Health Informatics and Health Information Management

Human Resources Outlook 2014-2019

June 2014

Canada Health Infoway / Inforoute Santé du Canada

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Health Informatics and Health Information Management: Human Resources Outlook, 2014 – 2019

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Executive Summary

This report updates the 2009 *Health Informatics and Health Information Management Human Resources Report* (*2009 HI/HIM Report*) which estimated hiring requirements for the period 2009 to 2014.

The current report has two objectives. The first is to estimate hiring requirements for Health Informatics (HI) and Health Information Management (HIM) professionals from 2014 to 2019. The second is to identify HI and HIM professional roles for which there is a risk of skills shortages.

The report's findings are based on surveys that were administered in both the public and private sector, additional statistical research, and a review of relevant literature on human resources requirements in the e-health field. Based on this research, estimates were developed of the hiring requirements that will result from replacement demand, new investment in e-health technologies, and growth in the installed base of e-health systems and applications. The risk rankings for skills shortages reflect projected hiring requirements, reported vacancy rates and indications of hiring challenges from the 2014 HI and HIM Private and Public Sector Surveys.

Key Findings

Current employment of health informatics (HI) and health information management (HIM) professionals in the public and private sector is estimated at approximately 39,900 persons. *Over the next five years the combination of growth demand and replacement demand will generate hiring requirements ranging from approximately 6,200 to 12,200 persons.* More than 70% of these hiring requirements will be in information technology and health information management. The following chart summarizes projected hiring requirements under three scenarios for investment in e-health technologies. Each of the scenarios represents a national average that will apply under the specified investment conditions. The experience of individual jurisdictions may vary from the national average.

Estimated Health Informatics and Health Information Management Employment in 2014 and Projected Five-Year Hiring Requirements, 2014 to 2019

	Information Technology	Health Information Management	Other Professional Roles*	Total
2014 Estimated Employment	20,500	5,700	13,700	39,900
Five-Year Replacement Demand	2,581	718	1,724	5,023
Five-Year Growth Demand:				
Low Investment Scenario	670	406	62	1,138
Moderate Investment Scenario	2,007	723	815	3,545
High Investment Scenario	4,145	1,224	1,817	7,186
Five-Year Hiring Requirements (Sum of Replacement Demand + Growth Demand)				
Low Investment Scenario	3,251	1,124	1,786	6,161
Moderate Investment Scenario	4,588	1,441	2,539	8,568
High Investment Scenario	6,726	1,942	3,541	12,209

* Other Professional Roles: Canadian Health System Management and Administration, Organizational and Behavioural Management, Project Management, Analysis and Evaluation, and Clinical Informatics.

In the *low investment* scenario, net new investment in e-health technologies is lower than in previous years. There are still significant hiring requirements in this investment scenario, but 78% of these hiring requirements are driven by replacement demand rather than an increase in HI and HIM employment.

In the *moderate investment* scenario, new investment activity continues approximately on par with the current level. Employment in professional roles focused on implementation holds steady, while employment pertaining to support, operations and optimization will increase. In part this reflects improvements in the overall fiscal position of governments which implies an increased capacity to support higher staffing levels and higher investment. In this scenario, replacement demand accounts for somewhat more than half of hiring requirements.

In the *high investment* scenario, the federal or provincial governments announce new investment plans that will lead to an increase in investment activity compared to current levels. Both implementation demand and support, operations and optimization demand will drive significant employment growth. In this scenario, employment growth accounts for roughly 62% of hiring requirements.

Changes since 2009

Shortages of HI and HIM professionals will continue to be a serious risk for the healthcare system. However,

the nature of that risk has changed since publication of the *Health Informatics and Health Information Management Human Resources Report* (2009). Since that time, there have been a number of changes in the e-health landscape on both the 'supply side' and the 'demand side'. On the 'supply side':

- there has been an increase in the number of specialized academic health informatics and health information management programs,
- the curricula of clinical programs in medicine, nursing and pharmacy were expanded to include e-health competencies,
- learning standards for HIM professionals and competency standards for HI professionals have been revised and updated, and
- there has been a significant increase in the availability of upgrade and advanced training opportunities for current HI and HIM professionals.

There have also been important changes on the 'demand side':

- Canada Health Infoway has deployed more than 70% of the $2.2 billion allocated by the Government of Canada to support e-health investments,
- the expiry of the Canada Health Accord raises uncertainties,
- more than two-thirds of physicians now use electronic medical records,
- adoption of e-health technologies in the hospital sector has progressed, and
- IT spending as a share of hospital operating costs has increased.[1]

The context of e-health human resources needs is also changing:

- new professional roles and specialized qualifications for those roles are emerging in both HI and HIM,
- optimization of installed e-health investments to fully realize potential clinical and productivity gains has taken on greater importance among both users and stakeholders,
- the technology landscape is being altered by the adoption of mobile/wireless technologies and data analytics (including 'Big Data'). Cloud technology may also affect the implementation of e-health strategies. The application of e-health technologies to consumer health solution is generating innovations in systems and applications, and
- the rapid acceleration of e-health investments in the United States is drawing on the pool of specialized and experienced HI and HIM human resources in Canada.

Principal Themes in the Forecast

[1] See Chapter three for detailed evidence on physician use of electronic medical records, the adoption of e-health technologies in the hospital sector and IT spending as a share of hospital operating costs.

A number of themes emerge from the forecasts presented in this report:

First: over the next five years, based on the available evidence and recent announcements, *most jurisdictions will see a moderation in the pace of new investment in e-health technologies*. However, there will continue to be new investment and e-health technologies will be extended to other components of the healthcare sector, such as long-term care, community care, public health and regional health bodies. There will also continue to be technology innovation as legacy systems and applications are updated.

Second: in this investment environment, *new priorities will be emphasized*. These will include:

- expanding and optimizing the utilization of e-health technologies,
- integrating new technologies into the health care system, and
- increasing the clinical and productivity benefits from investments that are in place.

Third: the new priorities will alter the profile of human resources needs in the public sector and the nature of the business opportunities for the private sector. Specifically, *there will be an increase in the demand for human resources that are focused on support, utilization, and optimization of e-health technologies.* This will increase both the breadth and the complexity of skills requirements.

Fourth: *replacement demand, which arises from the aging of the work force, will take on significantly greater importance as a driver of hiring requirements.* The essence of the human resources management challenge is replenishing a work force which is being depleted by the retirement of experienced professionals with recent graduates who often lack practical experience. Employers will need to ensure that their recruitment at the entry level is sufficient to meet long-term needs and that they strengthen their training and development strategies to accelerate newly hired professionals' movement up the learning curve.

Fifth: although replenishment of the e-health work force will be a priority, employers also need to be mindful of the fact that *the majority of professionals who will be using or supporting e-health technologies over the next five years are already in the work force*. Upgrade and advanced training of currently employed HI and HIM professionals will therefore take on greater importance.

Risk of Shortages

The anticipated moderation in the pace of new investment will *not* remove the risk of skills shortages, although it will alter the professional roles affected. Replacement demand, rather than employment growth arising from new investment, will be the more important driver of hiring requirements over the next five years.

There are particular professional roles that are at a high risk of shortage. The following chart summarizes this risk under low, moderate and high investment scenarios. These professional roles should be the focus of proactive human resources planning to avert skills shortages.

Professional Roles at 'High Risk' of Skills Shortage

	Low Investment Scenario	Moderate Investment Scenario	High Investment Scenario
Senior IT Management			■
Architecture	■	■	■
Application Implementation and Support			■
Security		■	■
Quality Assurance and Testing			■
Privacy		■	■
Standards		■	■
Data Quality Management		■	■
Information Governance		■	■
Risk Management			■
Business Analysis		■	■
Change Management			■
Project Management			■
Analysis and Evaluation (Data Analytics roles)	■	■	■
Senior Clinical Information		■	■
Clinical Analysis		■	■

Human Resources Issues in the Private Sector

More than half of private sector survey respondents identified 'data analytics' and 'clinical practice and procedures' as skill areas in which they are having the greatest difficulty in meeting their current human resources requirements. Forty percent of survey respondents also identified 'IT system architecture / data integration' as being an area of particular hiring difficulty. A similar proportion (38%) reported difficulty in finding 'business process / systems needs analysts'. Private sector employers anticipate that their current difficulties in hiring for these professional roles will increase over the next five years.

The nature of the e-health market may unintentionally exacerbate skills shortages. Requests for proposals commonly specify required levels of prior experience for persons on the assignment team. The weight given to experience in competitive tenders is often mirrored by companies' hiring strategies. In turn, these hiring strategies can lead to under-recruitment at the career entry level. Over a longer period, this under-recruitment at the entry level contributes to a systemic shortage of experienced professionals.

Survey evidence also shows that certifications and specialized training are playing an increasingly important role in the private sector. A majority of companies now require or prefer candidates with specialized e-health training or certifications when hiring new employees.

In the period 2009 to 2014, the dominant focus was managing the implementation of new e-health investments. Over the next five years, priorities in the health care system will shift. There will be greater emphasis on optimization of investments that are in place and expanding the utilization of those investments. As a result, the role of the private sector will change. In particular, expertise in supporting and optimizing e-health systems and applications will take on increased importance.

Recommendations

1. *There is a need to systematically monitor trends in the supply and demand for professionals in Health Informatics (HI) and Health Information Management HIM).* Of particular importance is the need to track enrolment and graduation trends in post-secondary HI and HIM programs. There is also a need to monitor trends in the adoption of new technologies that are altering skill requirements.

2. *The principal challenge facing the public sector over the next five years will be the loss of experienced HI and HIM human resources as a result of retirements*. In purely quantitative terms, the substantial expansion of post-secondary programs in HI and HIM addresses this problem. However, recent graduates are not equivalent to experienced professionals. *To reduce the looming skills gap, post-secondary institutions need to partner with employers in the public sector and private sector to integrate co-op semesters and internships into HI and HIM training where this is not already being done*. There is an important role for organizations like Canada Health Infoway, CHIMA, COACH, ICTC, and ITAC-Health to promote and facilitate this strategy. At the same time, *employers in the public sector need to commit to succession planning to ensure sufficient hiring at the entry level to meet long-term needs*.

3. *Public sector procurement strategies for e-health expertise need to align with strategic human resources goals.* It is common practice for the public sector to specify experience requirements in requests for proposals (RFPs). This reduces risk in project implementation. However, an overly narrow adherence to this practice creates another risk which is of greater long-term significance, namely insufficient private sector hiring of entry-level professionals. Over the long run, this can result in a shortage of experienced professionals to replace those who retire. The public sector bears the consequence of this shortage in the form of high costs and a diminished pool of qualified proponents. In other fields where experience requirements in RFPs can unintentionally constrict the flow of new entrants into the professional work

force, procurement strategies have been adjusted. The favoured approach is to give preference to proponents that augment their assignment teams with entry-level and junior professionals without weakening the overall experience required for the project. The healthcare sector should explore the potential scope for such innovation in its e-health procurement strategies.

4. There is a need to *expand the range of structured and certified skills upgrading and skills broadening opportunities* for professionals who are in the e-health field or who wish to transition into this field.

5. Although the curricula for students in medicine, nursing, and pharmacy now incorporate training in e-health technologies, there is a gap in the opportunities for practicing clinical professionals to acquire these skills through continuing professional development. If this gap is not addressed, it could hamper efforts to expand the utilization of e-health technologies and optimize the use of those technologies. *It is important therefore to expand the opportunities for clinical professionals to acquire clinical informatics and health information management skills*.

1 Introduction

Purpose of the Report

This report has two objectives. The first is to estimate hiring requirements for Health Informatics (HI) and Health Information Management (HIM) professionals from 2014 to 2019. The second is to identify HI and HIM professional roles for which there is a risk of skills shortages.

This report updates the 2009 *Health Informatics and Health Information Management Human Resources Report* (*2009 HI/HIM Report*) which similarly estimated hiring requirements for the period 2009 to 2014.

Changes in the E-Health Environment since 2009

There have been a number of changes in the e-health environment which make it appropriate to review and update the forecasts and skills shortage risks set out in the *2009 HI/HIM Report*. To appreciate the significance of these changes for human resources planning, it is useful to recall the main features of the 2009 context.

The Situation in 2009

In 2009, Canada's e-health system was in the middle of a rapid acceleration in the implementation of major e-health investments. Over the previous three years, Canada Health Infoway had invested more $628 million in e-health projects. This expenditure was augmented by provincial government investments. Over the next five years (2009 to 2015), Canada Health Infoway would add to these invests by almost $800 million. Additional commitments by provincial and territorial governments would multiply this investment. The *2009 HI/HIM Report* estimated that, on a national basis, hiring requirements for HI and HIM professionals would range from approximately 6,300 persons to 12,300 persons. The report warned that, in the absence of proactive human resources planning measures, skills shortages posed a significant risk to the successful implementation of e-health investments. The report also pointed to a shortage of opportunities for upgrade training for HI and HIM professionals.

Supply of Skilled Professionals: Changes in Professional Training since 2009

A number of initiatives were taken to reduce the skills shortages risks that were flagged in the *2009 HI/HIM Report.*

- *HI and HIM Post-Secondary Programs:*

  Since 2009, there has been an increase in the number of specialized Health Informatics programs and CHIMA-accredited Health Information Management programs. These programs are now graduating HI and HIM professionals.

- *E-Health Competency in Clinical Programs:*

  The curricula of clinical programs in medicine, nursing, and pharmacy were expanded to include e-health competencies.

- *Updating of Learning and Competency Standards*

  In 2010, CHIMA released the updated version of its *Learning Outcomes for Health Information Management* (LOHIM) document which sets out curriculum standards for CHIMA-accredited programs in colleges, universities, and institutes of technology. To better equip HIM professionals to adapt to changing e-health technologies, the LOHIM document re-oriented important elements of HIM curricula from learning about specific hardware and software to understanding the underlying logic and concepts of electronic health information systems.[2]

  In 2012, COACH published a new edition of *Health Informatics Professional Core Competencies, Version 3.0*. The 2012 edition of the *Core Competencies* document reflects advances in e-health and the practice of health informatics. The document includes increased emphasis on patient safety, consumer health, architecture and integration, change management and quality improvement. As part of the updating of the *Core Competen*cies document, the related resources – the *HIP® Career Matrix*, *HIP® Role Profiles* and the *Canadian CPHIMS-CA Reference and Study Guide* were also updated.

- *HI and HIM Upgrade Training:*

  There has been a significant increase in the availability of upgrade training for HI and HIM professionals. In particular, COACH, CHIMA, Canada Health Infoway, and the National Institutes of Health Informatics offer an increased range of workshops and courses. Colleges, universities, and institutes of technology also offer more skills upgrading opportunities. Vendors also offer training to support users of their applications. E-learning technologies have made this upgrade training more accessible. In 2009, COACH introduced the Certified Professional in Health Information Management Systems - Canada (CPHIMS-CA) certification.

Demand for Skilled Professionals: Changes in the Investment and Implementation Environment since 2009

Since 2009 there have been important changes in the implementation and investment context which will alter human resources requirements in e-health.

- *Investment:*

[2] CHIMA, *Learning Outcomes for Health Information Management (LOHIM Document), 2010* https://www.echima.ca/him-curriculum-lohim

Canada Health Infoway has deployed more than 70% of the $2.2 billion allocated by the Government of Canada to support e-health investments.[3]

- *Health Sector Funding*:

  The expiry of the Canada Health Accord on March 31, 2014, raises uncertainties about the long-run future of federal support for the health care system.

- *Adoption and Use*:

  The proportion of physicians using electronic medical records has increased from 37% in 2009 to 64% in 2013.[4] Adoption of e-health technologies in the hospital sector has also progressed significantly. IT spending as a share of hospital operating costs has also increased.

The Human Resources Context: Changes since 2009

There have also been important changes in the e-health context that are altering human resources needs. Some of these changes have been evident for a few years, but are likely to be more important over the next five years.

- *New Roles and Specialized Qualifications*:

  Data governance frameworks, data quality, data standards, and data analytics have taken on increased importance as e-health systems and applications are more widely implemented.

- *Benefits Realization*:

  Optimizing the use of recent e-health investment to fully realize the benefits of those investments has taken on greater importance. The shift in emphasis from implementing new investments to optimizing the use of investments-in-place has important implications for human resources requirements. In particular, there has been a ratcheting up of demand for application support, service desk, data analytics, clinical informatics, data quality management, and change management. Related to benefits realization goals, there is increased emphasis on measuring the economic and clinical benefits of e-health technologies in

[3] Canada Health Infoway, *Annual Report 2012-2013*

[4] 2009 data are drawn from Commonwealth Fund, *International Survey of Primary Care Doctors*. 2013 data are drawn from National Physician Survey.

Canada. Peer-reviewed studies in the United States are documenting these benefits across sectors and Canadian evidence of benefits is emerging.[5]

- *Technology Trends:*

  The technology landscape is being significantly affected by the adoption of mobile technologies and advanced analytics (including 'Big Data'). Cloud technology may also affect the implementation of e-health strategies.

- *Trends in the United States:*

  The rapid acceleration of e-health investments in the United States is exercising a gravitational pull on specialized and experienced HI and HIM human resources in Canada.

Looking Forward to 2019

This report makes three contributions to human resources planning in HI and HIM. First, the report profiles and estimates the current HI and HIM workforce. Second, the report provides estimates for hiring requirements over the next five years. Third, the report indicates particular HI and HIM roles where there will be a moderate or high risk of skills shortages. The risk shortage rankings are based on three different investment scenarios plus the impact of replacement demand which is a consequence of demographic trends. The purpose of the risk shortage rankings is to focus stakeholders' attention on particular HI and HIM roles for which there is a

[5]There is an emerging literature that documents the productivity and clinical impacts of e-health technologies, The following titles are examples of this literature:

M. Price. F. Lau and J. Lai, "Measuring EMR adoption: A framework and case study", *ElectronicHealthcare*, 2011;10(1):e25-e30

F. Lau, M. Price and K. Keshavjee,"From benefits evaluation to clinical adoption – Making sense of health information system success", *Healthcare Quarterly*, 201, 14(1):39-45.

