeding with implementation of EHS technologies in a different order than is presumed in the HIMSS model. This can result in misleading rankings under the HIMSS model.

In future studies, it will be important to compile and develop more refined indicators of technology adoption. In addition to the HIMSS model, which will be further adapted to Canadian conditions, it may also be feasible to draw on empirical work undertaken by other organizations, such as the Branham Group, and the National Physician Survey.

Figure No. 22 summarizes the HIMSS Analytics adoption model.

Figure No. 22

HIMSS Analytics Seven-Stage Electronic Medical Records (EMR) Adoption Model

7	<ul style="list-style-type: none"> • Health records are fully electronic. • Clinical information can be readily shared through Continuity of Care electronic transactions with all entities within health information networks (i.e., other hospitals, ambulatory clinics, sub-acute environments, patients, etc.) • Data warehousing and data mining technologies are used to capture and analyze data to improve care protocols and provide decision support.
6	<ul style="list-style-type: none"> • Full physician documentation/charting (structured templates) are implemented for at least one patient care service area. • A full complement of radiology PACS is implemented (i.e. all images, both digital and film-based, are available to physicians via an intranet or other secure network).
5	<ul style="list-style-type: none"> • The closed loop medication administration environment is fully implemented in at least one patient care service area. • eMAR and bar coding or other auto-identification technology, such as RFID, are implemented and integrated with CPOE and pharmacy to maximize point-of-care patient safety processes for medication administration.
4	<ul style="list-style-type: none"> • CPOE for use by any clinician added to nursing and CDR environment. • Second-level of clinical decision support related to evidence-based medicine protocols implemented. • If one patient service area has implemented CPOE and completed previous stages, this stage has been achieved.
3	<ul style="list-style-type: none"> • Clinical documentation installed (e.g. vital signs, flow sheets, nursing notes, care plan charting, and/or eMAR system are scored with extra points and are implemented and integrated with the CDR for at least one service in the hospital. • First level of clinician decision support is implemented to conduct error checking with order entry (i.e. drug/drug, drug/food, drug/lab, conflict checking normally found in the pharmacy). • Some level of medical image access from PACS is available for access by physicians via the organization's intranet or other secure networks.

2	<ul style="list-style-type: none"> Major ancillary clinical systems feed data to CDR that provides physician access for retrieving and reviewing results. CDR contains a CMV and the clinical decision support system and rules engine for rudimentary conflict checking. Optional for extra points. Information from document imaging systems may be linked to the CDR.
1	<ul style="list-style-type: none"> EHR is installed in all three major ancillary clinical systems – laboratory, pharmacy and radiology.
0	<ul style="list-style-type: none"> Some clinical automation may exist. Laboratory and/or pharmacy and/or radiology not installed.

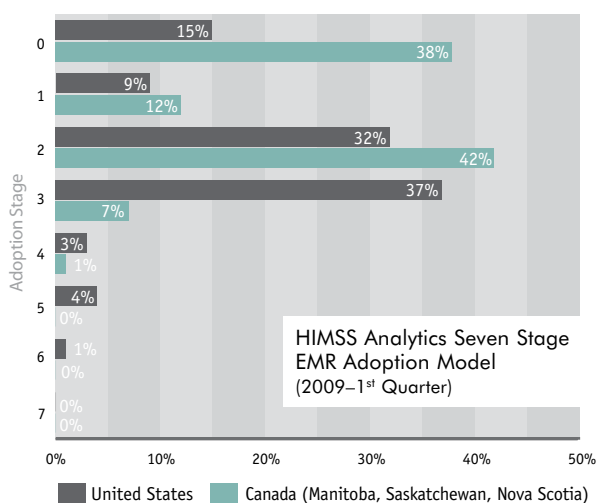
Acronym Guide	
PACS Picture Archiving And Communications System	eMAR Electronic Medical Administration Records
RFID Radio Frequency Identification	CPOE Computerized Practitioner/Physician Order Entry
CDR Clinical Data Repository	CMV Controlled Medical Vocabulary

Figure No. 23 shows the HIMSS Analytics estimates of US adoption of EHR technologies compared to partial data for Canada. Data collection in Canada is still underway. The partial results shown in Figure No. 23 reflect only Manitoba,

Nova Scotia and Saskatchewan. A more complete picture will emerge when HIMSS Analytics completes its Canadian study.

Figure No. 23

EMR Technology Adoption – HIMSS Analytics Adoption Model (presented to CIO Forum, June 15, 2009)



This comparison broadly indicates that 76% of US hospitals are at Stage two or higher, compared with only 50% of Canadian hospitals. In terms of the seven-stage adoption model, the average level of adoption in US hospitals is 2.2, compared to 1.2 in Canada. This comparison, however, may overstate the adoption gap between Canadian and US hospitals. The three provinces included in this study all operate small community hospitals which provide ambulatory care and limited in-patient facilities in addition to all-disciplines hospitals. The US sample is confined to all-disciplines hospitals. If the US-Canada comparison is confined to the all-disciplines hospitals in larger urban centres, the adoption gap narrows, but is not eliminated. The gap may be further reduced when regional and ministerial initiatives are taken into account. As well, some regions are further down the implementation path. (See Figure No. 16.) Notwithstanding these qualifications, it remains likely that, at least from a national perspective, there is a technology adoption gap when Canada is compared to the US. There is most certainly a technology adoption gap when Canada is compared to other OECD jurisdictions that are leaders in implementing EHR technologies. (See discussion in Chapter One.)

HIMSS Analytics estimates that information technology operating expenses in US hospitals averaged 4.18% of total hospital expenses.³¹ This is down somewhat from the estimate of 4.94% in 2006. This suggests that notwithstanding increased

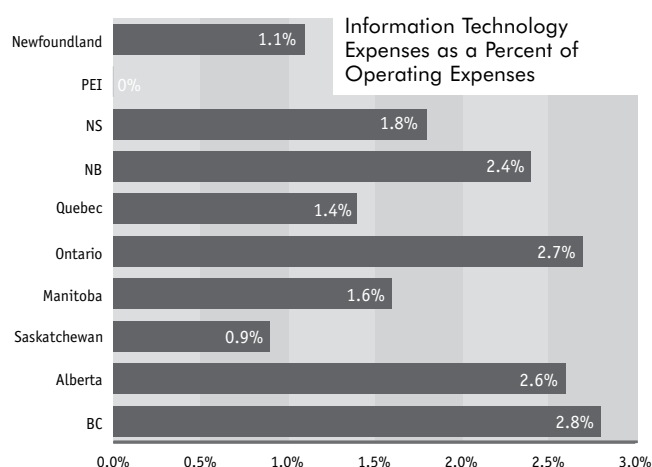
³¹ HIMSS Analytics, 2009 Annual Report of the US Hospital IT Market, Table HB1, p 4.

adoption of EHS technologies in US hospitals, *the relative cost of information technology operations may have declined.*

In Canada, CIHI data indicate that information technology costs account for approximately 2.5% of total expenses in 2007–2008. There was considerable variation in this ratio, as Figure No. 24 indicates.