F. Lau, C. Kuziemski, M. Price and J Gardner, "A review of systematic reviews on health information system studies", *American Journal of Medical Informatics*, 2010, 17:637-45.

R. Liisa Jaakkimainen, Susan E. Schultz and Karen Tu, "Effects of implementing electronic medical records on primary care billings and payments: a before–after study", *CMAJ Open,* October 17, 2013 vol. 1 no. 3 E120-E126 http://www.cmajopen.ca/content/1/3/E120.full

Terry, M. Stewart, M. Fortin, S. Wong, M. Kennedy, F Burge, R. Birtwhistle, M. Charlebios, I. Grave-Gubbins, G. Webster and A. Thind, "How Does Canada Stack Up? A Bibliometric Analysis of the Primary Health Care Electronic Medical Record Literature, *Informatics in Primary Care*, 2012 Dec; 20 (4): 233-240

Clare Liddy, Margo S. Rowan, Amir Afkham, Julie Maranger and Erin Keely, "Building access to specialist care through e-consultation", *Open Medicine* 2013;7(1)e1 (January 8, 2013)

Marianne Tolar and Ellen Balka, "Beyond Individual Patient Care: Enhanced Use of EMR Data in a Primary Care Setting", in E.M. Borycki *et al*. (eds.), *International Perspectives in Health Informatics,* IOS Press, 2011

material likelihood that skills shortages will jeopardize e-health project implementation schedules, diminish the realization of clinical and operational benefits from projects, or perhaps introduce unnecessary risks to the health care system. *This report should be interpreted not as a warning of shortages but as a call for proactive human resources planning to avoid those shortages.*

Methodology

This report uses the taxonomy of HI and HIM professional roles described in the *Health Informatics Professional Core Competencies, v. 3.0* developed by COACH and the *Learning Outcomes in Health Information Management (LOHIM)* document*, 2010* developed by CHIMA. Both documents were validated by industry stakeholders. HI and HIM professional roles are distinct from occupations. An HI or HIM professional role refers to a set of specialized functions that requires specific training or experience and which arises in the context of implementing, supporting, or working with e-health technologies. In some workplaces, HI or HIM professionals may perform more than one professional role. In other workplaces, individuals may perform a single professional role.

Estimates of current HI and HIM employment are based on five sources:

- the 2011 National Household Survey,
- the 2014 HI and HIM Public Sector Survey, administered by COACH for this study,
- the 2014 HI and HIM Private Sector Survey, administered by COACH for this study,
- administrative data provided by CHIMA, and
- the *2009 HI/HIM Report* which drew on the 2006 Census, surveys of the public and private sector, CHIMA administrative data, and an Ontario survey designed and administered by the Ontario Hospital Association (77 of 153 hospitals).

The 2014 HI and HIM Public Sector Survey received responses from 45 regional or provincial administrative bodies or hospitals. This compared with 35 responses in 2009. The 2014 HI and HIM Private Sector Survey received responses from 51 companies. This compared with 45 companies that participated in the 2009 survey.

Estimates for hiring requirements reflect both projected increases in HI and HIM employment and replacement demand arising from demographic trends. The projected increases in HI and HIM employment are based on three alternative investment scenarios in e-health systems and applications. These scenarios are described in Chapter three. Replacement demand is based on an expected retirement rate of 2.4%, which is commensurate with the estimate used by Employment and Social Development Canada (ESDC) in its Canadian Occupational Projection System (COPS). Risk rankings reflect projected hiring requirements, reported vacancy rates and indications of hiring challenges from the 2014 HI and HIM Private and Public Sector Surveys.

A more detailed description of the methodology for this report is provided in Appendix B.

Outline of the Report

Chapter two profiles the seven HI and HIM professional categories and the roles within those categories.

Chapter three discusses the conceptual framework and the indicators used to make judgement-based estimates of supply and demand trends and to identify skill areas where there is likely to be a significant risk of shortages.

Chapter four summarizes the outlook for the seven HI and HIM professional categories with particular emphasis on skill areas where there is a significant risk of skills shortages.

Chapter five examines trends in the private sector, based on a survey undertaken for this report.

Chapter six summarizes the main findings of this report and presents recommendations.

Appendix A sets out the detailed supply and demand forecasts and projected hiring requirements.

Appendix B is a technical description of the procedures and sources used in the forecasts.

Appendix C describes the HIMSS Analytics 7-Stage EMRAM model for gauging progress in the adoption of e-health technologies,

Appendix D lists the members of the steering committee.

Appendix E lists practice briefs published by CHIMA

Appendix F lists Guidelines and White Papers published by COACH.

The Report's Sponsors and Partners

The sponsors and partners of this report are:

Canada Health Infoway (*Infoway*):

Canada Health Infoway *(Infoway)* helps to improve the health of Canadians by working with partners to accelerate the development, adoption and effective use of digital health across Canada. Through our investments, we help deliver better quality and access to care and more efficient delivery of health services for patients and clinicians. Established in 2001, *Infoway* is an independent, not-for-profit organization funded by the federal government. www.infoway-inforoute.ca

Canadian Health Information Management Association (CHIMA):

CHIMA is a not-for-profit professional association. CHIMA works to promote the HIM® profession, expand the job market, influence the direction of professional practice, and monitor trends in the industry. CHIMA represents more than 5,000 Certified Health Information Management professionals, HIM students, and affiliate members from across Canada. Through the Canadian College of Health Information Management, CHIMA certifies professionals in the field of Health Information Management and accredits academic programs. www.echima.com

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. www.cihi.ca

COACH - Canada's Health Informatics Association:

COACH is the *voice of health informatics (HI) in Canada* promoting the adoption, practice and professionalism of HI. COACH represents a diverse community of accomplished, influential professionals who work passionately to make a difference in advancing healthcare through information technology. HI is the intersection of clinical, information management/information technology and management practices. Members are dedicated to realizing their full potential as professionals and advancing HI through access to information, talent, credentials, recognition, programs and a broad range of services and specialized resources. www.coachorg.com

Information and Communications Technology Council (ICTC):

ICTC is a centre of expertise in digital economy research, labour market intelligence, policy development, program management and delivery. Through its strong network of industry, academia and government, ICTC enables the progress of Canada's future economies by empowering industries to maintain a competitive advantage in a global market through a highly-skilled and innovative workforce.

ICTC offers the largest, most rigorous and primary ICT data analysis and research infrastructure in Canada, allowing timely monitoring of Canada's workforce requirements for the digital economy, including the intersection of ICT with emerging occupations, enabling technologies and sub-sectors. ICTC provides access to accurate, timely and comprehensive labour market information which is critical for the

development of economic and social policies that enable Canadian workers to make informed decisions. www.ictc-ctic.ca

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. http://itac.ca/activities/itac-health/

The members of the Report's Steering Committee are listed in Appendix D.

This report was prepared by Prism Economics and Analysis.

2 Profile of the Current HI and HIM Work Force

This chapter is based on the description of Health Informatics (HI) and Health Information Management (HIM) roles in *Health Informatics Professional Core Competencies, v. 3.0* developed by COACH and the *Learning Outcomes for Health Information Management, 2010 (LOHIM)* document developed by CHIMA. Both documents have been validated by industry stakeholders.[6] Figure 1 summarizes the structure of the Core Competencies model.

Figure 1
Professional Role Groups and Professional Roles
COACH, *Health Informatics Professional Core Competencies, v. 3.0*
CHIMA, *Learning Outcomes in Health Information Management, 2010 (LOHIM)*

Information Technology • Senior IT Management • Architecture • Application Implementation and Support • Security • Quality Assurance and Testing • Service Desk • Network, Storage and Other Infrastructure Support	**Health Information Management (HIM)** • Senior Health Information Management • Privacy • Standards • Data Quality Management • Information Governance • Health Records Management • Coding and Classifications (including Terminologies)	**Canadian Health System Management and Administration** • Senior E-Health Leadership • Policy and Strategic Planning • Risk Management • Business Analysis
Organizational and Behavioural Management • Product / Serviced Support • Change Management • Training and Development • Process Improvement	**Project Management** • Program Management • Project Management	**Analysis and Evaluation** • Various professional roles
	Clinical Informatics • Senior Medical Information Officers • Clinician-Analysts	

[6] COACH, *Health Informatics Professional Core Competencies, v. 3.0*, available at: http://coachorg.com/en/resourcecentre/Competencies-Career-Matrix.asp

CHIMA, *Learning Outcomes in Health Information Management, 2010 (LOHIM)* https://www.echima.ca/him-curriculum-lohim

CHIMA has published a series of practice briefs that cover a range of HIM professional functions. These practice briefs are listed in Appendix E. COACH has published Guidelines and white papers that address a range of issues relevant to HI professional functions. A list of these Guidelines and white papers can ve found in Appendix F.

The professional roles shown in Figure 1 are not necessarily equivalent to occupations. In this report, the term 'professional role' refers to a set of specialized functions that requires specific training or experience. These roles arise in the context of implementing, supporting or working with e-health technologies. In some workplaces, HI or HIM professionals may perform more than one professional role. In other workplaces, an individual may perform a single professional role and his or her employer may view this professional role as being equivalent to an occupation. Individual professional roles that have a similar focus or orientation are grouped together in the seven 'Professional Role Groups' shown in Figure No. 1.

The human resources profile presented in this chapter applies to both the public and the private sector. Although some professional roles may be associated more strongly with the public or private sector, there are no hard and fixed boundaries between the two sectors.

Figure 2 compares the estimated employment in 2009 from the *2009 HI/HIM Report* with the estimates for 2014 which are used in this report.

Figure 2
Comparison of Estimated HI and HIM Employment, 2009 and 2014
Estimates: Prism Economics and Analysis

Professional Role Groups	2009	2014 (+/- 10%)
Information Technology	15,910 to 19,090	20,500
Health Information Management	4,130 to 5,800	5,700
Canadian Health System Management and Administration	not estimated	2,200*
Organizational and Behavioural Management	3,030 to 3,580	2,400
Project Management	1,870 to 2,210	2,200
Analysis and Evaluation	3,270 to 3,920	4,700
Clinical Informatics	980 to 1,160	2,200
Total	29,370 to 35,780	39,900

* this estimate is offered with a caution

Four factors account for the increase in estimated employment between 2009 and 2014:

First: there was an increase in human resources requirements which led to an expansion of employment. This appears to have been most evident in Information Technology and Health Information Management;

Second: Statistics Canada's 2011 National Household Survey utilized occupational classifications that better captured the size of the HIM work force compared to the 2006 Census;

Third: data from the 2014 HI/HIM surveys added further insight into employment of HI and HIM professionals. In the *2009 HI/HIM Report,* there were no estimates offered for Canadian Health System Management and Administration roles. In this report, a cautious estimate is provided; and

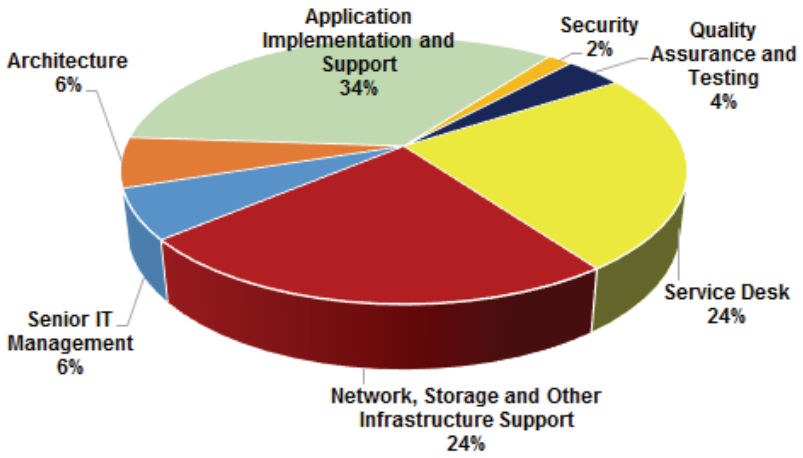
Fourth: some professionals who were already employed in the health care sector were transitioned into HI and HIM roles. This represented an increase in the HI and HIM work force, but not an increase in the overall health care work force.

The sections which follow discuss each of the seven Professional Role Groups in more detail.

Information Technology

Figure 3 shows the distribution of Information Technology staff across the seven IT professional roles.

Figure 3
Distribution of Professional Roles in the Information Technology Group
Private and Public Sector
Estimates: Prism Economics and Analysis



The estimates in Figure 3 reflect data from the 2014 surveys undertaken for this report, the 2006 Census and the 2011 National Household Survey (NHS). *Among the important changes since 2009 (data not shown; refer to 2009 report) are a system-wide increase in the relative importance of service desk and network support roles*

and an increase in the role of the private sector as a supplier of ongoing support services (network support, service desk, and application support) to both the public sector and to clinics and private practices. Survey evidence suggests that private sector employees account for approximately 5% of the on-site work force in the public sector. The private sector provides substantially more support to the public sector using off-site resources.

Approximately one quarter of IT professionals in the public sector hold an IT certifications such as ITIL Around 15% of IT professionals in the public sector have specialized training in HL7 or SNOMED CT.

Survey data suggest vacancy rates around 6-7%. These vacancy rates are notably higher for Application Implementation and Support roles where survey data indicate that they may exceed 10%. Skills shortages in Application Implementation and Support can be an important factor in drawing out implementation periods for e-health investments.

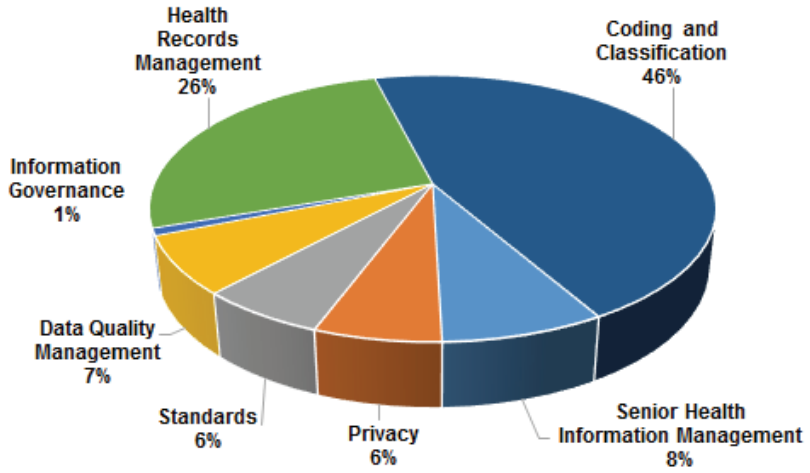
Estimates of human resources availability in the private sector are necessarily elastic. Many companies that operate in the e-health market have the capacity to draw on resources from other divisions of their company. Additionally, some companies also have the capacity to draw on international resources. The estimate used in this study pertains to the number of persons who are primarily focused on e-health.

Data from the National Household Survey indicate that across a range of IT occupations, in comparison with the consulting sector, a somewhat greater proportion of the public sector work force is age 50 or older. This is particularly the case for managers, computer programmers, and database administrators. The implication is that replacement demand and the need to replenish the skills base will be greater in the public sector over the next five years.

Health Information Management

Figure 4 shows the distribution of Health Information Management staff across the seven Health Information Management professional roles in the public sector. There are insufficient data to support estimates for the private sector.

Figure 4
Distribution of Professional Roles in the Health Information Management Group
Public Sector
Estimates: Prism Economics and Analysis



The estimates in Figure 4 reflect data from both the surveys undertaken for this report and the 2011 National Household Survey (NHS). An important change in the 2011 NHS was recognition of Health Information Management as a distinct occupation.

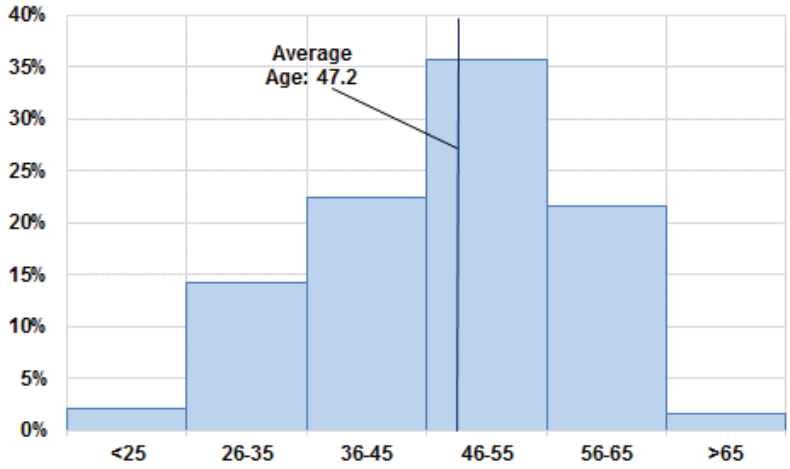
A comparison with the 2009 survey (data not shown; refer to 2009 report) shows that *the most significant change is the increased importance of coding and classification roles, in particular the more advanced terminology roles*. This reflects both the importance of 'clean data' in an e-health system and an organizational trend that treats coding and classification as a distinct function within Health Information Management.

Survey data suggest overall vacancy rates under 5% for HIM professional roles overall. However, *for Data Quality Management roles the vacancy rate is 10%.* This may indicate hiring challenges in this field.

Certification in health information management has been offered since the 1930s. The certification has seen a number of iterations since that time, evolving with the profession and technological change. Prior to 2010, certification in HIM was restricted to those who graduated from an accredited HIM program of study. In 2010, an advanced standing program was introduced to allow applicants who work in HIM and who meet the requirements for the program to apply to write the credentialing examination

Figure 5 shows the age distribution of CHIMA members.

Figure 5
Age Distribution of CHIMA Members
CHIMA Administrative Data



Although there has been a general trend towards delayed retirement for both men and women, the evidence still suggests that women tend to retire somewhat earlier than men.[7] It is relevant, therefore, that roughly 95% of HIM professionals are women – an estimate supported both by CHIMA's administrative data and the 2011 National Household Survey. In 2009, the average age of CHIMA's members was 46.5. In 2014, the average age was 47.2.

The 2011 National Household Survey suggests that *virtually all Health Information Management professionals are employed in the public sector*. Only around 3% of Health Information Management professionals are employed in the private sector. It would appear from the 2011 NHS that information management professionals in the private sector have experience or qualifications in other types of information and records management and do not identify themselves as HIM professionals, even if they may be working this field. Survey evidence also indicates that less than 1% of the on-site work force in Health Information Management in the public sector are private sector employees.

Data from the 2014 HI and HIM Public Sector Survey indicate that around two-thirds of HIM professionals hold the CHIM (Certified in Health Information Management) designation. Additionally, CHIMA has student members and candidates who are preparing for the CHIMA registration examination.

The 2014 HI and HIM Public Sector Survey indicates that approximately two-thirds of HIM professionals in standards roles have specialized training in areas such as HL7, LOINC or SNOMED CT. The survey data also show that about 5% of HIM professionals hold a project management certification.

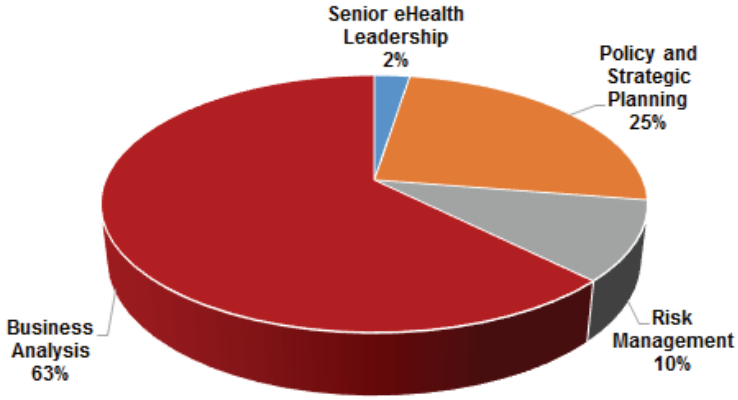
[7] Yves Carrière and Diane Galarneau, "Delayed Retirement: A New Trend?", Statistics Canada, *Perspectives on Labour and Income,* vol. 23, no. 4 (October 2011) 75-001-X

In 2013, Infoway surveyed stakeholders on the need for, and degree of interest in, a professional certification in terminologies. The survey was distributed to CHIMA members and to members of ITAC-Health. There were 294 responses to the survey. Among the survey's findings were that 27.5% of respondents had completed training in SNOMED CT and 12% had completed training in LOINC. The survey also showed significant demand for specialized training in terminologies and a growing trend among HIM recruiters to require this training.

Canadian Health System Management and Administration

It is difficult to determine the number of persons in the System Management and Administration group owing to differences in the ways that organizations define jobs. In the 2009 report, no estimates were provided for these roles. This report used 2011 NHS data and 2014 survey data to develop provisional estimates. It is stressed, however, that these are provisional estimates and should be used with caution. Figure 6 summarizes the estimated distribution of the four professional roles across the System Management and Administration group.

Figure 6
Provisional Estimate of Distribution of Professional Roles in
the Canadian Health System Management and Administration Group
Public Sector and Private Sector
Estimates: Prism Economics and Analysis



By far the largest professional role in the System Management and Administration category is Business Analysts. Business analysis is a key role. The needs analysis undertaken by Business Analysts and the technology solutions that they propose, guide the technical architecture and subsequent design of systems and applications. Errors at this stage have long-term consequences. These can include costly re-designs or systems that perform significantly below expectation or which do not demonstrate clinical value and therefore face adoption challenges.

Until the last decade there was comparatively little training available in the business analysis field. Most Business Analysts acquired their skills entirely through experience. Professional accreditations in this field are

comparatively recent and have not gained significant traction. Consequently, both clients and employers relied on, and continue to rely on, 'track record' as the primary criterion for hiring or engaging a Business Analyst. In all sectors of the economy, including the healthcare sector, Business Analysts with significant industry-specific experience are in short supply.[8] *The health-care sector is heavily dependent on the private sector to supply qualified Business Analysts.* Survey data suggest that as many as 40% of on-site Business Analysts are consultants supplied by the private sector. Vacancy rates for both Risk Managers and Business Analysts are around 10%.

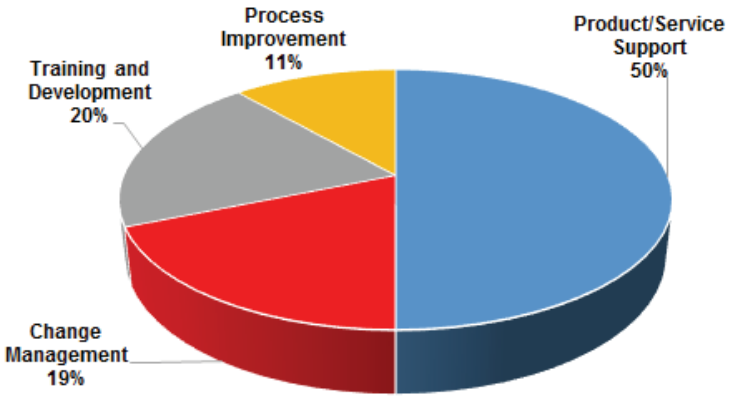
Survey results indicate that approximately 60% of Senior E-Health leadership hold a technical certification. The most common certification is in project management. Only a quarter of Business Analysts hold a technical certification, usually in IT (*e.g.*, ITIL) or standards (*e.g.*, HL7 or SNOMED CT). Only around 5% of Business Analysts hold a CPHIMS-CA certification.

The majority of Risk Managers appear to have had fewer than five years of experience, although the sample size is small. Roughly 35% of Business Analysts have fewer than five years of experience. An emerging field within Risk Management is patient safety.

Organizational Behaviour and Management

Changes in professional role definitions make the estimates for 2014 not comparable with the 2009 estimates. Figure 7 shows the approximate distribution of the four professional roles across the Organizational Behaviour and Management group.

Figure 7
Estimate of Distribution of Roles in
the Organizational Behaviour and Management Professional Group
Public Sector and Private Sector
Estimates: Prism Economics and Analysis



[8] Information and Communications Technology Council, *Business Analysts and the Digital Economy*

The most notable change from 2009 (data not shown; refer to 2009 report) is the increased importance of Process Improvement. This reflects the increased focus on increasing the gains from installed systems and applications through both broader and more intensive usage of those assets. These gains include increased patient safety, improvements in clinical productivity, and operational efficiencies. Survey data suggest that vacancy rates for these positions may exceed 10%, indicating some degree of challenge in recruiting for Process Improvement roles. The majority of individuals in Process Improvement roles appear to have had fewer than five years of experience in these roles. This is also the case with Training and Development roles.

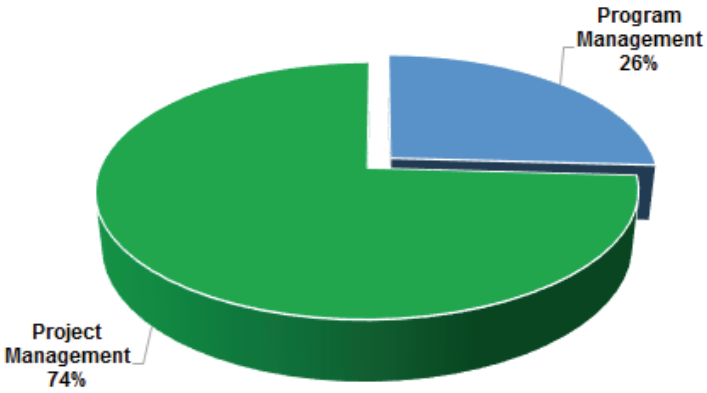
There is significant overlap between Product Service and Support roles and both Health Information Management and Information Technology roles. Survey data suggest that around 15-20% of individuals in these roles hold a CHIM certification while the same proportion holds an IT certification. Around one quarter of persons in Change Management roles hold a project management certification.

Increased use of e-learning technologies may have reduced some of the demand for Training and Development resources.

Project Management

The Project Management group comprises two professional roles: Program Management and Project Management. Program Managers are responsible for a portfolio of projects whereas Project Managers focus on a single project or on a small number of projects. Figure 8 shows that roughly three-quarters of persons in the Project Management group are Project Managers.

Figure 8
Estimate of Distribution of Professional Roles in
the Project Management Group
Public Sector and Private Sector
Estimates: Prism Economics and Analysis



The private sector is an important source of human resources supply in Project Management. *2014 survey data suggest that almost 80% of on-site Project Managers are on assignment from the private sector*. To some degree the reliance on the private sector reflects challenges that the public sector faces when filling vacancies. Survey data suggest that the vacancy rate for Project Managers may be around 20% or higher. Roughly a third of the private sector's assignment of Project Managers appear to be covering public sector vacancies.

The demand for Project Management is a direct function of the number of e-health investment projects. If there is a tapering off of new investment projects over the next five years, the demand for Project Management will diminish. In the forecast presented in this report, the skills shortages in this field will diminish, except under the high investment scenario. (The investment scenarios are described in Chapter three.) It is possible that the apparently high proportion of vacancies for Project Managers reflects decisions to defer recruitment until the funding outlook for new e-health investments by governments is clearer.

As would be expected, the most common certifications in the Project Management field are project management certifications, such as those offered by the Project Management Institute.

Analysis and Evaluation

The scope for Analysis and Evaluation has increased with the greater availability of robust and high quality e-health data, supporting privacy and security protocols, and improved infrastructure. As a result, the use of both comparative analytics and predictive analytics has increased and will continue to increase. There will be increased use of 'Big Data' technologies (discussed in Chapter three) to extract findings from large and disparate datasets.

There are broadly two domains in which Analysis and Evaluation professional will play an increased role. The first pertains to evidence-based management of the healthcare system. Comparative analytics will be used to benchmark and compare elements of the healthcare system and allocate resources to achieve the greatest operational efficiencies. Predictive analytics will enable the healthcare system to adapt more quickly to changes in population health trends. Comparative and predictive analytics will also have increased applicability in clinical environments. In the clinical context, both comparative and predictive analytics will be used to identify emerging trends in disease or wellness, improve clinical outcomes, and guide research activity.

As the Canadian healthcare system moves through the various stages of implementing e-health technologies, data analytics will become a significantly more important skill set to monitor.

Clinical Informatics

The requirement for Clinical Informatics expertise increases in tandem with the completion of e-health

investments. The 2014 survey evidence suggests a significant increase in the requirement for professionals in this field since 2009 (data not shown; see 2009 report), although it is difficult to gauge the magnitude of the increase precisely. In part, this arises from the overlap with clinical professions. Survey evidence suggests that half or more of professionals in the Clinical Informatics field have a professional background in one of the clinical disciplines. Most frequently, this is the field Nursing. Approximately a quarter of Clinical Informatics staff hold technical certifications beyond their professional and post-secondary training.

Survey data suggest vacancy rates of around 10% in Clinical Informatics. On-site consultants augment the public sector workforce by approximately 7% to 10%.

Survey data indicate that roughly three-quarters of persons in Clinical Informatics roles have five or more years of experience. This may reflect the significant overlap with other roles in the clinical professions

■

3 Analytical Framework

The analytical framework which informs estimates of supply and demand trends has three elements: (1) a human resources demand component, (2) a supply trends component, and (3) alternative e-health investment and growth scenario. A more detailed description of the methodology used to develop the forecast of hiring requirements and the risk of skills shortages is set out in Appendix B.

A. Demand Drivers

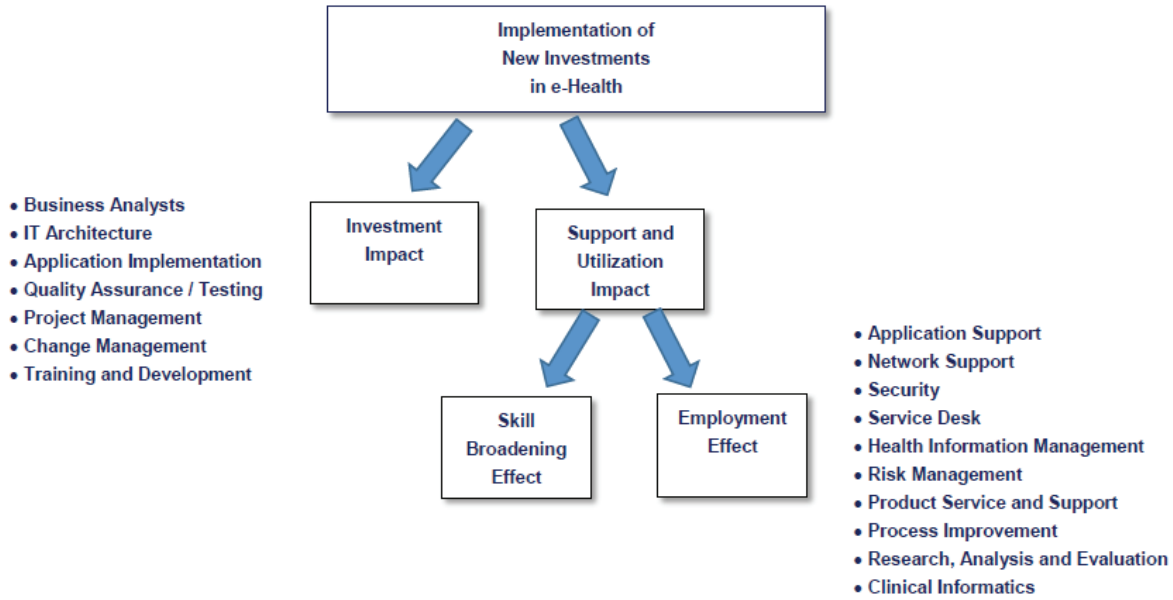
The principal demand drivers that shape human resources requirements are:

1) investment in e-health technologies,
2) the degree of progress in adopting e-health technologies,
3) replacement demand arising from demographic trends,
4) technology impacts, and
5) international demand.

Neither technology impacts nor international demand were factored into the 2009 outlook report.

Figure 9 illustrates impact of investment in e-health technologies on human resources requirements.

Figure 9
Human Resources Impact of
Implementing New Investments in E-Health



As Figure 9 shows, there are two distinct impacts arising from the implementation of new investments in e-health technologies. The first is an investment impact. This affects primarily those occupations directly involved in the design and implementation of a new e-health system or application. Most e-health projects proceed through similar stages. They begin with analysis and planning which require clinical and stakeholder engagement, technical design and workflow process design. This stage is followed by ramping up as the implementation process proceeds. The implementation stage involves project management, change management, training and development, and, in some cases, adjustments to the original technical and process designs. Human resources requirements associated with implementation peak and then subsequently wind down. As the implementation project reaches completion, the focus shifts to clinical adoption and workflow integration. The professional roles most strongly affected by the investment impact are: Business Analysis, IT Architecture, Application Implementation, Quality Assurance/ Testing, Project Management, Change Management, and Training and Development. The human resource demands generated by new investment are inherently cyclical.

The second human resources impact arising from the implementation of new e-health investments is the long-term requirements for HI and HIM professionals to support and utilize the new technology. Figure 9 shows that there are two dimensions to the support and utilization impact – an employment effect and a skill broadening effect. The employment effect refers to the increase in the human resources required to provide ongoing support for e-health systems and applications. The skill broadening effect pertains to the new skills that are required by the incumbent workforce in the healthcare system to utilize e-health technologies and derive the fullest degree of clinical and productivity benefits from those technologies

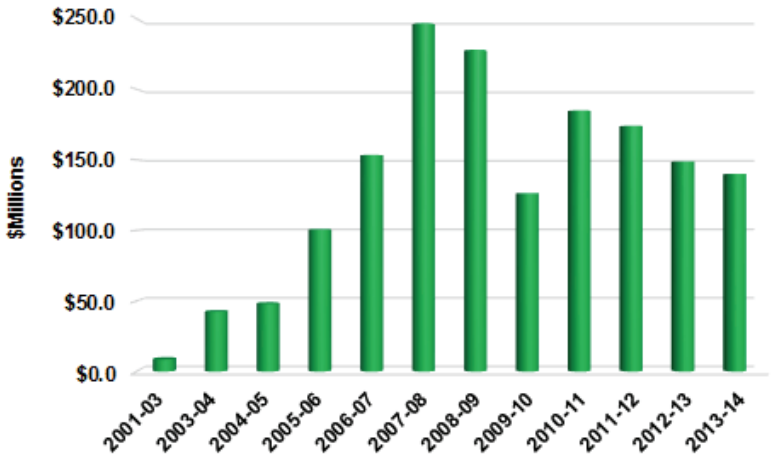
The next sections discuss each of the five demand drivers in more detail.

1. Investment Trends

New Investment Trends:

The principal sources of e-health investment in Canada are the federal government through Canada Health Infoway, the provincial and territorial governments, and private practitioners and clinics. The federal government allocated $2.1 billion to Canada Health Infoway to develop national standards and to support provincial and territorial e-health projects. Figure 10 shows the annual disbursements for investments made by Canada Health Infoway.