Figure No. 24

Information Technology Expenses as a Percent of Operating Expenses in Hospitals, 2007–2008 (CIHI)



The apparent gap between 2.5% in the Canadian hospital system and 4.18% in the US hospital system should not be taken at face value. In the first place, as noted earlier, not all IT expenses are incurred at the hospital level. In some jurisdictions, some IT services are provided by regional bodies or by government ministries. As well, within hospitals, some IT expenses may be classed as clinical expenses. Practices may also differ in the degree to which information technology assets are purchased or leased. When assets are leased, a depreciation cost is implicitly factored into the leasing cost. When assets are purchased, operating expenses may be expressed either with or without

depreciation charges. Incorporating depreciation charges can raise the IT expenditure ratio by as much as 1.4%.³²

Notwithstanding these qualifications, it is likely that there is a gap in the IT spending ratio between Canadian and US hospitals. This gap is consistent with the lower rate of adoption of EHS technologies in Canadian hospitals. Based on partial data available from the HIMSS Analytics Canadian study, it appears that *approximately half of the adoption gap is due to the higher rate of zero adoption in Canada, compared to the US*. Bringing these stage-zero hospitals on stream will significantly narrow the adoption gap. *Bringing these stage-zero facilities on stream will also have significant human resources impacts.*

Scenario for Technology Adoption

As noted earlier, based on HIMSS Analytics' preliminary data, roughly half of Canadian hospitals have either not introduced EMR (using the HIMSS Analytics definition of EMR) or are still in Stage 1 in the HIMSS Analytics adoption model. Over the next five years, in light of the spending commitments announced by governments, we anticipate:

- The proportion of Stage Zero hospitals will fall from the current 38% to under 10%.
- The proportion of hospitals at Stage two or beyond will increase from the current 50% to around 75%.
- The average ranking will increase from 1.2 to around 2.5–2.9, though some provinces and territories will operate with average rankings in Stage three or Stage four.

Unless there is a change in policy, we expect that the acute care system will continue to be the focus of EHS technology adoption over the next five years.

Investment and Adoption Scenarios

Figure No. 25 describes three investment scenarios and their expected implications for HI & HIM human resources requirements.

³² Lorraine Pederson and Kevin Leonard, "Measuring Information Technology Investment in Canadian Academic Health Sciences Centres", *Electronic Healthcare*, vol. 3, no. 3 (2006). Pederson and Leonard studied eight teaching/research hospitals. They estimated that the IT expense ratio was 3.6% without depreciation charges, but 5.0% with depreciation charges. The Ontario Hospital Association estimated that in 2005–2006, IT expenditures were 2.3% without depreciation, but 3.2% if depreciation was included. OHA, *Incentives for Transformation: eHealth as a Strategic Health System Priority*.

Figure No. 25

Demand Scenarios, 2009–2014

Low Demand Scenario
<p>The deterioration in the fiscal position of governments will lead to across the board expenditure restraints in the health system. In turn, these spending restraints will cause some investments in EHIS technologies to be deferred. However, there will still be increases in the rate of investment compared to 2008. The average annual increase in investment, compared to 2008 will be approximately 3.0%. By 2014, investment spending on EHIS technologies will be approximately 16.0% above 2008 levels. Employment will grow by 1.0% per year (or less) in occupational groups that are primarily affected by operations requirements and around 2.5% per year in occupational groups that are primarily affected by implementation requirements. Overall HI & HIM employment will increase by approximately 7.7% over the five-year period. The proportion of HI & HIM professionals who will require either formal training or experience in EHIS technologies will increase from approximately 27% (2009 estimate) to around 39%.</p>
Moderate Demand Scenario
<p>The deterioration in the fiscal position of governments will lead to deferral of some capital spending plans, but major commitments will still move forward at an accelerated pace. The average annual increase in investment, compared to 2008 will be approximately 8.0%. This is broadly consistent with the IDC Canada outlook. By 2014, investment spending on EHIS technologies will be approximately 40.0–50.0% above 2008 levels. Employment will grow by 1.5%–2.0% per year in occupations primarily affected by operations requirements and by around 4.0% per year in occupations primarily affected by implementation requirements. Overall HI & HIM employment will increase by approximately 14% over the five-year period. The proportion of HI & HIM professionals who will require either formal training or experience in EHIS technologies will increase from approximately 27% (2009 estimate) to around 59%.</p>
High Demand Scenario
<p>The changed fiscal position of governments does not affect capital spending commitments on EHIS technologies. The average annual increase in investment, compared to 2008 will be approximately 15.0%. By 2014, investment spending on EHIS technologies will be approximately double the 2008 level. Employment will grow by around 3.0% per year in occupations primarily affected by operations demand and by approximately 7.0% per year in occupations primarily affected by implementation requirements. Overall HI & HIM employment will increase by approximately 26% over the five-year period. The proportion of HI & HIM professionals who will require either formal training or experience in EHIS technologies will increase from approximately 27% (2009 estimate) to around 78%.</p>

Provincial Outlooks will vary from the National Outlook

The employment projections set out in this chapter are based on national scenarios for investment in EHIS technologies. Regardless of the scenario that is judged the most appropriate, there will be differences across provinces. Some provinces will recover from the economic downturn more rapidly than others. The fiscal position of those governments will be less constrained. As well, the provinces are at different stages in the implementation of EHIS technologies. Some are on the cusp of implementing major investments. Other provinces are consolidating investments that have been made, while still others are finalizing their investment strategies. All of these factors will affect the trajectory of demand for HI & HIM professionals at the provincial level. *In every demand*

scenario, some provinces will have HI & HIM requirements that significantly exceed the national projections.

Skill Broadening Implications under the Three Investment Scenarios

It was noted in Chapter One that the adoption of EHIS technologies broadens skill requirements. The skill broadening that is the focus of this Report has two characteristics:

- First,** the need to broaden professional skills pertains to *additional theoretical knowledge and practical insight that an HI & HIM professional will need to acquire from domains of professional expertise beyond his or her principal domain.* Information

technology professionals, for example, will require additional theoretical knowledge and practical insight into the field of health information management. Similarly, HIM professionals will require additional theoretical knowledge and practical insight into information technology systems and applications.

Second, the skill broadening that HI & HIM professionals will require exceeds the learning that results from normal working experience. The focus of this Report is on skill broadening which will require some type of formal training or structured, experience-based learning.

Figure No. 26 sets out estimates of the proportion of HI & HIM professionals who currently have formal training or experience in implementing or working with EHS technologies and the proportion of professionals who will require this formal training or experience in five years. The 2014 estimates are based on the three investment scenarios set out above. These estimates are based on judgements by Prism Economics and Analysis. The judgements reflect the investment scenarios described above and the implications of these scenarios for technology adoption. Future studies will refine these estimates. Figure No. 26 summarizes the estimates by occupational category. Detailed estimates for each of the 27 occupational groups are presented at the end of this chapter.

Figure No. 26

Proportion of HI & HIM Professionals who will require Formal Training or Experience in EHS Technologies based on Low, Moderate and High Investment and Adoption Scenarios*
(Estimates by Prism Economics and Analysis)

	2009	2014		
		Low	Moderate	High
Information Technology – Public Sector	25%	33%	52%	74%
Information Technology – Private Sector	39%	56%	64%	71%
Health Information Management	20%	35%	60%	85%
Management of the Canadian Health System	xxx	xxx	xxx	xxx
Project Management – Public Sector	24%	35%	59%	85%
Project Management – Private Sector	26%	35%	60%	85%
Organizational and Behavioural Management – Public Sector	25%	35%	61%	85%
Organizational and Behavioural Management – Private Sector	32%	49%	70%	85%
Analysis and Evaluation – Public Sector	25%	35%	60%	85%
Clinical Informatics – Public Sector	25%	36%	61%	84%
Clinical Informatics – Private Sector	34%	40%	67%	85%
Total (excluding certain occupation groups)	27%	39%	59%	78%

* The estimates for each occupational category are a weighted average of the estimates for each occupational group within the category. See detailed estimates for each occupational group at the end of this chapter.

Current Shortages

Figure No. 27 summarizes estimates of current vacancy rates (public sector and private sector), based on the HI & HIM Human Resources Survey. The average vacancy rate for all HI & HIM occupational groups was 4.5%. By way of comparison, a Statistics Canada study using 1999 data found that the overall vacancy rate in the education and

health sector was 1.6%, although the rate was 4.7% among those employers that reported current vacancies.³³ On their face, therefore, the data in Figure No. 27 suggest that there are higher vacancy rates in HI & HIM occupational groups than may be the case for health sector occupations as a whole. This would be also be consistent with the Statistics Canada study which also reported substantially higher vacancy rates (4.2%) for employers adopting new technologies.

Figure No. 27

Current Vacancy Rates by Occupational Group
HI & HIM Human Resources Survey

Above 4.5% Average Vacancy Rate	Vacancy Rate
Health Information Management – Standards	23.0%
Health Information Management – Decision Support	14.4%
Information Technology – Quality Assurance/Testing	12.5%
Health Information Management – Privacy	11.6%
Management of Canadian Health System – Business Analysis	11.4%
Clinical Informatics – Senior Medical Information Officers	10.9%
Information Technology – Network, Storage, and Other Infrastructure Support	7.1%
Organizational and Behavioural Management – Change Management	7.0%
Information Technology – Help Desk	6.7%
Clinical Informatics – Clinician-Analysts	6.6%
Organizational and Behavioural Management – Product/Service Management	6.3%
Health Information Management – Data Quality Management	5.7%
Project Management – Senior Project Management	4.8%
At or Below 4.5% Average Vacancy Rate	Vacancy Rate
Project Management – Project Management	4.5%
Information Technology – Security	4.3%
Organizational and Behavioural Management – Training and Development	4.2%
Health Information Management – Health Records Management	3.9%
Management of Canadian Health System – Policy and Strategic Planning	3.1%
Management of Canadian Health System – Risk Management	3.1%
Analysis and Evaluation – Analysis and Evaluation	3.0%
Information Technology – Architecture/Development	3.0%
Organizational and Behavioural Management – Program Management	2.6%
Health Information Management – Coding and Classifications	2.5%
Information Technology – Application Implementation and Support	1.9%
Organizational and Behavioural Management – Account Executives (Vendors)	1.3%
Information Technology – Senior IT Management	1.1%
Health Information Management – Senior Health Information Management	0.0%

³³ Rene Morissette and Xuelin Zhang, "Which Firms have High Vacancy Rates in Canada?", Statistics Canada, 11F0019MIE No. 176 (November 2001). The analysis is based on 1999 data collected in the Workplace and Employee Survey.

It is also noteworthy that the HI & HIM Human Resources Survey found vacancy rates above 10% in 6 of the 27 HI & HIM occupational groups. Under all three investment scenarios, the anticipated HI & HIM hiring requirements will exacerbate the recruitment difficulties that are reflected in these vacancy rates.

Demand Projections

Figure No. 28 sets out demand projections based on the three investment and technology adoption scenarios

discussed earlier. Figure No. 28 summarizes the estimates by occupational category. Detailed estimates for each of the 27 occupational groups are presented at the end of this chapter. The table identifies both 'investment effect', i.e., the overall employment growth in HI & HIM occupations resulting from EHIS investments, and the 'skill broadening effect', i.e., the projected number of HI & HIM professionals who will require skill broadening as a result of the adoption of EHIS technologies.

Figure No. 28

Projected Employment and Requirements for Skill Broadening based on Low, Moderate and High Investment and Adoption Scenarios (Prism Economics and Analysis)

	2009		2014 Employment			2014 Requirement for Skill Broadening*		
	Employment	Skill Broadening	Low	Moderate	High	Low	Moderate	High
Information Technology – Public Sector	12,000	3,030	12,900	13,700	15,090	4,320	7,170	11,160
Information Technology – Private Sector	5,520	2,170	6,000	6,370	7,070	3,360	4,060	4,990
Health Information Management	5,040	1,000	5,230	5,500	5,850	1,840	3,300	4,980
Management of the Canadian Health System	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx
Project Management – Public Sector	830	200	940	1,010	1,170	330	600	990
Project Management – Private Sector	1,200	310	1,360	1,450	1,680	480	870	1,430
Organizational and Behavioural Management – Public Sector	1,200	300	1,270	1,350	1,480	440	820	1,260
Organizational and Behavioural Management – Private Sector	2,100	670	2,300	2,460	2,760	1,130	1,720	2,340
Analysis and Evaluation – Public Sector	3,590	900	3,890	4,140	4,580	1,360	2,480	3,890
Clinical Informatics – Public Sector	650	160	670	710	760	240	430	640
Clinical Informatics – Private Sector	410	140	420	450	470	170	300	400
Total (excluding certain occupational groups)	32,540	8,880	34,980	37,140	40,910	13,670	21,750	32,080

xxx Survey estimates were considered unreliable or insufficient to support estimates.