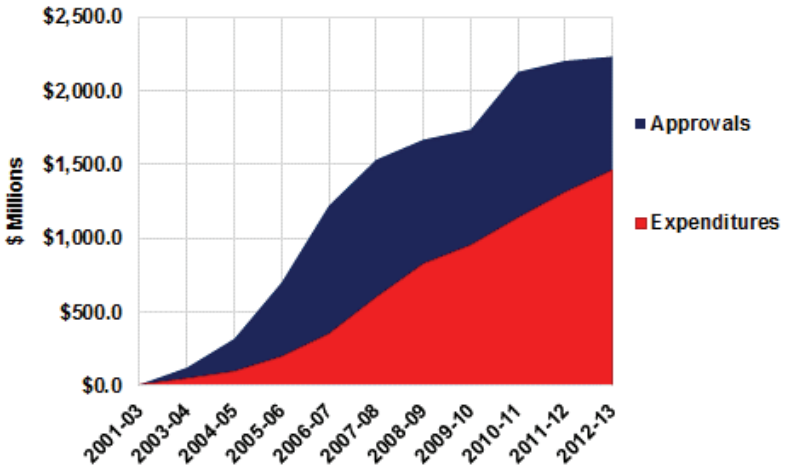
Figure 10
Annual Investment Outlays – Canada Health Infoway
(Canada Health Infoway, *Annual Reports*, 2001-02 to 2012-13)



As can be seen from Figure 10, annual investment outlays ramped up rapidly in the period after 2003 and peaked in 2007-08. Since 2007-08, there has been a decline in annual outlays of Canada Health Infoway's initial co-investment strategy.

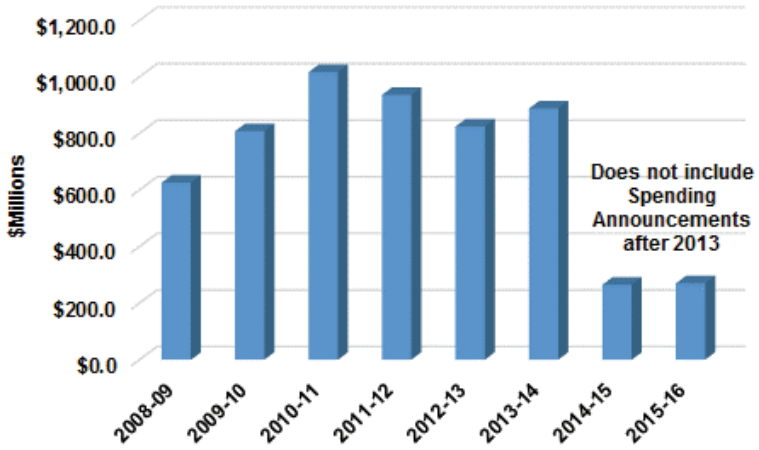
Figure 11 compares cumulative approved investments with cumulative outlays on those approved investments. *As of March 2013, analysis of data suggests that approximately two-thirds of the $2.1 billion allocated to Canada Health Infoway by the federal government was expended*. Over the next few years, this means that the flow of investment will be in the $100-$150 million range and then taper off, in the absence of a renewed commitment by the federal government.

Figure 11
Cumulative Investment Approvals and Outlays – Canada Health Infoway
(Canada Health Infoway, *Annual Reports*, 2001-02 to 2012-13)



It is difficult to develop precise estimates at the provincial level as it is not always clear whether announced expenditures include Infoway funds. As well, some announced e-health spending repeats commitments that may have been announced in a previous year. The spending estimates are therefore approximate based on available provincial and territorial data and announcements. Figure 12 shows that provincial spending on e-health investments appears to have peaked around 2010-11. Since then, investment spending has declined by approximately 15-20%, although spending announcements in 2014 and thereafter could alter that picture.

Figure 12
Estimated Provincial Investment in E-Health
(Various Provincial Announcements)



Although significantly smaller than the public sector, e-health investment by the private health is likely to increase in coming years. This reflects the trend to greater adoption of e-health technologies in private clinics, private practices and private laboratories. Some of this investment is supported by incentive plans (such as Canada Health Infoway's and aligned jurisdictional EMR programs) that subsidize a portion of the initial investment cost. Trends in adoption by family physicians (discussed below) show considerable progress in integrating e-health technology into private medical practices. There may also be increased adoption of e-health technologies in long-term care and public health.

Investment Trends

- **The pace of new investment in e-health systems and applications is likely to moderate compared to the last five years. This does *not* imply a cessation of new investment. Rather, based on announced spending intentions, the pace of new investment will slow down.**

2. Adoption Trends:

Breadth and Intensity of Adoption:

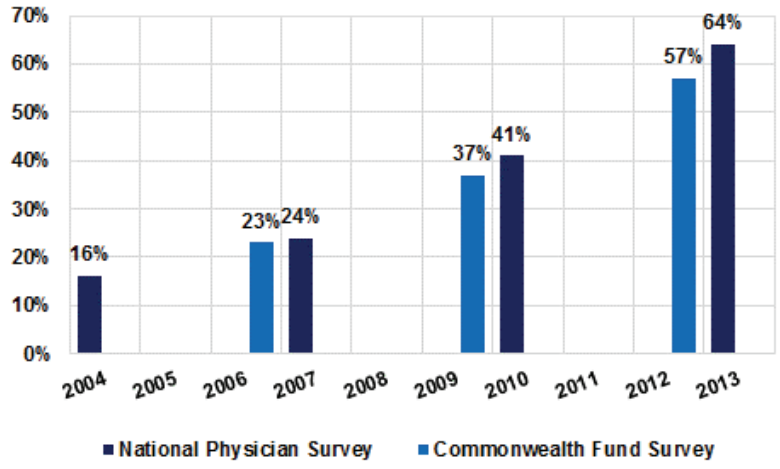
Figure 13 summarizes the progress that Canada Health Infoway expects to achieve on the availability of electronic health records (EHRs) across a range of key domains.

Figure 13
Expected Availability of Electronic Health Records (EHRs)
Canada Health Infoway, *Summary of Corporate Plan* 2014-15

Forecasted EHR Availability by Domain as of March 31, 2015					
Client Registry	Provider Registry	Diagnostic Imaging	Drug	Lab	Clinical Reports or Immunizations
100%	100%	100%	64%	90%	99%

Availability, however, is not usage. Figure 14 illustrates the trend in the use of electronic medical records (EMRs) by primary care physicians. The data are derived from the National Physicians Survey and surveys administered by the Commonwealth Fund. *The survey data indicate a growing use of electronic medical records (EMRs) by primary care physicians.*

Figure 14
Physician Use of Electronic Medical Records
National Physician Survey and Commonwealth Fund Survey



A second indicator of adoption and utilization is measurements of adoption trends in the hospital sector. To gauge these trends, the U.S.-based Health Information Management Systems Society (HIMSS) developed the

Electronic Medical Record Adoption Model (EMRAM). EMRAM is a seven-stage model that employs technology and usage indicators to classify hospitals across the seven adoption stages. Appendix C provides a summary of the EMRAM stages.

Figure 15 shows that *on a national basis, adoption progress to date in the hospital sector has been moderate and is progressing at a measured pace, rather than at a 'breakneck' pace.* On the seven-stage spectrum, the weighted average was Stage 1.782 in 2010(Q4) and Stage 1.999 three years later.

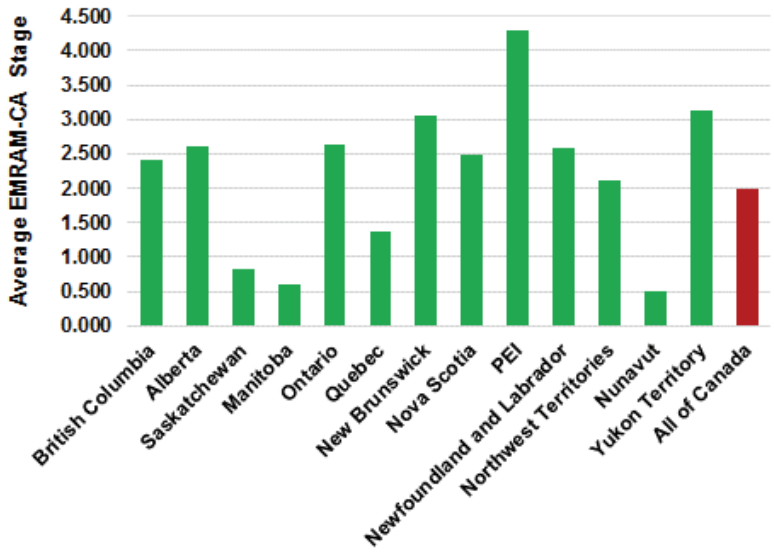
Figure 15
Adoption Progress in Hospitals over Three Years (2010 to 2013)
HIMSS Analytics EMRAM Model[9]
(Values may not sum to 100.0% owing to rounding)

	2010 – Q4	2013 – Q4
Stage 7	**0.0%**	**0.0%**
Stage 6	**0.2%**	**0.6%**
Stage 5	**0.2%**	**0.0%**
Stage 4	**2.2%**	**3.8%**
Stage 3	**33.0%**	**32.2%**
Stage 2	**23.5%**	**29.1%**
Stage 1	**12.1%**	**14.5%**
Stage 0	**29.0%**	**19.8%**
Weighted Average	**1.782**	**1.999**

Hospital adoption trends at the provincial level shows significant differences across jurisdictions. Figure 16 compares average adoption levels across Canada.

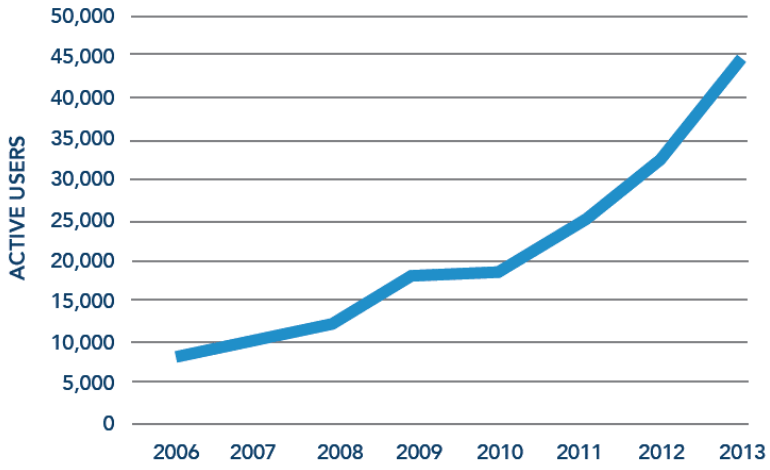
[9] The HIMSS Analytics EMRAM model is described at: http://www.himssanalytics.org/emram/emram.aspx

Figure 16
Average Adoption Levels in the Hospital Sector across Canada
HIMSS Analytics EMRAM Model



A third indicator of adoption trends is estimates of active users. Figure 17 shows estimates developed by Canada Health Infoway of the number of users of two or more integrated provincial datasets who have accessed a system at least once per month or three times per quarter. (Figure 17 does not include users of datasets that are not integrated with a provincial dataset.) As can be seen *the number of active users, defined in this way, increased from roughly 7,600 persons in 2006 to approximately 45,000 persons in 2013*.

Figure 17
Active Users of Electronic Medical Records
(Users = persons who access 2 or more integrated provincial datasets
once per month or three times per quarter)
Canada Health Infoway, *Annual Report* 2012-13



In summary, the evidence points to the following:

- a moderating of the pace of new investment in e-health systems and applications,
- significant progress in completing infrastructure investment to achieve *availability* goals for electronic health records,
- significant progress in primary care physician utilization of electronic medical records,
- a moderate rate of progress in the adoption and utilization of health information systems (HIS) in the hospital sector,
- substantial differences across provinces in HIS adoption and utilization levels, and
- rapid growth in the number of active users of integrated provincial datasets.

The implication of these trends for human resources is that over the next five years there will be a discernible shift in emphasis in the healthcare system from implementing major new investments in e-health to optimizing the utilization of recent investments and deriving greater benefits from those investments. This is not to say that there will be no new investments in e-health systems and applications. On the contrary – investment will continue and some of this investment will reflect 'cutting edge' innovation. However, the overall pace of new investments in systems and applications is likely to moderate. As a result, there will be increased emphasis on support for installed systems and applications, optimization of their usage, and maximization of derived benefits. This will have implications for human resources requirements over the next five years. Following this consolidation phase, which may last for about three to five years (2014 to approximately 2019), it is reasonable to expect a subsequent ratcheting up of investment and innovation. This may coincide with, and be enabled by, a general improvement in the fiscal position of provincial governments. (Section C below comments on the importance of the fiscal position of provincial governments as an enabler of e-health investment.)

Shift in Emphasis in Human Resources Needs

- **Over the next three to five years, there will be less emphasis on designing and executing new investment projects and significantly more emphasis on optimizing the use of recent investments and maximizing benefits from those investments.**
- **As a result of the shift in emphasis towards optimizing the use of recent investments, there will be a re-orientation of human resources needs. This re-orientation will increase the demand for professional roles that contribute to optimization. These include application support and service desk within the IT Professional Role Group and various data quality functions (*e.g.*, standards, terminology) within the HIM Professional Role Group.**

As described earlier, there are two principal human resources impacts from adopting e-health technologies: an employment effect and a skill broadening effect.

Employment Effect:

Employment effects refer to the increase in human resources required to support and utilize e-health systems, applications, and data. These employment effects are evident in most, although not all, Professional Role Groups. There are also differences within Professional Role Groups as some professional roles are more strongly associated with support and utilization functions.

An analysis by the Ontario Hospital Association found that at Stage 1 in the EMRAM adoption model, the ratio of non-IT staff (i.e., clinical, administrative, maintenance, etc.) to IT staff in hospitals (measured as full-time equivalents) was approximately 160:1. In Stages 2 and 3, this ratio falls to between 75:1 and 70:1. The ratio continues to decline as hospitals progress through the remaining adoption stages. At Stage 6, the ratio is approximately 50:1. *The implication is that as a hospital progresses through the adoption stages, IT human resources requirements increase significantly*. The greatest impact occurs in the transition from Stage 1 to Stage 2.

Data on IT spending by hospitals confirm this pattern. CIHI data indicate that the IT share of hospital operating costs increased from approximately 2.0% in 2002-03 to 2.63% in 2011-12.[10] In some provinces, the IT share now exceeds 3.5% of operating expenses and is continuing to increase. In real terms (i.e., netting out the effect of inflation), *IT spending by the hospital system increased by 5.0 to 7.0% per year over the past five years*. Much of this increase was reflected in increased staffing levels and in increased purchases of support services from the private sector.

The increase in human resources required to maintain and support e-health technologies has a significantly greater *long-run* impact on human resources needs than the resources required to implement those technologies. This is especially true when the pace of implementation proceeds at a comparatively measured pace, as is expected to be the cast in Canada over the next five years.

Skill Broadening Effect:

The majority of the HI and HIM professionals who will be implementing or supporting e-health systems are already employed by the health care system. These individuals understand the health care system and are technically competent in their respective IT, information management, clinical, or administrative roles. What many of these individuals lack is the cross-disciplinary training that is required in an e-health environment. Clinical professionals, in particular, need to acquire additional skills to utilize e-health systems and to take full advantage of the potential benefits of these systems to improve the quality and productivity of clinical practice.

[10] Estimates are derived from Canadian Institute for Health Information, “Financial Performance Indicators”.

As will be described later in this chapter, there has been significant progress in establishing new post-secondary programs in health informatics and health information management. However, *post-qualification training is a major gap*. COACH, CHIMA, Infoway, the National Institutes of Health Informatics (NIHI) and the post-secondary system are all sources of update and skill broadening training. However, *these resources will need to be strengthened and expanded to accommodate the skill broadening needs that arise in tandem with the implementation of e-health technologies*. If this investment is not made, there is a risk that skills shortages will diminish the utilization of e-health technologies and thereby reduce the potential clinical, productivity and patient safety benefits that can be derived from e-health investments.

Skill broadening needs to be a key element in strategies to increase the utilization of e-health technologies and to maximize the benefits derived from those investments.

Human Resources Impacts

- **Support and utilization requirements have a significant, *long-run* impact on human resources needs.**
- **Among the more important of these impacts is the need for skill broadening which is critical to optimizing the use of e-health technologies and maximizing benefits derived from those investments.**

3. Replacement Demand

Demographic trends will continue to put pressure on the available skill supply. The Canadian Occupational Projection System (COPS) estimates that the average rate of retirement from the labour force in 2009 was approximately 2.1%. COPS estimates that in 2014, the retirement rate will be 2.4%.[11] The increase in the expected retirement rate reflects the impact of long-run demographic trends.

The impact of population aging trends is evident in a comparison of 2006 Census data with data from the 2011 National Household Survey. To cite one example, the proportion of persons in the occupational category, 'Computer and Information Systems Professionals', between ages of 45 and 65 increased from 26.0% in 2006 to 33.8% in 2011. The aging population trend in also evident in CHIMA administrative data. In 2009, 15.5% of CHIMA's membership was in the 56-65 age group. By 2013, that proportion had increased to 21.6%.

[11] Human Resources and Skills Development Canada, *Estimating and Forecasting Aggregate Retirement Flows in the Canadian Labour Marke*t, December 2005.

Offsetting these demographic trends is evidence that many workers have been delaying their retirement.[12] However, the impact of this trend is not sufficient to diminish the importance of basic demographic trends. Moreover, the data suggest that the trend to delay retirement peaked around 2005 and has plateaued since then. In the 2009 report, the assumed retirement rate from the workforce was 2.0%. For this forecast, the assumed retirement rate has been increased to 2.4%.

Depending on the growth scenario, replacement demand will account for somewhere between 38% and 78% of five year hiring requirements. An important implication of this finding is that the health care system will experience a significant erosion of its skills base and will need to take proactive steps to replenish that skills base.

Replacement Demand

- **Replacement demand will be a key driver of human resources requirements over the next five years.**
- **Approximately 12.6% of the current HI and HIM work force will retire between 2014 and 2019. This will generate hiring requirements for approximately 5,000 persons. Growth demand will be on top of this.**

4. Technology Trends

A review of the trade press and analyses of technology trends by both ICTC and Infoway indicate that the key technology trends that will affect human resources requirements over the next five years are mobile technologies and data analytics.[13] Cloud technologies may also have an impact, although the magnitude of this impact will depend on successful systems for protecting security and privacy and on cost trends that establish a persuasive business case for adopting cloud technologies. The application of e-health technology to consumer health solutions is also driving innovation in systems and applications.

Mobile technologies are not emerging technologies in the health care system. Rather mobile technologies are already a significant component of the e-health environment. Mobile technologies involve platforms, network protocols and applications that differ from those of systems built around servers and hard-wired to PCs to create in network. In addition to requiring new technical skills, mobile technologies also raise challenges related to security, interoperability and reliability. An Infoway white paper comments that, "outside of the implementation of electronic health records (EHRs), *the use of mobile devices promises to be one of the most*

[12] Yves Carrière and Diane Galarneau, "Delayed Retirement: A New Trend?", Statistics Canada, *Perspectives on Labour and Income*, Autumn 2011, vol. 23, 4. Statistics Canada Catalogue 75-001-XIE.

[13] ICTC's reports on emerging technology trends can be found at: http://www.ictc-ctic.ca/?page_id=1767 Infoway's reports are cited throughout this section.

transformational information technologies in health care."[14] Adoption of mobile technology appears to be more advanced in the United States, particularly with large Health Maintenance Organizations (HMOs) like Kaiser Permanente.[15] To some degree wireless technology replaces reliance on in-house networks, platforms and applications with hosted solutions that reduce the human resources requirements in the public sector, though may increase human resources needs in the private sector. A potentially important application of mobile technologies is greater patient involvement in off-site monitoring of health conditions. Both of these technologies also carve out a larger role for the private sector.

Data analytics involves preparing and modelling data to discover information that will support managerial, scientific and clinical decision-making. Data analytics encompasses diverse techniques in different business and science domains. Data mining focuses on discovery of patterns for predictive rather than purely descriptive purposes. Business intelligence focuses on data generated by business and organizational processes. Exploratory data analysis discovers new features in data while confirmatory data analysis confirms or falsifies hypotheses. Predictive analytics encompasses the application of statistical and structural models for forecasting. Text analytics applies statistical, linguistic, and structural techniques to extract and classify information from text sources. Data visualization applies advanced 3-D graphical applications to data to better illustrate trends and correlations.

'Big Data' is an emerging and increasingly important tool in data analytics. 'Big Data' refers to data that is characterized by exceptionally high volumes, high velocity of updating and usage, and significant diversity in content, source and format. The size and complexity of 'Big Data' make it difficult to use traditional database management and data processing tools. A critical distinction between 'Big Data' analytics and traditional data analysis is the capacity of 'Big Data' systems to handle unstructured queries. A white paper by Canada Health Infoway notes that *an important constraint on the adoption of 'Big Data' systems and 'Big Data' analytics is the global shortage of skilled human resources*.[16]

Cloud computing offers three services: applications, platforms, and storage. A white paper by Canada Health Infoway cites a U.S. study that finds cost savings, in the U.S. context, of more than 60% from cloud computing compared to traditional on-site servers with resident operating systems and applications.[17] The degree which these potential cost savings currently apply in Canada is unclear. Cloud computing also reduces the overall demand for skilled professionals to support applications, platforms and networks. This advantage may prove more important than cost advantages. Notwithstanding its potential advantages, cloud computing poses significant security and governance issues. These challenges could impede the adoption of cloud technologies. The Infoway white paper concludes that, "cloud computing has the potential to solve many pressing issues in the application of IT in health."

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[14] Canada Health Infoway, "Mobile Computing in Clinical Settings – White Paper", Emerging Technology Series (November 2013) [emphasis added]

[15] *Canadian Health Care Technology*, "Wireless systems are transforming healthcare through fast access to data", May 2012

[16] Canada Health Infoway, "Big Data Analytics in Health – White Paper", Emerging Technology Series (April 2013)

[17] Canada Health Infoway, "Cloud Computing in Health – White Paper", Emerging Technology Series (September 2012)

In the field of consumer health solutions, e-health technologies are leading to the development of portals through which consumers can access health information and potentially add to that information. Remote monitoring technologies enable consumers to track their medical condition in real time without the need to attend a clinic or a testing laboratory.

Technology Trends

- **Mobile/Wireless. Data analytics (including 'Big Data'). Cloud computing. Consumer health solutions.**
- **All four trends affect skill requirements.**
- **Cloud computing and mobile/wireless technologies imply a greater role for the private sector in supplying and supporting platforms.**

5. International Demand

In 2009, the United States adopted the *American Recovery and Reinvestment Act* (*ARRA*) to arrest and reverse the severe economic contraction that occurred in 2008. Title XIII of the *ARRA* was the *Health Information Technology for Economic and Clinical Health Act (HITECH Act)*. The *HITECH Act* provides significant incentives for the adoption and 'meaningful use' of electronic health records. The *Act* also imposed modest penalties for failing to adopt those technologies. A consequence of the *HITECH Act* was a significant acceleration in the adoption of e-health technologies. Adoption progress at the hospital level in the United States is now significantly ahead of Canada. In the United States, in 2013(Q4) the average EMRAM adoption level was Stage 4.024 compared with Stage 1.999 in Canada.

A direct consequence of the acceleration of investment in e-health technologies in the United States has been a surge in demand for qualified human resources. This wave is not confined to Information Technology occupations, but it is this demand that is most often measured. One study found that hiring demand for IT professionals in the U.S. healthcare system has increased by approximately 45% over the past four years.[18] The *HIMSS Workforce Survey* (July 2013) found that 31% of respondents had to place an IT initiative on hold as a result of staffing shortages and that a further 19% were considering doing so.[19] Many health care providers in the U.S. effectively shift their staffing challenges onto vendors' shoulders. The HIMSS survey found that 70% of healthcare providers use outsourcing as an alternative to direct hiring. Evidence of skills shortages was also reported in a Deloitte survey conducted for the American Medical Informatics Association (AMIA). The survey found that "even when the budget is available, these organizations are unable to secure the right people

[18] Wanted Analytics, Abby Lombardi, "Recruiting Analytics for Healthcare IT Talent" http://www.wantedanalytics.com/insight/2014/03/14/recruiting-analytics-for-healthcare-it-talent

[19] HIMSS Analytics, *HIMSS Workforce Survey* (July 2013) p 16

and the right data to meet their needs."[20] The U.S. Bureau of Labour Statistics estimated in its 2012-13 *Occupational Outlook Handbook* that e-health investments will generate approximately 200,000 new IT jobs.

In its current heated state, the U.S. e-health market is exerting a gravitational pull on experienced and specialized e-health human resources in Canada. The recent depreciation of the Canadian dollar will increase the strength of this pull. The effect of U.S. requirements on Canada will be to exacerbate skills shortages in key areas, notably IT architecture, database administration, and network design.

U.S. Demand

- **The acceleration of e-health investments pursuant to the HITECH Act will draw specialized and experienced human resources out of Canada. This will be especially evident in skill areas such as IT architecture, database administration, and network design.**

B. Supply Trends

Since the *2009 HI/HIM Report*, there has been significant progress in addressing skills supply. There are broadly four channels for the delivery of training in e-health technologies:

- the post-secondary system,
- expanded curriculum in clinical programs,
- professional training (both upgrade and accreditation), and
- vendor training.

Post-secondary Programs:

A report by COACH comments that, "Canada now boasts a robust number and variety of HI post-secondary programs at all levels from diploma to PhD." The report also noted that co-op and internship options figure prominently in these programs.[21] Graduates from these programs are now entering the HI/HIM labour market and enabling both the health care sector and the private sector to replenish their skills base. One group of

[20] American Medical Informatics Association (AMIA), *The 2012 Deloitte-AMIA Health Informatics Industry Maturity Survey*, p 9

[21] COACH, *Health Informatics Education in Canada* (May 2013)

authors commented after reviewing the number of programs that, "from our perspective, it is a whole new world out there compared to just a few years ago."[22]

In 2009, there were 16 HIM programs accredited by the Canadian College of Health Information Management (CCHIM). Only one of those offered a distance-learning option. In 2014, there are 19 accredited programs, of which five offered a distance-learning option. All accredited HIM programs in Canada provide education and training in e-health. One HI program has recently received Ministry approval and has undergone CCHIM accreditation to offer a combined HI and HIM training.

Figure 18 lists post-secondary institutions that currently deliver certificate, diploma or degree programs in Health Informatics and Health Information Management.

Figure 18
Health Informatics and
Health Information Management Post-Secondary Programs

HEALTH INFORMATICS	HEALTH INFORMATION MANAGEMENT (includes both CCHIM accredited and candidacy programs)
• British Columbia Institute of Technology	• Canadian Healthcare Association
• Calgary, University of	• Cégep regional de Lanaudière à l'Assomption
• Centennial College	• Cente for Distance Education
• Conestoga College	• Collège Ahuntsic
• Dalhousie University	• Collège Laflèche
• George Brown College	• Collège O'Sullivan de Montréal
• McMaster University	• Conestoga College
• Memorial University	• Douglas College
• Mohawk College	• Fleming College
• Ontario University Institute of Technology	• George Brown College
• Ottawa, University of	• McMaster University
• Ryerson University	• New Brunswick Community College
• Sherbrooke, Université de	• Nova Scotia Community College
• Toronto, University of	• Red River College
• Victoria, University of	• Ryerson University
• Waterloo, University of	• Sask. Institute of Applied Science & Tech.
• Western Ontario, University of	• Southern Alberta Institute of Technology
• York University	• St. Lawrence College

[22] University of Waterloo, "University-Wide Option in Health Informatics: Draft Report of the Sub-Committee"

Expanded Curricula in Clinical Programs:

Curricula have been developed in a number of clinical programs in the use of e-health technologies:

- The Association of Faculties of Medicine of Canada (AFMC) in partnership with Canada Health Infoway initiated a project on e-health curriculum and e-learning. Several medical schools have already incorporated e-health training into their curricula.
- The Canadian Association Schools of Nursing (CASN) developed nursing informatics competencies that all Registered Nurses will possess upon graduating from an undergraduate nursing program in Canada.
- The Association of Faculties of Pharmacy of Canada (AFPC) and Canada Health Infoway partnered to develop a national on-line, competency based, educational program to help prepare undergraduate pharmacy students in optimizing the use of Information and Communication Technologies (ICT).

It will be important to monitor trends in the use of these curricula resources.

Professional Upgrade Training and Certification:

Professional training is also available to broaden or upgrade the skills of incumbent professionals. COACH offers the Certified Professional in Health Information and Management Systems – Canada (CPHIMS-CA) which augments content from a similar certification offered by HIMSS in the United States. The standards for the Certified Health Information Management (CHIM) designation includes demonstrated competency in relevant e-health technologies. Candidates for both the CPHIMS-CA and CHIM designations are supported with training materials. Specialized training is also available in ITIL, HL7, privacy, project management and SNOMED CT.

The Certified Professional in Healthcare Information and Management Systems - Canada (CPHIMS-CA) is provided through a partnership between COACH and HIMSS, which issue the credential jointly to successful candidates. The CPHIMS-CA credential demonstrates an individual's professional competency in the health informatics field. CPHIMS-CA recognizes the importance of experience; with eligible candidates requiring a minimum of three years of associated experience. Re-certification is required every three years.

Vendor Training:

Vendors have ramped up the training they provide both to users of their applications and to specialized professionals who provide technical support. E-learning is especially common in vendor-supplied training as well as in training provided by provincial e-health agencies

C. Alternative Investment Scenarios

Economic Growth Outlook

Figure 19 summarizes the growth projections from the Bank of Canada, the *Economist* Intelligence Unit, and the Conference Board. The consensus outlook for the Canadian economy over the next five years is for moderate real growth.

Figure 19
Economic Forecasts, Canada
Increase in Real GDP

	Bank of Canada	*Economist* Intelligence Unit	Conference Board
2014	2.5%	2.2%	2.1%
2015	2.5%	2.3%	2.6%
2016	Not Forecasted	2.6%	2.3%
2017	Not Forecasted	2.4%	2.2%
2018	Not Forecasted	2.0%	2.0%
2019	Not Forecasted	Not Forecasted	Not Forecasted

At these growth rates, unemployment will decline slowly and the fiscal position of provincial governments in central and eastern Canada will take some time to repair themselves. In western Canada, growth will be stronger, although it is unlikely to be the hyper-growth that was evident a few years ago. In these circumstances, capital spending plans put pressure on the resources available for current program spending. This is especially true in the healthcare sector.

The expiry of the Canada Health Accord raises uncertainties about the available funding for provincial and territorial health care systems. Federal support will continue to increase by 6% per year through to 2016-17. Beyond 2016-17, future monies will also be allocated on a per capita basis. The impact of these changes is likely to be a reduction in the rate of increase in federal funding for most provinces. It is uncertain how provincial and territorial governments will respond to this new funding environment. Some may defer or slow down capital spending so as to maintain program spending. Others may increase their investment in e-health technologies to realize greater productivity gains in their healthcare systems.

As noted in Chapter Two, Canada Health Infoway has expended approximately 70% of the $2.1 billion allocated to it by the federal government. Absent a renewed commitment, federal spending to support e-health investments by the provinces will wind down. Recent announcements by provincial governments do not point to a return to earlier levels of investment, although some provinces may be better positioned to support high levels of investment over the next five years.

Based on this assessment of the broader economic and fiscal context, human resources needs are forecast on the basis of three scenarios. These scenarios are summarized in Figure 20.

Figure 20
E-Health Human Resources Demand Scenarios
Prism Economics and Analysis

	Low Investment Scenario	Moderate Investment Scenario	High Investment Scenario
	Implementation Demand		
Annual Rate of Employment Growth relative to 2014	-2.0%	0.0%	3.0%
Five Year Cumulative Employment Growth relative to 2014	-9.6%	0.0%	15.9%
	Support and Operations Demand and Optimization		
Annual Rate of Employment Growth relative to 2014	1.5%	2.5%	4.0%
Five Year Cumulative Employment Growth relative to 2014	7.7%	13.1%	21.7%

In the *low investment scenario*, there are still significant hiring requirements, but 78% of these hiring requirements are driven by replacement demand. Employment in professional roles that are focused primarily on implementation of new e-health technologies would decline, although this decline would be more than offset by long-term employment growth arising from support and operations demand.

In the *moderate investment scenario*, new investment activity continues approximately on par with the current level. Employment in professional roles focused primarily on implementation holds steady, while employment arising from support and operations demand increases more rapidly than in the low investment scenario. In part this reflects improvements in the overall fiscal position of governments and an increased capacity to support higher staffing levels. In this scenario, replacement demand accounts for slightly more than half of hiring requirements.

In the *high investment scenario*, the federal or provincial governments announce new investment plans that lead to an increase in investment activity compared to current levels. Both implementation demand and support and operations demand drive significant employment growth. Employment growth accounts for roughly 62% of hiring requirements which, of course, are much greater than in the low or moderate investment scenarios..

Although the forecast in this report is a national forecast, it is entirely possible for the scenarios to play out differently across the country.

While the three investment scenarios differ in the emphasis they put on new investment, there are nevertheless common themes in all three scenarios:

- The long-run increases in the human resources required for support and operations roles will take on greater importance than the cyclical requirements to meet new implementation needs.

- Optimization of existing investments and deriving greater clinical and productivity benefits will be a more significant focus over the next five years.
- Strategic human resources planning in both the public sector and the private sector will need to adjust to this shift in the human resources needs paradigm.

4 Outlook for Human Resources Needs

This chapter estimates hiring requirements for health informatics (HI) and health information management (HIM) professional roles and identifies professional roles for which there is a moderate or serious risk of shortages. The estimates for hiring requirements reflect both projected increases in HI and HIM employment and replacement demand arising from demographic trends. The risk rankings reflect projected hiring requirements, reported vacancy rates and indications of hiring challenges from the 2014 HI and HIM Private and Public Sector Surveys. Appendix B provides more detailed information on the methodology and sources supporting the forecast.

At the sector level, hiring requirements reflect the combined impact of replacement demand and growth demand. Replacement demand is the result of retirements and mortality. Growth demand is the result of additional hiring required to implement or support *increases* in the installed base of e-health systems and applications. Growth demand is modelled in terms of the three investment scenarios described in Chapter three.

Hiring requirements at the level of individual employers may exceed or fall short of the sector level. When there are skills shortages, employees often will take advantage of the opportunity to advance their careers by changing employers. Consequently, *turn-over* at the level of individual employers is sometimes greater than overall hiring requirements at the sector level. In general, skills shortages exacerbate turnover.

The estimates in this chapter pertain to both the public sector and the private sector. The functions performed by the public sector and the private sector in e-health vary across jurisdictions and also change over time. There is no hard and fast boundary line separating the two sectors.

Impact of Shortages

On the implementation side, shortages lead to unexpected delays, cost over-runs, unplanned disbursements to third parties, lengthy organizational disruptions, and often sub-optimal design and execution of projects owing to the need to use less skilled professionals. On the operations and support side, shortages result in chronic or prolonged periods of understaffing for some or all professional roles. This, in turn, leads to lower levels of utilization of e-health technologies, a decrease in system and application availability and reliability, and morale problems. Patient care and safety also may be adversely affected.

Hiring Requirements: 2014 to 2019

Over the five-year period from 2014 to 2019, replacement demand will generate hiring requirements for approximately 5,000 persons. Depending on the investment scenario, growth demand will generate *additional* hiring requirements ranging from approximately 1,100 persons to around 7,200 persons. Figure 21 summarizes the replacement demand and growth demand for each of the seven Professional Role Groups.