* The nature of the Skill Broadening requirements is discussed at p 10. These requirements include formal training or structured experience to acquire theoretical knowledge and practical insight into domains of professional expertise beyond an individual's principal domain.

Replacement Demand (Retirements, Exits)

No demographic data was collected for this study, except for CHIMA's administrative data which applies only to certified HIM professionals. HRSDC publishes retirement estimates for each of the major National Occupation Classifications (NOCs). There are four drawbacks in relying on these retirement rates:

1. HI & HIM occupations cannot be easily mapped into NOC categories.
2. In many HI & HIM occupational groups, the demographic profile of the public sector is older than that of the private sector. Retirement rates based on the overall population estimate, therefore, may underestimate the replacement demand challenge in the public sector.
3. Recent changes in economic conditions may alter retirement rates.
4. We do not know the degree to which those who will be retiring are trained or experienced in EHIS technologies.

For employees in most professional occupations, average annual retirement rates range between 2.0% and 2.5%. Given its somewhat older demographic profile, it is reasonable to expect that in the public sector the rate would be closer to 2.5% and in the private sector, closer to 2.0%. This would imply that *for most HI & HIM occupational groups, replacement demand would add an additional*

Figure No. 29

Cumulative Impact of Replacement Demand on Hiring Requirements at 2014 based on Low, Moderate and High Investment and Adoption Scenarios (Prism Economics and Analysis)

	Percent
Increased Employment	
Low Growth Scenario	7.6%
Moderate Growth Scenario	14.3%
High Growth Scenario	26.1%
Replacement Demand	11.8%
Total Hiring Requirement	
Low Growth Scenario	19.4%
Moderate Growth Scenario	26.1%
High Growth Scenario	37.9%

10.0 to 12.5% or more to the hiring requirements arising from employment increases. Figure No. 29 summarizes the broad impact of incorporating replacement demand.

The tables at the end of this chapter set out detailed estimates for each of the occupational groups. The implications of these estimates are discussed in Chapter Four.

Detailed Estimates by Occupational Group

(Prism Economics and Analysis)

Figure No. 30

Proportion of HI & HIM Professionals who will require Skill Broadening based on Low, Moderate and High Investment and Adoption Scenarios (Estimates by Prism Economics and Analysis)

	2009	2014		
		Low	Moderate	High
Information Technology – Public Sector				
• Senior IT Management	40%	50%	70%	90%
• Architecture/Development	65%	75%	80%	90%
• Application Implementation/Support	25%	35%	60%	80%
• Security	25%	35%	55%	75%
• Quality Assurance/Testing	25%	35%	55%	90%
• Help Desk	20%	25%	35%	65%
• Network, Storage and Other Infrastructure Support	10%	10%	12%	35%
Information Technology – Private Sector				
• Senior IT Management	40%	50%	65%	80%
• Architecture/Development	80%	80%	85%	90%
• Application Implementation/Support	40%	70%	75%	80%
• Security	35%	40%	60%	70%
• Quality Assurance/Testing	35%	40%	60%	70%
• Help Desk	25%	30%	40%	50%
• Network, Storage and Other Infrastructure Support	10%	10%	12%	15%
Health Information Management				
• Senior Health Information Management	20%	35%	60%	85%
• Privacy	20%	35%	60%	85%
• Standards	20%	35%	60%	85%
• Data Quality Management	20%	35%	60%	85%
• Decision Support	20%	35%	60%	85%
• Health Records Management	20%	35%	60%	85%
• Coding and Classifications	20%	35%	60%	85%
Management of the Canadian Health System				
• Policy and Strategic Planning	20%	35%	60%	85%
• Risk Management	25%	35%	60%	85%
• Business Analysis	25%	35%	60%	100%

	2009	2014		
		Low	Moderate	High
Project Management – Public Sector				
• Senior Project Management	25%	35%	60%	85%
• Project Management	25%	35%	60%	85%
Project Management – Private Sector				
• Senior Project Management	25%	35%	60%	85%
• Project Management	25%	35%	60%	85%
Organizational and Behavioural Management – Public Sector				
• Account Executives	25%	35%	60%	85%
• Program Management	25%	35%	60%	85%
• Product/Service Management	25%	35%	60%	85%
• Change Management	25%	35%	60%	85%
• Training and Development	25%	35%	60%	85%
Organizational and Behavioural Management – Private Sector				
• Account Executives	35%	50%	75%	85%
• Program Management	25%	40%	60%	85%
• Product/Service Management	35%	60%	75%	85%
• Change Management	25%	40%	60%	85%
• Training and Development	25%	40%	60%	85%
Analysis and Evaluation – Public Sector	25%	35%	60%	85%
Analysis and Evaluation – Private Sector	25%	35%	60%	85%
Clinical Informatics – Public Sector				
• Senior Medical Information Officers	25%	35%	60%	85%
• Clinician-Analysts	25%	35%	60%	85%
Clinical Informatics – Private Sector				
• Senior Medical Information Officers	35%	40%	65%	85%
• Clinician-Analysts	35%	40%	65%	85%
Total (excluding certain occupational groups)	27%	39%	59%	79%

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Figure No. 31

Projected Employment and Requirements for Skill Broadening based on Low, Moderate and High Investment and Adoption Scenarios (Prism Economics and Analysis)

	2009		2014 Employment			2014 Requirement for Skill Broadening		
	Employment	Skill Broadening	Low Growth	Moderate Growth	High Growth	Low Growth	Moderate Growth	High Growth
Information Technology – Public Sector								
• Senior IT Management	960	380	1,000	1,050	1,110	500	740	1,000
• Architecture/Development	480	310	540	580	670	410	460	600
• Application Implementation/Support	7,080	1,770	7,670	8,160	9,040	2,680	4,900	7,230
• Security	120	30	130	140	150	50	80	110
• Quality Assurance/Testing	240	60	270	290	340	90	160	310
• Help Desk	1,680	340	1,740	1,830	1,950	440	640	1,270
• Network, Storage and Other Infrastructure Support	1,440	140	1,560	1,660	1,840	160	200	640
Sub-Total	12,000	3,030	12,910	13,710	15,100	4,330	7,180	11,160
Information Technology – Private Sector								
• Senior IT Management	220	90	230	240	260	120	160	210
• Architecture/Development	660	530	750	800	930	600	680	840
• Application Implementation/Support	2,700	1,080	2,930	3,110	3,450	2,050	2,330	2,760
• Security	170	60	180	200	220	70	120	150
• Quality Assurance/Testing	500	170	570	610	700	230	370	490
• Help Desk	770	190	800	840	890	240	340	450
• Network, Storage and Other Infrastructure Support	500	50	540	580	640	50	70	100
Sub-Total	5,520	2,170	6,000	6,380	7,090	3,360	4,070	5,000
Health Information Management								
• Senior Health Information Management	100	20	100	110	120	40	70	100
• Privacy	400	80	430	460	510	150	280	430
• Standards	300	60	310	330	350	110	200	300
• Data Quality Management	450	90	470	490	520	160	290	440
• Decision Support	1,110	220	1,150	1,210	1,290	400	730	1,100
• Health Records Management	1,920	380	1,990	2,090	2,230	700	1,250	1,900
• Coding and Classifications	760	150	790	830	880	280	500	750
Sub-Total	5,040	1,000	5,240	5,520	5,900	1,840	3,320	5,020

	2009		2014 Employment			2014 Requirement for Skill Broadening		
	Employment	Skill Broadening	Low Growth	Moderate Growth	High Growth	Low Growth	Moderate Growth	High Growth
Management of the Canadian Health System								
• Policy and Strategic Planning	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx
• Risk Management	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx
• Business Analysis	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx
Project Management – Public Sector								
• Senior Project Management	140	30	160	170	200	60	100	170
• Project Management	690	170	780	840	970	270	500	820
Sub-Total	830	200	940	1,010	1,170	330	600	990
Project Management – Private Sector								
• Senior Project Management	300	80	340	360	420	120	220	360
• Project Management	900	230	1,020	1,090	1,260	360	650	1,070
Sub-Total	1,200	310	1,360	1,450	1,680	480	870	1,430
Organizational and Behavioural Management – Health System								
• Account Executives	90	20	100	110	130	40	70	110
• Program Management	370	90	380	400	430	130	240	370
• Product/Service Management	470	120	490	510	540	170	310	460
• Change Management	80	20	90	100	110	30	60	90
• Training and Development	190	50	210	230	270	70	140	230
Sub-Total	1,200	300	1,270	1,350	1,480	440	820	1,260
Organizational and Behavioural Management – Private Sector								
• Account Executives	780	270	880	950	1,090	440	710	930
• Program Management	110	30	110	120	130	40	70	110
• Product/Service Management	660	230	690	720	770	410	540	650
• Change Management	320	80	360	390	450	140	230	380
• Training and Development	230	60	260	280	320	100	170	270
Sub-Total	2,100	670	2,300	2,460	2,760	1,130	1,720	2,340
Analysis and Evaluation – Public Sector	3,590	900	3,890	4,140	4,580	1,360	2,480	3,890
Analysis and Evaluation – Private Sector	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx

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	2009		2014 Employment			2014 Requirement for Skill Broadening		
	Employment	Skill Broadening	Low Growth	Moderate Growth	High Growth	Low Growth	Moderate Growth	High Growth
Clinical Informatics – Public Sector								
• Senior Medical Information Officers	100	20	100	110	120	40	70	100
• Clinician-Analysts	550	140	570	600	640	200	360	540
Sub-Total	650	160	670	710	760	240	430	640
Clinical Informatics – Private Sector								
• Senior Medical Information Officers	90	30	90	100	100	40	70	90
• Clinician-Analysts	320	110	350	370	410	140	240	350
Sub-Total	410	140	440	470	510	180	310	440
Total (excluding certain occupational groups)	32,540	8,880	35,020	37,200	41,030	13,690	21,800	32,170

xxx Survey estimates were considered unreliable or insufficient to support estimates.

4. Implications of Supply and Demand Trends for Human Resources Planning

Chapter Three described two effects that will arise from investments in electronic health information systems (EHIS).

The 'employment effect' refers to the increase in the number of HI & HIM professionals who will be required to implement and subsequently maintain electronic health information systems. The 'employment effect', along with replacement needs, generates overall *hiring requirements*.

The 'skill broadening effect' refers to the increase in the *proportion* of HI & HIM professionals who will require

formal training in EHIS technologies as a result of the adoption of these technologies. The 'skill broadening effect' leads to a *professional development requirement*.

Hiring Requirements

Figure No. 32 summarizes the HI & HIM *hiring requirements* that will result from investments in EHIS technologies.

Figure No. 32

Estimated HI & HIM Employment in 2009 and Projected Hiring Requirements in 2014 based on Low, Moderate and High Investment Scenarios (Prism Economics and Analysis)

	Estimated Employment 2009	Employment Forecast: 2014		
		Low Growth	Moderate Growth	High Growth
Information Technology – Public Sector	12,000	12,910	13,710	15,100
Information Technology – Private Sector	5,520	6,000	6,380	7,090
Health Information Management	5,040	5,240	5,520	5,900
Management of the Canadian Health System	xxx	xxx	xxx	xxx
Project Management – Public Sector	830	940	1,010	1,170
Project Management – Private Sector	1,200	1,360	1,450	1,680
Organizational and Behavioural Management – Public Sector	1,200	1,270	1,350	1,480
Organizational and Behavioural Management – Private Sector	2,100	2,300	2,460	2,760
Analysis and Evaluation – Public Sector	3,590	3,890	4,140	4,580
Clinical Informatics – Public Sector	650	670	710	760
Clinical Informatics – Private Sector	410	440	470	510
Total (excluding certain occupational groups)	32,540	35,020	37,200	41,030
Five Year Increase in Employment		2,480	4,660	8,490
Five Year Percentage Increase in Employment		7.6%	14.3%	26.1%
Five-Year Replacement Demand				
Replacement Rate (invariant to investment scenario)		11.8%		
Replacement Requirement (invariant to investment scenario)		3,840		
Five Year Hiring Requirement				
Hiring Requirement		6,320	8,500	12,330
Hiring Requirement as percent of 2009 Employment		19.4%	26.1%	37.9%



As can be seen from Figure No. 32, the estimated public and private sector employment of HI & HIM professionals in 2009 is 32,540 persons. By 2014, depending on the EHS investment scenario³⁴, HI & HIM employment will increase by 2,480 to 8,490 persons. In addition, employers will need to replace professionals who retire or who leave HI & HIM careers for other reasons. *This will increase the five-year hiring requirements to somewhere between 6,320 persons and 12,330 persons.*

These hiring requirements should be considered in light of current vacancy rates which are indicative of recruitment difficulty in a number of occupational groups. Figure No. 27 in Chapter Three reported survey results that showed current vacancy rates above 10% in six of the 27 occupational groups. *Under any of the three investment scenarios, the projected hiring requirements, will exacerbate the recruitment difficulties that are reflected in the vacancy rates.*

External Competition for Scarce Skills

Many of the skills of HI & HIM professionals are specific to the health system. However, it would be an error to ignore the mobility of professionals between the health system and other sectors of the economy. In current depressed labour market conditions, there may not be much movement of HI & HIM professionals out of the health system or out of companies and private practices with a health system focus.