Figure 21
Estimated Hiring Requirements
Prism Economics and Analysis

Professional Role Group	Replacement Demand	Growth Demand by Investment Scenario			Total Hiring Requirements (Replacement Demand + Growth Demand)		
		Low	Moderate	High	Low	Moderate	High
Information Technology	2,581	670	2,007	4,145	3,251	4,588	6,726
Health Information Management	718	406	723	1,224	1,124	1,441	1,942
Management of the Canadian Health System	277	- 97	53	269	180	330	546
Project Management	277	- 211	0	350	66	277	627
Organizational and Behavioural Management	302	83	238	486	385	540	788
Analysis and Evaluation	592	118	235	235	709	827	827
Clinical Informatics	277	170	289	477	447	566	754
Total	5,023	1,138	3,545	7,186	6,161	8,569	12,210

Note: In some scenarios, Total Hiring Requirements may differ from the sum of Replacement Demand plus Growth Demand owing to rounding. Similarly, some columns may not total correctly owing to rounding.

Shortage Risk: 2014 to 2019

Figure 22 identifies the professional roles for which there is a high risk of skills shortages. As described later in this chapter, there are other occupations for which there is a moderate risk of shortage. However, *the occupations flagged in Figure 22 pose the greatest risk and should be the focus of proactive steps to address likely gaps in supply*.

Figure 22
Professional Roles for which there is a High Risk of Shortage, 2014 - 2019
Prism Economics and Analysis

	Low Investment Scenario	Moderate Investment Scenario	High Investment Scenario
Information Technology			
Senior IT Management			
Architecture			
Application Implementation and Support			
Security			
Quality Assurance and Testing			
Service Desk			
Network, Storage and Other Infrastructure Support			
Health Information Management			
Senior Health Information Management			
Privacy			
Standards			
Data Quality Management			
Information Governance			
Health Records Management			
Coding and Classification			
Canadian Health System Management and Administration			
Senior E-Health Leadership			
Policy and Strategic Planning			
Risk Management			
Business Analysis			
Organizational and Behavioural Management			
Product/Service Support			
Change Management			
Training and Development			
Process Improvement			
Project Management			
Program Management			
Project Management			
Analysis and Evaluation			
Analysis and Evaluation (data analytics roles)			
Clinical Informatics			
Senior Clinical Information			
Clinical Analysis			

The following sections of this chapter examine each of the Professional Role Groups in more detail. A complete set of hiring requirements forecasts are set out at Appendix A. To facilitate interpretation of the forecasts, skills shortage risks are characterized as 'no significant risk', 'moderate risk', and 'high risk'.

Definition of Risk Rankings

No Significant Risk

When an occupation is characterized as being at 'no significant risk' of shortage the intended meaning is that expected availability of graduates from post-secondary programs and from immigration intake will be sufficient to meet hiring requirements. However, additional training often will be required to equip these new hires with the specific skills needed. For example, in Information Technology, service desk staff, application support staff and network support staff will need training on the specific systems and applications they are supporting. The term 'no significant risk' does *not* mean that new hires will 'hit the ground running' on their first day. Rather *the term 'no significant risk' means that there likely will be a sufficient number of qualified candidates who will be able to fulfill 70-80% of their professional roles after a normal learning period of one to three months.*

Moderate Risk

Characterizing an occupation as being at 'moderate risk' means that employers will face difficulty in meeting their human resources requirements. This will be reflected in longer periods of time to fill vacancies. In the public sector, some employers will turn to staff augmentation services to cover gaps while they recruit permanent employees. In some regions, *employers will need to expand their candidate search beyond the regional or provincial labour market*. There may be *pressure to increase compensation*. In the public sector, this may be accommodated by hiring at a higher classification or at a higher step in the wage progression. In the private sector, higher salaries or bonus entitlements may be required to meet human resources needs. *Occupations at 'moderate risk' of shortage are typically occupations for which employers usually require or strongly prefer three to five years of relevant experience as a minimum condition for hiring*. The term 'relevant experience' refers both to technical experience and to health sector experience.

High Risk

Occupations described as being at 'high risk' of shortage are occupations for which many employers will be unable to meet their human resources needs, even after expanding candidate search beyond the local or regional labour market and offering compensation inducements, where these are feasible.

The sections which follow discuss each of the seven Professional Role Groups. Each section presents a summary of the risk rankings followed by a summary of projected hiring requirements, based on replacement demand plus growth demand under the three investment scenarios. There is then a discussion of specific skills issues or human resources trends. The total is some tables may not be precisely accurate owing to rounding.

Information Technology

Figure 23 identifies skills shortage risks for Information Technology professional roles under the three investment scenarios.

Figure 23
Skills Shortage Risks under Three Investment Scenarios, 2014 - 2019
Information Technology
Prism Economics and Analysis

	Skills Shortage Risk		
	Low Investment Scenario	Moderate Investment Scenario	High Investment Scenario
Senior IT Management	Moderate Risk	Moderate Risk	High Risk
Architecture	High Risk	High Risk	High Risk
Application Implementation and Support	Moderate Risk	Moderate Risk	High Risk
Security	Moderate Risk	High Risk	High Risk
Quality Assurance and Testing	Moderate Risk	Moderate Risk	High Risk
Service Desk	No Significant Risk	No Significant Risk	No Significant Risk
Network, Storage and Other Infrastructure Support	No Significant Risk	No Significant Risk	Moderate Risk

Information Technology occupations will account for roughly half of projected hiring requirements between 2014 and 2019. Figure 24 shows the estimated hiring requirements across the seven Information Technology professional roles.

Figure 24
Estimated Hiring Requirements by Professional Role
(Hiring Requirements = Replacement Demand + Growth Demand)
Information Technology
Prism Economics and Analysis

	Low Investment Scenario	Moderate Investment Scenario	High Investment Scenario
Senior IT Management	254	322	428
Architecture	37	157	356
Application Implementation and Support	1,103	1,563	2,296
Security	55	78	115
Quality Assurance and Testing	24	101	228
Service Desk	1,006	1,274	1,696
Network, Storage and Other Infrastructure Support	772	1,094	1,607
Total	3,251	4,588	6,726

Senior IT Management:

The primary driver in hiring requirements for Senior IT Management is demographics. Senior IT Management are usually promoted from within an organization or recruited from other organizations in the same sector. In both the low and moderate investment scenarios, it is expected that there will be a 'moderate risk' of skills shortages. This implies that organizations will be able to meet their human resources needs, but should anticipate recruitment difficulty, especially if they have not been preparing internal staff for promotion into these roles. In the high investment scenario, growth in the number of persons in Senior IT Management and career options in the private sector raise the skills shortage risk from moderate to high.

Architecture:

IT professionals who have the experience and training to take on Architecture roles are in scarce supply in all sectors. The challenges in the healthcare sector, however, may be magnified by market opportunities in the United States. Under all three investment scenarios, there is a 'high risk' of skills shortages for IT professionals who can take on Architecture roles. *This skills shortage may be the number one skills bottleneck in the implementation of new investment projects*.

Application and Implementation Support:

Organizations recruiting for Application and Implementation Support usually require or prefer three to five years of relevant experience. In a sector in which human resources needs are increasing, the need for relevant prior experience inevitably means that there will be some degree of skills shortage. In Application and Implementation Support, the private sector will address some of this shortage by providing staff augmentation and off-site support for applications. Some economies of scale that are available to the private sector are not available to many public sector organizations. Large private sector companies often have more scope to organize staff into tiers, based on their qualifications and experience, and to then allocate support tasks to these tiers based on the complexity of the tasks. A transition to cloud-based applications and to Software-as-a-Service (SaaS) solutions may also reduce some of the pressure to staff internally for Application and Implementation Support.

Organizations that are using or supporting commercially available applications will generally face a 'moderate risk' of skills shortage. Organizations using custom designed applications will face much greater challenges in meeting human resources requirements. Similarly, organizations that are in regions where economic growth will be markedly higher than national growth rates (e.g., Alberta) will face a greater risk of skills shortages.

Security:

Security is a specialized area of IT expertise which is even more specialized in the health care context. There are significant liabilities and reputational costs for organizations that suffer security breaches. For these reasons, organizations seek not only technical qualifications but also relevant experience when hiring in the Security field. The post-secondary system has increased the number of graduates with generic training in

Security. However, there will continue to be a systemic shortage of persons with security experience and expertise in the healthcare context.

In the healthcare sector, IT Security is a comparatively mature field but one which is also characterized by the ongoing emergence of new challenges. The Security field tends to attract younger professionals. Consequently, demographic pressures do not weigh as heavily on this field compared to others. For this reason, Security is ranked as being at only a 'moderate risk' of skills shortages in the low investment scenario where replacement demand is the primary driver of human resources needs. In the moderate and high investment scenarios, Security is ranked at a 'high risk' for skills shortages because of the 'employment effect' of new investment.

ISO standards have become an important benchmark in the Security field. Professionals working in this area will increasingly be expected to have an understanding of these standards. COACH has become a centre of technical expertise in the Security and privacy protection field.

Quality Assurance and Testing:

Quality Assurance and Testing is also a specialized area of IT. The particular needs of the healthcare sector make this even more specialized. As with Security, the post-secondary system has increased the number of graduates with generic training. However, there will continue to be a systemic shortage of persons with healthcare sector experience and expertise. Organizations providing professional development training may need to focus resources on this need.

Investment in new projects has a significant impact on the demand for Quality Assurance and Testing expertise. In the low and moderate investment scenarios, the skills shortage risk is expected to be moderate. In the high investment scenario skills shortages will be more acute.

Service Desk:

Service Desk is an entry level occupation for many recent graduates. In some cities, students in IT programs are a source of part-time labour. Data from the 2011 National Household Survey suggest that this is one of the fastest growing IT professional roles in the healthcare system. To reduce their need for on-site Service Desk support, many organizations in the health care sector will increase their use of knowledge portals, on-line tutorials and remotely delivered support services. Notwithstanding the expected growth in demand for Service Desk employees, the availability of labour combined with normal employer training and access to private sector support are expected to be sufficient to meet future human resources needs.

Network, Storage and Other Infrastructure Support:

Network, Storage and Other Infrastructure Support is also one of the fastest growing IT occupations in the healthcare sector. This reflects the magnitude of the investment in network systems to facilitate the exchange of EMRs. Employment growth will continue to be significant in this area. However, a skills shortage is likely

to be avoided by the flow of graduates from post-secondary programs. The training and experience to adapt generic skills in this occupation to the needs of the healthcare sector are not on a scale that is likely to cause skills shortages. If cloud technologies are more widely adopted, there may be a reduction of on-site requirements in this field.

Health Information Management

Figure 25 identifies skills shortage risks for Health Information Management professional roles under the three investment scenarios.

Figure 25
Skills Shortage Risks under Three Investment Scenarios, 2014 - 2019
Health Information Management
Prism Economics and Analysis

	Skills Shortage Risk		
	Low Investment Scenario	Moderate Investment Scenario	High Investment Scenario
Senior Health Information Management	Moderate Risk	Moderate Risk	Moderate Risk
Privacy	Moderate Risk	High Risk	High Risk
Standards	Moderate Risk	High Risk	High Risk
Data Quality Management	Moderate Risk	High Risk	High Risk
Information Governance	Moderate Risk	High Risk	High Risk
Health Records Management	No Significant Risk	No Significant Risk	Moderate Risk
Coding and Classification	No Significant Risk	Moderate Risk	Moderate Risk

Health Information Management occupations will account for roughly 16% of projected hiring requirements between 2014 and 2019. Figure 26 shows the distribution of hiring requirements across the seven Health Information Management professional roles.

Figure 26
Expected Hiring Requirements by Professional Role
(Hiring Requirements = Replacement Demand + Growth Demand)
Health Information Management
Prism Economics and Analysis

	Low Investment Scenario	Moderate Investment Scenario	High Investment Scenario
Senior Health Information Management	91	116	154
Privacy	55	78	115
Standards	55	78	115
Data Quality Management	81	103	137
Information Governance	8	11	16
Health Records Management	305	386	514
Coding and Classifications (incl. Terminology)	528	669	891
Total	1,124	1,441	1,942

Senior Health Information Management:

The primary driver in hiring requirements for Senior Health Information Management is demographics. Senior HIM Management are usually promoted from within an organization or recruited from other organizations in the same sector. In all three investment scenarios, it is expected that there will be a 'moderate risk' of skills shortages. This implies that organizations will be able to meet their human resources needs, but should anticipate recruitment difficulty, especially if they have not been preparing internal staff for promotion into these roles. Compared to the IT sector, there are fewer career options for Senior HIM Managers outside the public sector. This reduces the likelihood of a 'high risk' of skills shortages.

Privacy:

Privacy specialists will be critically important as adoption of e-health systems and applications proceeds. Some jurisdictions apply general privacy statutes to health information while others have enacted statutes specifically focused on health information. Continuing professional development training is available through COACH, CHIMA and the National Institutes for Health Informatics. Although not specific to the healthcare sector, the designation 'Certified Information Privacy Professional/Canada' (CIPP/C) has become a preferred certification in the healthcare sector.

New investment in e-health systems and applications is often associated with a need for new policies and procedures to protect privacy. In the low investment scenario, there will be a levelling down of this requirement. However, the expanding base of e-health systems and applications generates a need for ongoing support and revision of privacy policies and practices. In the low investment scenario, the risk of shortage is ranked 'moderate'. In the moderate and high investment scenarios there is a `high risk` of skills shortages

owing to the 'employment effect' of new investment. This risk is especially marked in the high investment scenario which may be more relevant in some provinces.

Standards:

CHIMA's *Transforming Health Information Management* report[23] identified Standards as an emerging HIM field which will increase in importance in tandem with the adoption of e-health systems and applications. Standards administration is critically important to the integrity of health data. There are a number of continuing professional development training opportunities and certifications in the standards field. Survey data indicate that approximately two-thirds of HIM professionals in Standards roles have received specialized training in one or more standards fields, such as HL7, DICOM, LOINC, or SNOMED CT. It will be important for organizations to maintain and possibly increase support for continuing professional development if they are to avoid serious skills shortages in the standards area.

Data Quality Management:

Data Quality Management pertains to the integrity of an organization's data during collection, application (including aggregation), warehousing, and analysis. Critical to data quality is compliance with the CIHI coding standards for use with the International Statistical Classification of Diseases and Related Health Problems, 10th Revision (ICD-10), Canadian enhancement (ICD-10-CA) and the Canadian Classification of Health Interventions (CCI).

Deficiencies in data quality weaken the capacity of the healthcare system to use data to improve organizational performance and treatment strategy. Data deficiencies can also reduce the quality of patient care when records are incomplete or use is inconsistent for terminology or coding capture. A 2013 report by Canada Health Infoway identified a number of processes and procedures that are required to ensure data quality. The report commented that "*few jurisdictions have made progress*" in addressing the need for rigorous data quality management policies and procedures. [24] Studies by CIHI and the Institute for Clinical Evaluative Studies (ICES) have also drawn attention to data quality deficiencies. In the same vein, CHIMA's *Transforming Health Information Management* report pointed to the importance of improving clinical documentation. The report suggests that "there will be a shift in focus in coding activity from coding and abstracting to working with clinicians to improve the quality of documentation and information and to auditing and supporting health professionals at the point of care."[25]

As the adoption and use of e-health technologies progress, the urgency of addressing data quality management issues also increases. For this reason, it is anticipated that over the next five years there will be increased focus on Data Quality Management and increased demand for the Data Quality Management skills. While university

[23] CHIMA, *Transforming Health Information Management: The Evolution of the HIM® Professional*, 2012

[24] Canada Health Infoway, "Client Registry Data Management Best Practices", prepared by Client Registry Jurisdictional Implementers Lead Group Data Management Subcommittee, November 2013.

[25] *op. cit*. p 21

programs graduate students with the theoretical understanding of data quality management, experience is also critical in this field. Under all investment scenarios, there is a risk of skills shortages. In both the moderate and high investment scenarios, skills shortages risks are ranked as high.

Information Governance:

Information Governance is a new and senior professional role identified in both the COACH *Health Informatics Professional Core Competencies, v. 3.0* and CHIMA's *Transforming Health Information Management, 2013.* A recent article by Richard Irving of the Schulich School of Business in *Canadian Healthcare Technology* commented that "if your organization regularly collects and distributes large amounts of data, eventually, you must address information governance."[26]

Information Governance refers to high-level strategies that define the purpose for collecting data, the procedures for generating, storing and aggregating data, as well as responsibility for strategies to ensure compliance with security, privacy and quality standards and access and usability goals. Sharing of data across institutions and jurisdictions requires an Information Governance framework.

Information Governance is a highly specialized role. There are comparatively few individuals in this professional role at this time. However, demand for this function is expected to increase. There does not appear to be any professional training resource directly relevant to the Canadian healthcare system.

Health Records Management:

Health Records Management is a core function in the HIM category and one of the largest professional roles. Health Records Management accounts for approximately a quarter of employment in the HIM Professional Role Group. The flow of graduates from post-secondary programs appears to be sufficient to meet future hiring requirements, except potentially in the high investment scenario. Demographic trends will bring about a significant turnover and replenishment of the workforce.

Coding and Classification (including Terminology):

Coding and Classification accounts for approximately 46% of employment in the HIM category. Like Health Records Management, this is a core HIM function. The observations made for Health Records Management apply equally to Coding and Classification. The flow of new graduates appears to be sufficient to meet hiring requirements, except potentially in the high investment scenario. Demographics will cause a significant turnover and replenishment of the workforce and make it important for CHIMA to have a proactive strategy to maintain its current high level of accreditation. There appear to be adequate opportunities for HIM professionals in the Coding and Classification field to maintain their skills, but insufficient opportunities for them to upgrade their skills.

[26] Richard Irving, "Do you have an Information Governance Strategy?", *Canadian Healthcare Technology*, vol. 8, 13 (April 2013)

CHIMA's *Transforming Health Information Management* report points to Clinical Terminology Standards. An Infoway stakeholder survey (see Chapter three) found that 57.8% of survey respondents (294) would consider pursuing a professional certification in terminologies to help with their current role and/or future career progression. The survey also found that almost a third of the current vacancies for terminology specialists are taking more than seven months to fill.

Canadian Health System Management and Administration

Figure 27 identifies skills shortage risks for Canadian Health System Management and Administration professional roles under the three investment scenarios.