However, when employment conditions recover (probably around 2013 or later), the health system will be vulnerable to 'poaching' from other sectors of the economy, especially if employment conditions and remuneration are not competitive.

Perhaps more important than competition from other Canadian sectors is the possibility of recruitment demands originating in the US. During the boom in IT investment in the late 1990s, there was a significant movement of Canadian-trained professionals to the US. Admittedly, this trend also coincided with a low dollar. However, the \$19 billion investment in electronic health information systems under the *American Recovery and Reinvestment Act* could affect the Canadian labour market if there are skills shortages in the US. In the past, smaller jurisdictions have had more difficulty coping with this pressure than larger jurisdictions.

Skill Broadening and Professional Development Requirement

In addition to meeting hiring challenges, employers in both the public sector and the private sector also will need to address the requirement to broaden the skills of HI & HIM professionals. The skill broadening that is the focus of this Report will not happen automatically. It will require formal training or structured experience. Figure No. 33 summarizes the skill broadening estimates developed in Chapter Three.

³⁴ See Chapter Three for a discussion of the three investment scenarios.

Figure No. 33

Estimated Number of HI & HIM Professionals who will require Professional Development as a result of Skill Broadening Requirements: 2009 Estimate and Projected Requirements in 2014, based on Low, Moderate and High Investment Scenarios (Prism Economics and Analysis)

	2009		2014 Employment		
	Employment	Skill Broadening Requirement	Low	Moderate	High
Information Technology – Public Sector	12,000	3,030	4,330	7,180	11,160
Information Technology – Private Sector	5,520	2,170	3,360	4,070	5,000
Health Information Management	5,040	1,000	1,840	3,320	5,020
Management of the Canadian Health System	xxx	xxx	xxx	xxx	xxx
Project Management – Public Sector	830	200	330	600	990
Project Management – Private Sector	1,200	310	480	870	1,430
Organizational and Behavioural Management – Public Sector	1,200	300	440	820	1,260
Organizational and Behavioural Management – Private Sector	2,100	670	1,130	1,720	2,340
Analysis and Evaluation	3,590	900	1,360	2,480	3,890
Clinical Informatics – Public Sector	650	160	240	430	640
Clinical Informatics – Private Sector	410	140	180	310	440
Total (excluding certain occupational groups)	32,540	8,880	13,690	21,800	32,170
Skill Broadening as a Percent of Total HI & HIM Employment		27.3%	39.1%	58.6%	78.4%



Figure No. 33 shows that, in 2009, it is estimated that approximately 27% of HI & HIM professionals currently have (or need) skill broadening as a result of EHS investments that have already been implemented. Depending on the EHS investment scenario, this proportion will increase to somewhere between 39% and 78%. *These estimates imply significant requirements for professional development to avoid the risk of a skills shortage.*

On most interpretations, the magnitude of the professional development challenge is equal to or greater than the magnitude of the hiring challenge. The magnitude of the professional development challenge exceeds the current resources of professional associations in HI & HIM.

The Human Resources Challenge is Equally a Public Sector and a Private Sector Challenge

The hiring challenge and the professional development challenge are equally important in both the public sector and the private sector. As discussed in Chapter Two, the private sector plays an important role in supplying expertise to the public sector. This is especially the case when the public sector is reluctant to take on permanent staff to meet needs

that are project-specific. Labour shortages and skills shortages in the private sector will jeopardize the success of EHS investments just as much as shortages in the public sector. Evidence from studies of the information and communications technology sector suggest that these shortages are likely to crystallize around difficulties in recruiting persons with 5+ years of HI & HIM experience, especially in business analysis, application implementation and support, and application development.³⁵

Priorities

The skills gap identified in this study is pervasive, that is to say, the gap will affect all HI & HIM occupational groups. Nevertheless, the skills gaps are more evident and potentially more constraining in certain occupational groups. These include:

- *Architecture/Development,*
- *Application Implementation and Support,*
- *Business Needs Analysis,*
- *Project Management, and*
- *virtually all HIM occupational groups.*

³⁵ For a discussion of the broader context of the ICT occupational labour market, see Information and Communications Technology Council, *Outlook on Human Resources in the ICT Labour Market, 2008–2015*, prepared by Prism Economics and Analysis (2008) www.ictc-ctic.ca/en/content.aspx?id=86.

5. Key Findings and Recommendations Introduction

Key Findings

- Substantial investments are planned across the country in electronic health information systems (EHIS). These investments show a pronounced acceleration or 'ramping up' pattern.
- The planned investments will broaden that adoption of EHIS technologies to include health care institutions which have not yet implemented these technologies and also deepen adoption in those institutions that have already commenced down this path.
- EHIS investments will generate significant requirements to increase the number of HI & HIM professionals in both the public sector and the private sector. The hiring requirement over the next five years, including replacement requirements, will range from by 2,480 to 8,490 persons. This represents an increase of 7.6% to 26.1% over current estimated employment of HI & HIM professionals. In provinces which are on the cusp of implementing major investments, hiring requirements could exceed these national averages.
- Projected hiring requirements will compound recruitment challenges that are already evident. In six of the 27 HI & HIM occupational groups, the *HI & HIM Human Resources Survey* results found vacancy rates above 10%.
- EHIS investments will also require significant professional development training to achieve the skill broadening that is required for successful implementation, maintenance and utilization of EHIS technologies. It is estimated that approximately 27% of HI or HIM professionals currently have (or need) skill broadening. Depending on the EHIS investment scenario, by 2014 this proportion will increase to somewhere between 39% and 78%.

Recommendations

Monitoring Trends in HI & HIM Human Resources Requirements:

1. Canada needs a national initiative to monitor the human resources implications of implementing electronic health information systems. This initiative should track, on at least an annual basis, trends in:
 - a. HI & HIM employment, including job vacancies,
 - b. expected and actual capital spending on the implementation of EHIS technologies,

- c. EHIS adoption trends across the health system,
 - d. IT spending (both capital and operating) in the health care sector, including spending at regional and ministry levels in support of health care delivery, and
 - e. enrolment and graduation trends in all post-secondary institutions that offer HI & HIM programs.
2. Forecasting HI & HIM human resources requirements should be understood as an ongoing, iterative process. Future monitoring and forecasting cycles should be undertaken in three stages.
 - a. The first stage should be a regionally representative and structured consultation with experts in both the public and private sector to guide the interpretation of technology adoption trends and the implications of these trends for human resources. This consultation should also refine the definition of occupational groups and, where practical, consolidate these groups to facilitate surveying and comparisons to Census and other data.
 - b. The second stage should be web-based surveys of human resources that track both total human resources in the HI & HIM occupational groups and persons who are experienced or trained in implementing or using EHIS technologies. In addition to tracking current employment trends by occupational group, the surveys also should collect demographic data.
 - c. The third stage of the monitoring and forecasting cycle should include regionally representative validation meetings to review the initial estimates of supply and demand and the interpretation of their human resources planning implications.
 - d. Efforts should be made to develop with HRSDC and Statistics Canada appropriate occupational codes for HI & HIM occupations, so that these codes will be in place for the 2011 Census.

Clinical Professions:

3. The EHIS readiness of clinical professions should be surveyed in collaboration with the colleges and professional associations of the respective clinical professions. Similarly, the implications of EHIS adoption for professional training and development in the clinical professions should be determined in collaboration with these bodies.

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Human Resources Planning Priorities:

4. Strategies to avert skill shortages should focus on:
 - a. Architecture/Development,
 - b. Application Implementation and Support,
 - c. Business Needs Analysis,
 - d. Project Management, and
 - e. Virtually all HIM occupational groups.
5. Strategies to address skills shortages should include measures to:
 - a. strengthen the capacity of professional associations to develop and deliver professional development training, including a common core of theoretical knowledge that is relevant to all HI & HIM occupational groups,
 - b. expand the role of skill certification by building on certification programs that are already in place,
 - c. expanding the co-op and internship components of post-secondary training in HI & HIM fields so as to accelerate the integration of recent graduates into the professional work force, and
 - d. accelerating the integration of recent immigrants with non-Canadian HI & HIM training and qualifications.





Appendices

- A. Technical Appendix
- B. Members of Steering Committee
- C. Members of Expert Advisory Committee
- D. HI & HIM Human Resource Survey*

* Appendix "D" is a spreadsheet file that is available on request.

Health Informatics and Health Information Management

Human Resources Study

Technical Appendix

Sources for 2009 Employment Estimates:

The 2009 Employment estimates are based on four sources:

1. HI & HIM Human Resources Survey
2. OHA Survey of Ontario Hospitals
3. 2001 and 2006 Census
4. CHIMA administrative data for HIM professionals

HI & HIM Human Resources Survey:

The HI & HIM Human Resources Survey was a multi-paged spreadsheet that requested data on current employment, vacancies, on-site consultants, educational background, and expected employment based on the 27 occupational groups. Respondents were given the option of providing data

either by occupational group or by specific occupations with the groups. Owing to its design, the survey template cannot be fully reproduced in this appendix. However, a sample page is provided. The spreadsheet file is available on request. A guide to the occupations in the 27 occupational groups was also provided to respondents.

The 27 occupational groups were developed by the Steering Committee with additional input from CIOs in the health system. For the most part, the occupational groups map into the *COACH Health Informatics Professional Career Matrix*. An advisory group of CIOs and HR experts from the health system also provided input into the design of the survey template.

The survey was administered in June and July of 2009.

Public Sector:

At the close of the survey, 35 responses were received from entities in the public sector. In Ontario the OHA had surveyed hospitals and regional bodies earlier in 2009. In order to maximize scarce project resources it was decided not to attempt to re-survey Ontario. Surveys were administered through contacts with provincial health systems, and national and provincial agencies.

The following table shows the estimated coverage of the survey in the public sector:

Figure No.T-1

Estimated Coverage of HI & HIM Survey in Public Sector

	Share of Population	Est. Survey Coverage
Newfoundland and Labrador	1.5%	70–85%
Prince Edward Island	0.4%	0.0%
Nova Scotia	2.8%	60–65%
New Brunswick	2.3%	15–20%
Quebec	23.3%	10–15%
Ontario	38.9%	0.0%
Manitoba	3.6%	70–85%
Saskatchewan	3.1%	65–75%
Alberta	10.8%	5–10%
British Columbia	13.2%	5–10%
Total	100.0%	



Appendix A

Based on this estimated coverage at the provincial and territorial level, it is estimated that the survey covered approximately 20–25% of employment among the participating provinces and territories and 10–15% of national employment. Additional, administrative data were supplied by CHIMA.

Private Sector:

A total of 313 companies were contacted by email and extensive telephone follow-up. The list of companies contacted was compiled from:

- the membership of ITAC Health,
- additional firms recommended by CHIMA, COACH and ICTC,
- *eHealth in Canada* (April 2009)³⁶
- a search of Industry Canada's database

Survey returns were received from 45 private sector companies.

Based on reviewing the list of participating companies with persons in the industry, it is estimated that the survey returns represent approximately 15% of firms in the relevant private sector and around 15–20% of relevant private sector employment.

OHA Survey

The OHA survey covered 77 of 153 hospitals in Ontario. Comparing the survey results to the 2006 Census, and adjusting for likely employment increases since 2006, it is estimated that the OHA survey covered approximately 40–45% of employment in IT occupations. We used this estimate as a proxy for broader survey coverage in other occupational groups.

2001 and 2006 Census

Census data were used at the 3-digit NAICS and 3-digit NOC-S level. These data were relevant for estimating IT occupational employment in the health delivery system, though not for estimating IT employment in regional administrative bodies, ministries, or agencies. Other HI & HIM occupational groups cannot be mapped easily into NOC-S codes.

Developing 2009 Employment Estimates

Estimates were developed by extrapolating results from the HI & HIM Human Resources Survey. Where feasible, these results were compared to the OHA survey and the Census. Adjustments were made where this seemed appropriate. The overall estimate for HIM occupations was developed in consultation with CHIMA and by comparison to the HI & HIM Human Resources Survey and the OHA survey. CHIMA provided administrative data.

High and low estimates were developed. For projection purposes, the mid-point between these was used.

In general, the 2009 employment estimates err on the conservative side. That is to say, if there are estimation errors, they are likely to be under-estimates of employment and therefore of future skill gaps, rather than over-estimates.

Employment Forecasts

There are three broad drivers of employment in HI & HIM occupations:

1. general increases in employment in the health system arising from population pressures and demographic changes in the population,
2. replacement requirements arising from retirements and other forms of labour force exit, and
3. investment in EHS technologies.

This study did not have the resources to estimate employment changes in the health system based on general population trends.

Replacement Demand – Demographic Trends

There were no demographic data collected as part of this study, except for CHIMA administrative data which apply only to certified HIM professionals. CHIMA data cover persons in the work force, as well as persons not currently working. Some CHIMA members may be working in the private sector.

³⁶ ICTC in partnership with COACH, CHIMA, CIHI, Canada Health Infoway, and ITAC Health, *eHealth in Canada: Current trends and Future Challenges* (April 2009).