Figure 27
Skills Shortage Risks under Three Investment Scenarios, 2014 - 2019
Canadian Health System Management and Administration
Prism Economics and Analysis

	Skills Shortage Risk		
	Low Investment Scenario	Moderate Investment Scenario	High Investment Scenario
Senior E-Health Leadership	No Significant Risk	Moderate Risk	Moderate Risk
Policy and Strategic Planning	No Significant Risk	No Significant Risk	No Significant Risk
Risk Management	No Significant Risk	Moderate Risk	High Risk
Business Analysis	Moderate Risk	High Risk	High Risk

Figure 28 shows the distribution of hiring requirements across the four professional roles.

Figure 28
Share of Expected Hiring Requirements by Professional Role
(Hiring Requirements = Replacement Demand + Growth Demand)
Canadian Health System Management and Administration
Prism Economics and Analysis

	Low Investment Scenario	Moderate Investment Scenario	High Investment Scenario
Senior E-Health Leadership	20	26	34
Policy and Strategic Planning	121	141	141
Risk Management	3	13	29
Business Analysis	36	151	342
Total	180	330	546

Senior E-Health Leadership:

The primary drivers in hiring requirements for Senior E-Health Leadership are demographics and expansion of e-health. In the moderate and high investment scenarios, investment activity is expected to generate additional requirements for Senior E-Health Leadership. The opportunities for consulting the U.S. market may diminish the pool of available talent in Canada causing a 'moderate risk' of skills shortages.

Policy and Strategic Planning:

Employment of persons in Policy and Strategic Planning roles is projected to increase only marginally. Hiring requirements are almost entirely driven by replacement demand. There is an ample supply of graduates from health economics and health management programs, as well as persons across the public and private sector with a background in policy and strategic planning. No anticipated skills shortage risk is expected.

Risk Management:

There are political, financial and organizational costs when e-health projects fail or when e-health systems and applications fail. There is extensive generic training available in Risk Management both on a stand-alone basis and as part of Project Management. There is less training available on Risk Management in an e-health context, although the generic principles of Risk Management are broadly applicable to e-health.[27] CHIMA includes risk management as a required skill area in its professional certification training.

E-health systems can inadvertently introduce new risks to patient safety. These risks to patient safety can compromise the implementation of e-health technologies. Patient safety in an e-health environment is an emerging skill requirement. To support the e-health sector, COACH recently published the *2013 eSafety Guidelines*. These Guidelines are based on international research and were validated by stakeholders.

Business Analysis:

Experienced Business Analysts are in short supply in every sector of the economy. The healthcare sector is no exception. At the heart of the shortage problem is the requirement for Business Analysts to be proficient in three distinct areas: (1) information technology, (2) generic business systems and practices, and (3) the systems and practices that are unique to a specific sector. It has been a constant challenge in the healthcare sector to find individuals who understand the systems and practices of the healthcare system as well as having proficiency in information technology and general business management processes.

There has been an increase in the number of universities that combine training in information technology and business management. These programs do not, however, address the need for training in healthcare systems and practices. In the absence of internship programs that provide business analysis graduates with exposure to the healthcare sector, the shortage of qualified Business Analysts will continue.

[27] Brendan Seaton, "eHealth Risk Report Card" mss (May 2007)

The demand for Business Analysts is primarily driven by new investment plans. The acceleration of e-health investment in the United States may draw on the pool of Canadian expertise and thereby exacerbate current shortages. Shortages in Canada will be especially evident in the moderate and high investment scenarios.

Organizational Behaviour and Management

Figure 29 identifies skills shortage risks for Organizational Behaviour and Management professional roles under the three investment scenarios.

Figure 29
Skills Shortage Risks under Three Investment Scenarios, 2014 - 2019
Organizational Behaviour and Management
Prism Economics and Analysis

	Skills Shortage Risk		
	Low Investment Scenario	Moderate Investment Scenario	High Investment Scenario
Product/Service Support	No Significant Risk	No Significant Risk	Moderate Risk
Change Management	No Significant Risk	Moderate Risk	High Risk
Training and Development	No Significant Risk	No Significant Risk	No Significant Risk
Process Improvement	No Significant Risk	No Significant Risk	No Significant Risk

Figure 30 shows the distribution of hiring requirements across the four professional roles.

Figure 30
Share of Expected Hiring Requirements by Professional Role
(Hiring Requirements = Replacement Demand + Growth Demand)
Organizational Behaviour and Management
Prism Economics and Analysis

	Low Investment Scenario	Moderate Investment Scenario	High Investment Scenario
Product / Service Support	244	309	411
Change Management	71	100	148
Training and Development	14	60	135
Process Improvement	56	71	94
Total	385	540	788

Product / Service Support:

The demand for Product and Service support staff increases approximately in tandem with the installed base of e-health applications and their users. In the high investment scenario, there is a 'moderate risk' of skills shortages.

Change Management:

As described in Chapter Three, the basic outlook of this report is that over the next five years, the healthcare system will reorient its emphasis to increasing the utilization of installed systems and applications and increasing the benefits derived from those investments. Change Management will play an important role in this effort to optimize the utilization of e-health investments. Should the high investment scenario unfold, new investments will further increase the demand for Change Management specialists. Although there are programs that provide training in Change Management, most specialists in this field acquire their skills through experience. The complexities of the healthcare system make it difficult (but not impossible) to port over Change Management skills acquired through experience in different sectors. While the private sector can supply some Change Management expertise, the healthcare system must provide the preponderance of this expertise from within its own ranks. Under these circumstances, there is a risk of skills shortages.

Training and Development:

There are ample training and development resources in the private sector to meet the expected needs of the healthcare system. Increased use of e-learning technologies will also reduce the requirement for on-site training. No skills shortages are expected.

Process Improvement:

Process Improvement is a well-developed field of private sector expertise. Although there are unique features of the healthcare system that arise from its institutional complexities, much of the private sector's Process Improvement expertise is applicable to the healthcare system. Indeed, Process Improvement is one of the key private sector management consulting disciplines.

The challenge for the public sector arises when it endeavours to internalize the Process Improvement role. To do so, public sector employers are often required to compete with the consulting sector where remuneration standards can be difficult to match.

Project Management

Figure 31 identifies skills shortage risks for Project Management professional roles under the three investment scenarios.

Figure 31
Skills Shortage Risks under Three Investment Scenarios, 2014 - 2019
Project Management
Prism Economics and Analysis

	Skills Shortage Risk		
	Low Investment Scenario	Moderate Investment Scenario	High Investment Scenario
Program Management	No Significant Risk	No Significant Risk	Moderate Risk
Project Management	No Significant Risk	Moderate Risk	High Risk

Figure 32 shows the projected hiring requirements across the two professional roles.

Figure 32
Expected Hiring Requirements by Professional Role
(Hiring Requirements = Replacement Demand + Growth Demand)
Project Management
Prism Economics and Analysis

	Low Investment Scenario	Moderate Investment Scenario	High Investment Scenario
Program Management	17	72	163
Project Management	49	205	465
Total	66	277	627

The demand for Project Management professionals is primarily determined by investment in new e-health projects and to a much lesser degree by replacement requirements. No skills shortage risk is anticipated in the low investment scenario. In the moderate investment scenario, a 'moderate risk' arises because of the potential for the U.S. market to draw on the Canadian talent pool, especially for Project Management professionals with significant experience in e-health projects. This will primarily affect the private sector, although some public sector Project Management professionals may be drawn to private sector opportunities, especially if there is compensation restraint in the public sector. Under these circumstances, there is a 'moderate risk' of skills shortages if the moderate investment scenario prevails. If the high investment scenario prevails, there is a 'high risk' of systemic shortages of qualified and experienced project managers.

Analysis and Evaluation

Figure 33 identifies skills shortage risks for Analysis and Evaluation Professional Role Group.

Figure 33
Skills Shortage Risks under Three Investment Scenarios, 2014 - 2019
Analysis and Evaluation
Prism Economics and Analysis

	Skills Shortage Risk		
	Low Investment Scenario	Moderate Investment Scenario	High Investment Scenario
Analysis and Evaluation*	Moderate Risk	Moderate Risk	Moderate Risk

*Data analytics roles are ranked as Significant Risk

Figure 34 shows the projected hiring requirements in Analysis and Evaluation.

Figure 34
Expected Hiring Requirements
(Hiring Requirements = Replacement Demand + Growth Demand)
Analysis and Evaluation
Prism Economics and Analysis

	Low Investment Scenario	Moderate Investment Scenario	High Investment Scenario
Analysis and Evaluation	709	827	827

As discussed in Chapter Three, the emphasis is expected to shift to strategies to optimize the use of e-health technologies, derive greater benefits from investments already in place, and document those benefits. This will require that Analysis and Evaluation capacities be kept at least at current levels and likely increased.

Replacement demand will be the major driver in hiring requirements for professionals in the Analysis and Evaluation field. In the moderate and high investment scenarios, employment growth in these professional roles will add to hiring requirements. Virtually all Analysis and Evaluation functions are performed for the public health system. Some of these functions are carried out by internal staff. Other Analysis and Evaluation roles are carried out for the public health system either by the private sector or academic researchers. It is assumed in this forecast that the additional need for Analysis and Evaluation services that would arise in the high investment scenario will be met by drawing on private sector and academic resources.

Data from the 2014 Public Sector HI/HIM Survey indicate a vacancy rate of approximately 11.0%. A vacancy rate of 11.0% would usually imply that public sector employers are having challenges in recruiting suitably qualified professionals. That is likely the case. However, some public sector employers may have had their hiring plans held back for budget control reasons, resulting in unfilled vacancies. There are two reasons,

therefore, for judging the risk of skills shortage to be 'moderate' rather than 'significant'. The first is the option to use private sector and academic resources to undertake some project-based Analysis and Evaluation functions. The second is the option to defer Analysis and Evaluation projects. In this latter case, the need for Analysis and Evaluation is both real and pressing, but some of this need does not translate into effective demand for human resources owing to budget constraints.

*An important exception to the 'moderate' ranking for the risk of skills shortages in Analysis and Evaluation professional roles is data analytics. (*The various data analytics roles were discussed in Chapter three.) Research by ICTC confirms that data analytics is a rapidly growing field and that expertise shortages are widespread in all sectors of the economy. Consistent with this view, the 2014 HI/HIM Private Sector Survey identified data analytics as the most commonly cited field in which skills shortages currently constrain hiring. (See Chapter five.)

While the overall risk ranking for skills shortages in Analysis and Evaluation is 'moderate', a ranking of 'significant' would apply to the field of data analytics.

Clinical Informatics

Figure 35 identifies skills shortage risks for Clinical Informatics professional roles.

Figure 35
Skills Shortage Risks under Three Investment Scenarios, 2014 - 2019
Clinical Informatics
Prism Economics and Analysis

	Skills Shortage Risk		
	Low Investment Scenario	Moderate Investment Scenario	High Investment Scenario
Senior Clinical Information	Moderate Risk	High Risk	High Risk
Clinical Analysis	Moderate Risk	High Risk	High Risk

Figure 36 shows the projected hiring requirements in Clinical Informatics.

Figure 36
Expected Hiring Requirements by Professional Role
(Hiring Requirements = Replacement Demand + Growth Demand)
Clinical Informatics
Prism Economics and Analysis

	Low Investment Scenario	Moderate Investment Scenario	High Investment Scenario
Senior Clinical Information	51	64	86
Clinician-Analysts	396	502	668
Total	447	566	754

Upgrading the clinical informatics skills of clinical professionals will need to be a higher priority for human resources planning over the next five years. Intensification and optimization of usage of e-health systems and applications will be the dominant trend between 2009 and 2014. Clinical Informatics will be central to this intensified usage. Survey data indicate that a large majority of Clinical Informatics staff come to these roles from a clinical profession. *The essence of the skills challenge is therefore to broaden the skills of current clinical professionals to better support them in Clinical Informatics roles*.

As noted in Chapter three, training in the use of e-health technologies has been introduced into the curricula for medicine, nursing and pharmacy. However, there continues to be a significant gap in the availability of skill broadening resources for *incumbent* clinical professionals. It will be important to address this gap to support the efforts to optimize the use of e-health investments and thereby fully derive the potential productivity and clinical benefits from those investments.

■

Summary of Skills Shortage Risk
by Professional Role and Investment Scenario

Information Technology	Low Investment Scenario	Moderate Investment Scenario	High Investment Scenario
Senior IT Management	Moderate Risk	Moderate Risk	High Risk
Architecture	High Risk	High Risk	High Risk
Application Implementation and Support	Moderate Risk	Moderate Risk	High Risk
Security	Moderate Risk	High Risk	High Risk
Quality Assurance and Testing	Moderate Risk	Moderate Risk	High Risk
Service Desk	No Significant Risk	No Significant Risk	No Significant Risk
Network, Storage and Other Infrastructure Support	No Significant Risk	No Significant Risk	Moderate Risk

Health Information Management	Low Investment Scenario	Moderate Investment Scenario	High Investment Scenario
Senior Health Information Management	Moderate Risk	Moderate Risk	Moderate Risk
Privacy	Moderate Risk	High Risk	High Risk
Standards	Moderate Risk	High Risk	High Risk
Data Quality Management	Moderate Risk	High Risk	High Risk
Information Governance	Moderate Risk	High Risk	High Risk
Health Records Management	No Significant Risk	No Significant Risk	Moderate Risk
Coding and Classification	No Significant Risk	Moderate Risk	Moderate Risk
Canadian Health System Management and Administration	Low Investment Scenario	Moderate Investment Scenario	High Investment Scenario
Senior eHealth Leadership	No Significant Risk	Moderate Risk	Moderate Risk
Policy and Strategic Planning	No Significant Risk	No Significant Risk	No Significant Risk
Risk Management	No Significant Risk	Moderate Risk	High Risk
Business Analysis	Moderate Risk	High Risk	High Risk

Organizational and Behavioural Management	Low Investment Scenario	Moderate Investment Scenario	High Investment Scenario
Product/Service Support	No Significant Risk	No Significant Risk	Moderate Risk
Change Management	No Significant Risk	Moderate Risk	High Risk
Training and Development	No Significant Risk	No Significant Risk	No Significant Risk
Process Improvement	No Significant Risk	No Significant Risk	No Significant Risk

Project Management	Low Investment Scenario	Moderate Investment Scenario	High Investment Scenario
Program Management	No Significant Risk	No Significant Risk	Moderate Risk
Project Management	No Significant Risk	Moderate Risk	High Risk

Analysis and Evaluation	Low Investment Scenario	Moderate Investment Scenario	High Investment Scenario
Analysis and Evaluation*	Moderate Risk	Moderate Risk	Moderate Risk

*Data analytics roles are ranked as Significant Risk

Clinical Informatics	Low Investment Scenario	Moderate Investment Scenario	High Investment Scenario
Senior Clinical Information	Moderate Risk	High Risk	High Risk
Clinical Analysis	Moderate Risk	High Risk	High Risk

5 Human Resources Issues in the Private Sector

The private sector plays an important role in Canada's implementation of e-health. This chapter reports on the results of a survey of companies that deliver or support e-health technologies or provide e-health services. Fifty-one (51) companies participated in the survey. These companies employ over 3,800 staff whose primary focus is e-health. Beyond these 3,800 employees, the surveyed companies also employ many thousands of other employees who may support e-health assignments from time to time. It is estimated that the survey respondents account for approximately 35% to 40% of the private sector work force for whom e-health is a primary focus. This implies that the size of the private sector work force that is primarily focused on e-health is between 9,500 and 10,800 persons.

Business Focus

The vast majority of private sector companies in the e-health market operate across multiple segments of the market. Narrow specialization is the exception, rather than the norm. Only 9 respondents (out of 50) reported that they focused on just one segment of the e-health market. These highly specialized companies accounted for only 5.6% of e-health employment in the private sector. Figure 37 summarizes the distribution of private sector companies across different segments of the e-health market space.

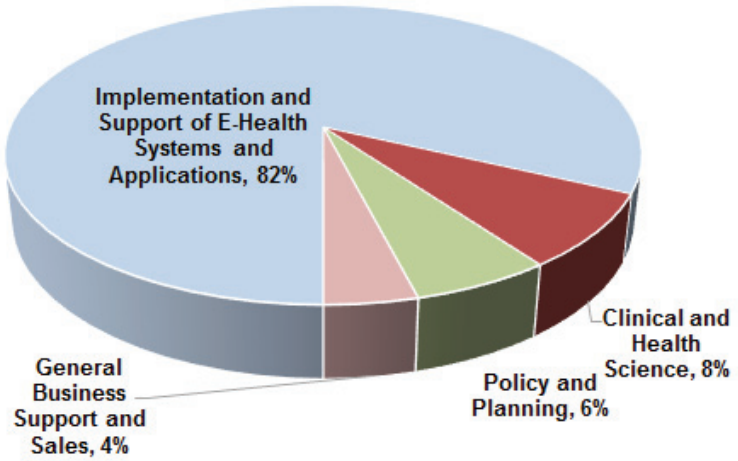
Figure 37
Percentage of Survey Respondents with a Business Presence
in Different Segments of the E-Health Market
(Multiple Responses Allowed)

Business Segment	Percent of Respondents Operating in Each Segment of the E-Health Market
Suppliers of E-Health Technology:	
Supply or support on site hardware technology	20%
Supply or support on site software applications	78%
Supply or support mobile technology	34%
Suppliers of E-Health Services:	
Supply or support cloud services for e-health	42%
Consulting services	60%
Outsourcing services	30%
Staff augmentation services	28%
Procurement services (on behalf of purchasers)	16%
Other Related Operations:	
Product distribution and support	24%
Clinics / laboratories / pharmacies	6%
Other	16%

Human Resources Focus

The major focus of specialized e-health resources in the private sector is the implementation and support of e-health technologies. Figure 38 shows that approximately 82% of specialized private sector staff are engaged in roles that directly pertain to implementing and supporting e-health technologies.