In the absence of HI & HIM demographic data, estimates of replacement demand were based on the Prism Economics Replacement Demand Model, which has been developed for generic application and two HRSDC studies of projected retirement rates:

- Kevin Dunn, Estimating and Forecasting Aggregate Retirement Flows in the Canadian Labour Market – December 2005, Policy Research & Coordination Directorate, HRSDC, SP-785-12-05E
- HRSDC, *Looking-Ahead: A 10-Year Outlook for the Canadian Labour Market (2006–2015)*. http://www.hrsdc.gc.ca/eng/publications_resources/research/categories/labour_market_e/sp_615_10_06/page07.shtml

The retirement rates estimated in the HRSDC studies are linked to NOC-S codes. As noted, there is no simple mapping of HI & HIM occupations into NOC codes. It was therefore decided to take an approximate average of the estimated retirement rates for occupations in Group C of the NOC-S classification system. This may underestimate retirement rates in the health system for two reasons. First, the gender composition of the health system work force may differ from that of the labour force as a whole.³⁷ Second, the average age of the health system may be older than that of the labour force as a whole.

Future studies should attempt to collect demographic data so as to permit the development of HI & HIM specific retirement rates.

Investment in EHS Technologies

There is no comprehensive database that tracks investments in electronic health information systems or estimates when announced investments will actually flow into the health system. Budget and announcement data are available to a greater or lesser degree across jurisdictions. Some data distinguish between Canada Health Infoway funds and provincial monies. Other data combine provincial and federal commitments. Based on the available data, it was entirely impractical to attempt to construct an investment data series. It was therefore impossible to construct employment co-efficients that relate changes in investment to changes

in employment. The construction of such co-efficients is the preferred forecasting method. Future studies should attempt to remedy the serious data deficiencies that prevent the application of this methodology.

Although there is no comprehensive and internally consistent data series, the available data does permit conclusions to be drawn about the *pattern* of EHS investments. These data show a marked acceleration pattern.

Reference was also made to IDC Canada's assessment of the vendor market for technology suppliers to the health sector.³⁸

CIHI provided data on IT spending in the hospital system.

In the absence of data that would support the development of employment co-efficients, judgement-based assumptions were made of the likely employment impact of accelerated EHS investments. Three scenarios were constructed. These scenarios reflect different interpretations of how the deterioration in the fiscal position of governments will affect (or not affect) investments in EHS technologies. Because it was necessary to make wholly judgement-based estimates of future investment trends and to further make wholly judgement-based assumptions about the link between investment spending and employment, *the resulting scenarios were deliberately conservative in terms of the projected employment trends. In other words, future employment requirements and the future recruitment challenge may have been under-estimated.*

Implementation and Operations Demand

Investment in EHS technologies creates both an implementation demand for human resources and an operations demand. In economic terms the implementation demand arises from the flow of new investment into the health system. The operations demand arises from the increase in the base of installed electronic health information systems. The implementation demand tends to be greater in the short and medium term. The operations demand tends to be greater in the long run. In developing employment estimates, the 27 occupational groups were categorized as being primarily affected by implementation demand or operations demand. Separate employment growth factors were then applied.



³⁷ The vast majority (90%+) of CHIMA-certified professionals are women.

³⁸ IDC Canada, *Canadian Healthcare IT, 2009–2013 Forecast* (May 2009).

Appendix A

Scenarios:

The following table summarizes the key variables in the three growth scenarios:

Technology Adoption

It is necessary to form some judgement of how *extensive* EHS adoption is and how *deep* the adoption is. The technology adoption model that was used for this study is the model developed by HIMSS Analytics for the acute care hospital system.³⁹ There are drawbacks in using the HIMSS model:

- The HIMSS adoption model reflects US organizational structures. These do not take account of the regional

and ministerial roles that are so important in the Canadian context.

- The HIMSS model is limited to the acute care system. The model does not take account of technology adoption in ambulatory clinics, free-standing diagnostic laboratories, and medical offices.
- The HIMSS model may use a different (and narrower) definition of electronic health information systems than is the practice in Canada.
- Some jurisdictions in Canada are proceeding with implementation of EHS technologies in a different order than is presumed in the HIMSS model. This can lead to misleading rankings under the HIMSS model.

Figure No.T-2

Investment and Employment Scenarios

	Low Growth Scenario	Moderate Growth Scenario	High Growth Scenario
Impact of Deterioration in Fiscal Position of Governments	Across the board reductions in health system spending including EHS investments.	Deferral of some capital spending.	Deterioration in fiscal position of governments does <i>not</i> affect EHS investment.
Increase in Annual Investment in EHS	3.0%	8.0%	15.0%
Change in EHS Investment Cumulative to 2014 relative to 2008	16.0%	40.0% to 50.0%	approximately 100%
Annual HI & HIM Employment Increase: Operations	1.0% or less	1.5% to 2.0%	3.0%
Annual HI & HIM Employment Increase: Implementation	2.5%	4.0%	7.0%
HI & HIM Total Employment Increase Cumulative to 2014 and relative to 2009	7.7%	14.4%	26.1%

³⁹ HIMSS Analytics, 4th Edition EMR Adoption Model

While there are other sources that could be drawn on, including the National Physician Survey and studies by the Branham Group, *the HIMSS model has the unique and important advantage of providing both extensive measures of adoption and depth measures*. The HIMSS model is currently being adapted for use in Canada. Data collection is under way. When the HIMSS Canadian study is completed, a better picture of technology adoption will be available. In the absence of this complete picture, the procedure used in this study – *faux de mieux* – was to reflect on the *partial* data that were available. Based on these partial data, a judgement-based view was developed of the likely current extent and depth of EHS adoption in Canada and where that adoption would likely proceed in light of the announced investment plans.

Impact of EHS Adoption on Professional Skills Requirements

Industry stakeholders acknowledge that the adoption of EHS technologies re-shapes skill requirements for HI & HIM professionals. The empirical questions are (1) to what degree have HI & HIM skill requirements already been re-profiled, and (2) to what degree will HI & HIM skill

requirements be re-profiled by 2014, under different EHS investment scenarios.

Estimates of the current impact of EHS technologies were based on judgements about how the current adoption of EHS technologies (as approximately proxied by the HIMSS Model) would likely have already affected HI & HIM skill requirements. A further set of estimates were developed on how those skill requirements would likely change in light of the extent and depth of EHS technology adoption that is implied by the investment plans in those technologies.

Case studies and detailed job requirements analyses would be extremely helpful in refining the skill impact estimates. Future studies should consider undertaking these case studies. As well, a more structured consultation on technology trends and their impacts could usefully precede the development of new estimates.

Employment Forecasting Model

Based on the analysis and assumptions described above, a spreadsheet-based employment forecasting model was constructed.



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