Figure 38
Percentage of Staff Focussed on E-Health
By Area of Focus



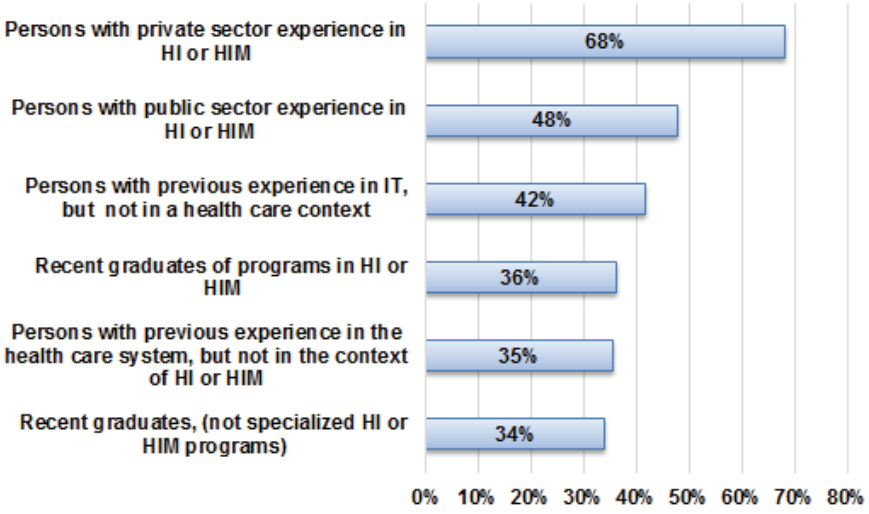
Within this core area of activity, the principal roles are:

- Information Technology Specialists: 32%
- Health Information Management Specialists: 14%
- Analysis and Evaluation Specialists: 12%
- Project Managers, Change Managers and Training Deliverers: 14%
- Customer Support: 10%

Recruiting Specialized Human Resources

Survey participants were asked to rank the importance of six different sources for recruiting their specialized staff. Figure 39 shows the proportion of respondents who ranked a particular source as 'important' or 'very important' (*i.e.*, a '4' or '5' ranking on a 5-level scale).

Figure 39
Importance of Different Channels
as Sources for Hiring E-Health Specialized Staff



There are two significant findings in Figure 39. The first is that *prior private sector experience in HI or HIM is by far the most important factor and this appears to lead to recruiting new hires from other private sector companies*. The importance that is assigned to experience is understandable. Requiring relevant prior experience is an effective way for companies to reduce performance risk. However, a human resources strategy that is sound for individual companies can pose problems when considered from a system perspective. Specialized experience is almost always in short supply. To ensure a sufficient pool of experienced e-health personnel in the private sector (as well as the public sector), there needs to be sufficient recruitment at the career entry level. Otherwise, there are too few individuals moving up the experience ladder. The inevitable result is a systemic shortage of experienced personnel. Survey results confirm that this is a serious problem for many private sector employers.

The nature of the e-health market may unintentionally encourage private sector companies to under-recruit at the career entry level. Virtually all e-health projects are competitively tendered. When requests for proposals (RFPs) seek professional services, those RFPs almost always specify required levels of experience. Indeed, the award of a contract often turns on the quality of the experience offered by proponent companies. The weight given to experience in RFPs leads directly to the emphasis on experience in companies' hiring strategies. RFPs do not require companies to include in their assignment teams a certain percentage of entry-level personnel. Public sector purchasers of e-health technologies and services may need to reconsider this omission. It is ultimately the public sector that pays the cost skills shortages through higher bid costs, delays in implementing projects, and recruitment of their own experienced staff by the private sector.

The second potentially important message in Figure 39 is that, in this survey, specialized HI and HIM programs *alone* do not appear to confer a significant advantage on job applicants. There is only a minor difference (2%) in the proportion of survey respondents who differentiate between recent graduates from HI and HIM programs and recent graduates from programs that are not specialized in these areas. These results underscore the

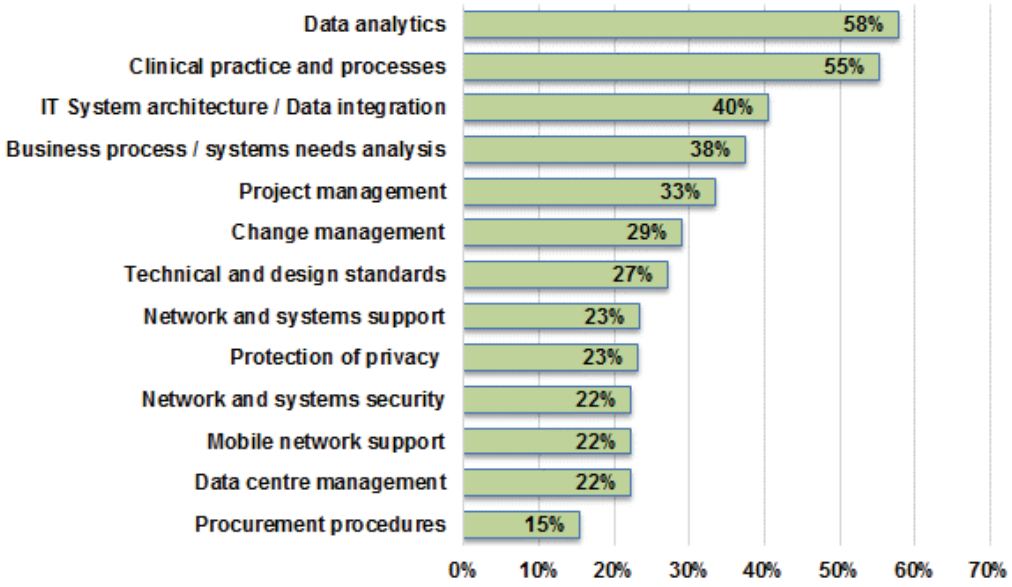
priority given to experience and the importance of including an experience component in post-secondary programs.

Skills Shortages: Current and Expected

More than half of survey respondents identified 'data analytics' and 'clinical practice and procedures' as skill areas in which they were having difficulty meeting their current human resources requirements. Forty percent also identified 'IT system architecture / data integration' as being an area of hiring difficulty. A similar proportion (38%) reported difficulty in finding 'business process / systems needs analysts'.

Figure 40 summarizes the proportion of survey participants who reported that a skill area was relevant to their business and that they were having difficulty meeting their human resources requirements.

Figure 40
Current Areas in which Companies are having Difficulty
meeting their Human Resources Requirements:
Difficulty ranked Important or Very Important on 1-5 Scale
(Percentages apply only to Respondents
for whom the Skill Area is Relevant to their Business)



Over the next five years, companies expect some changes in the availability of e-health professionals. Figure 41 summarizes the expected changes

Figure 41
Expected Changes in Ability to Meet
Human Resources Needs over the Next Five Years

Skill Area	Expected Change in Difficulty Meeting Human Resources Needs
Data Analytics	Worse
Clinical practice and processes	Better
IT System architecture / Data integration	Worse
Business process / systems needs analysis	Worse
Project management	Better
Change management	About the Same
Technical and design standards	About the Same
Network and systems support	About the Same
Protection of privacy	About the Same
Network and systems security	About the Same
Mobile network support	Better
Data centre management	About the Same
Procurement procedures	About the Same

It is especially noteworthy that there are two areas in which companies already report difficulty meeting their requirements and for which they anticipate *more* difficulty over the next five years: 'data analytics' and 'IT system architecture / data integration'. Companies also expect increased difficulty in recruiting suitably qualified and experienced 'business process / systems needs analysts'. In other words, of the four skill areas shown in Figure 41 which present the greatest current difficulty, companies are expecting recruitment conditions to be *more* difficult over the next five years.

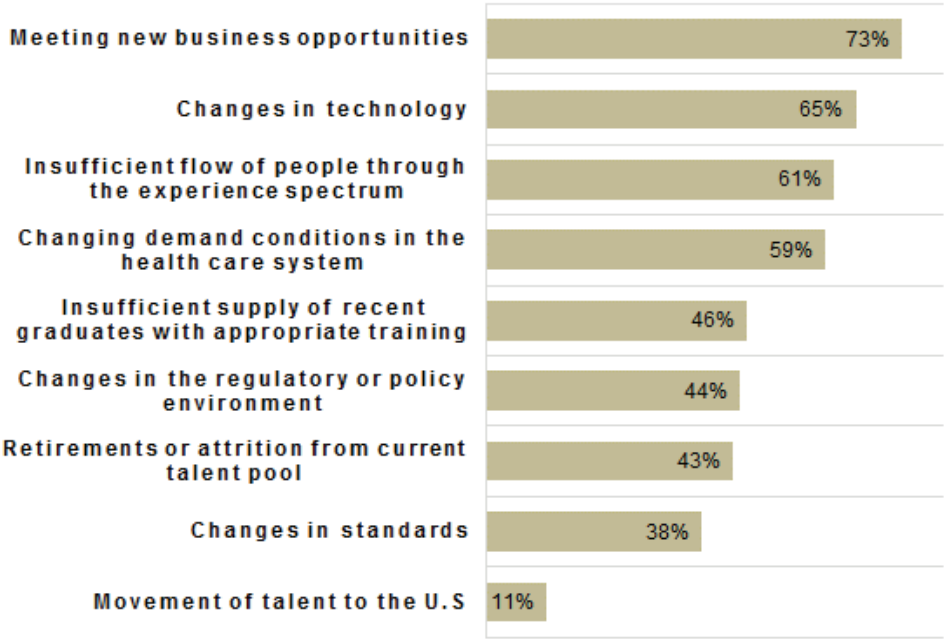
Pressures on Human Resources

The principal drivers that companies see as causing their difficulty in meeting current or expected human resources needs are:

- new business opportunities,
- changes in technology,
- an insufficient flow of people through the experience spectrum, and
- changing demand conditions in the health care system.

Figure 42 summarizes these survey results.

Figure 42
Percentage of Respondents Ranking Drivers in Skills Shortages
as Important or Very Important on a 1-5 Scale
(Answered only by 37/50 Respondents who reported
Current or Expected Difficulty in meeting Human Resources Needs)



Three of the leading pressures on skills – new business opportunities, changes in technology, and changing demand conditions in the health system – are closely related to one another. For example, the diffusion of mobile technologies is a change in technology, but it also creates new business opportunities. The same is true of cloud-based technologies. As was described in Chapter Three, the needs of the health care system change as it moves through the various maturity stages in the adoption of e-health technologies. The progressive implementation of Canada Health Infoway's blueprint for e-health also changes the health sector's requirements. *These changes in the system's needs create new business opportunities. They also alter the profile of human resources needed by the private sector to meet those requirements.*

The fourth of the leading pressures – insufficient flow of people through the experience spectrum – was discussed earlier. There appear to be competitive pressures in the e-health sector that encourage many companies to under-recruit entry-level professionals. The result is that too few people move through the experience spectrum. This leads to a systemic shortage of experienced e-health professionals across a range of skills areas.

Companies also pointed to 'an insufficient supply of recent graduates with *appropriate* training' [emphasis added].

It is also noteworthy that 11% of respondents identified the movement of talent to the United States as a source of pressure on the supply of skills available to Canadian companies. This could become more acute over the next few years. The principal impact is likely to be on highly specialized and experienced e-health

professionals, especially in 'IT system architecture / data integration'. The recent depreciation of the Canadian dollar will increase the incentive for these professionals to explore opportunities in the United States.

Finally, it is relevant to observe that retirements and attrition were identified as important or very important by 43% of respondents.

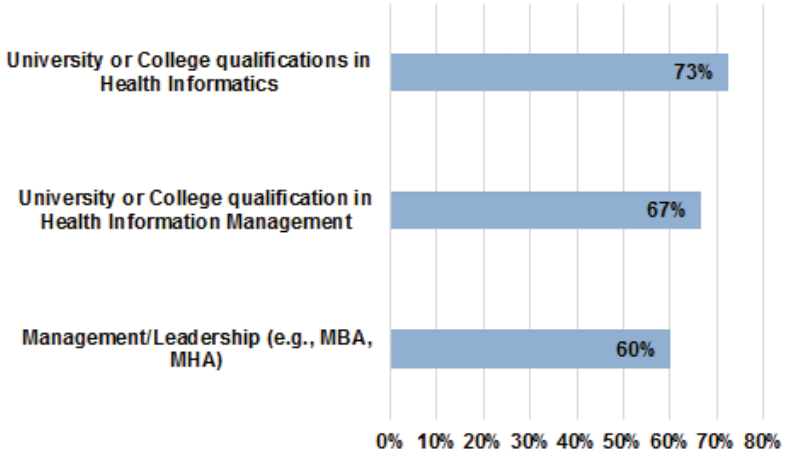
Specialized Post-Secondary Qualifications

Certifications and specialized post-secondary qualifications are playing an increasingly important role in e-health human resources. Both certifications and specialized post-secondary qualifications are indicators that attest to an individual's training and competence in a particular field. There are, however, important differences in how certifications and post-secondary qualifications operate in the professional labour markets.

Specialized post-secondary qualifications gain traction in professional labour markets when employers attribute particular value to those qualifications over more generic post-secondary qualifications. It is employers, therefore, who determine the career value of these specialized qualifications. It might be expected that all e-health employers would prefer a specialized post-secondary qualification over a generic post-secondary qualification. However, this is not the case. The role of post-secondary qualifications in professional labour markets is more complex. A university degree or college qualification indicates that an individual has been trained to a certain level of competence in a particular field. However, a post-secondary qualification also indicates a broader ability to learn, to problem solve, and to be productive. For many employers, this broader skillset is as important, or more important, than the specific training that an individual received. Thus, an employer might attribute a higher value to an MBA or an engineering degree because, in the employer's mind, those degrees are associated with high standards and with a good foundational training. This could outweigh the perceived value of a specialized qualification, especially if the employer had no in depth understanding of the specialized qualification. The important point to bear in mind is that *the demand for specialized post-secondary qualifications is employer-driven and it arises from the value that is attributed to such qualifications in relation to other, more generic post-secondary qualifications*.

In the private sector survey, two-thirds of employers indicated that a specialized post-secondary qualification was relevant to their business practice. Figure 43 shows that 73% make a specialized HI qualification a hiring requirement or preference. Similarly, 67% make a specialized HIM qualification a requirement or preference in hiring.

Figure 43
Percentage of Respondents reporting that a Particular Post-Secondary Qualification
is Either a Hiring Preference of a Hiring Requirement
(Limited to Respondents indicating that
a Specialized Post-Secondary Qualification is Relevant to their Business)

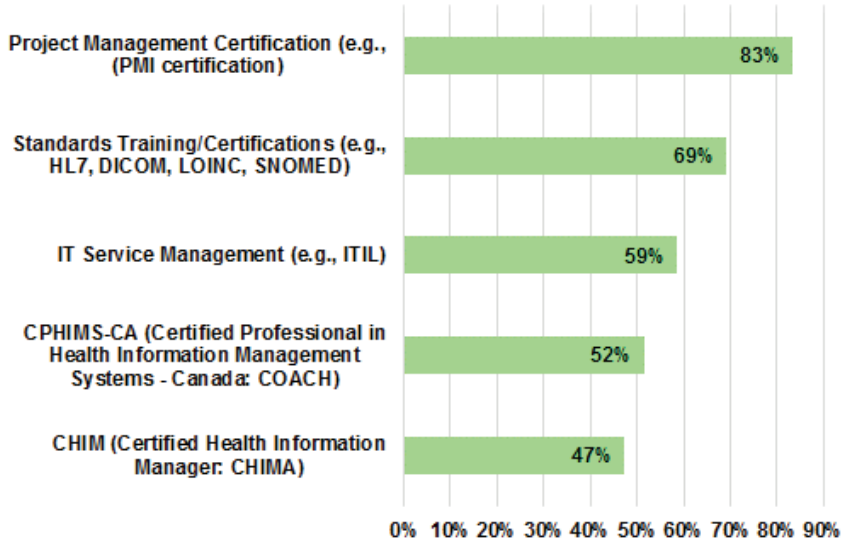


Certifications and Specialized Training

The role of certifications in professional labour markets is different from the role of specialized post-secondary qualifications. Certifications indicate a level of technical competence in a field that is usually defined more narrowly. While some employers give importance to certifications as indicators of competence when hiring new staff, most employers assign much greater weight to relevant experience. *It is the client that plays the key role in building the demand for certifications*. They do this by specifying certification requirements or preferences in RFPs. Employers respond to clients' requirements or preferences by adapting their hiring criteria.

Figure 44 summarizes the proportion of employers who make a particular certification a hiring requirement or preference *and* who also indicated that this certification is relevant to their companies' business.

Figure 44
Percentage of Respondents reporting that a Particular Certification
is Either a Hiring Preference or a Hiring Requirement
(Limited to Respondents indicating that
The Certification is Relevant to their Business)

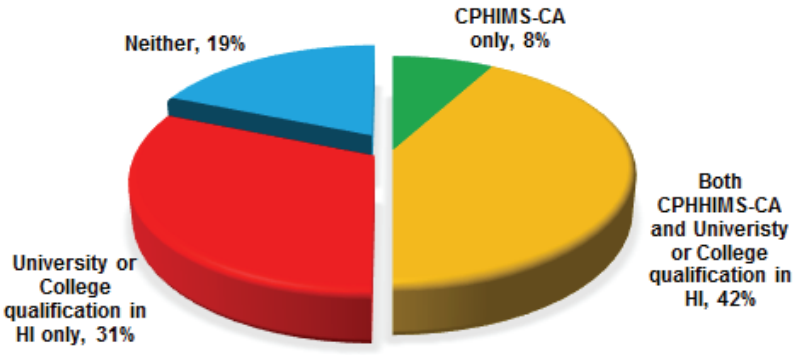


It is notable that *the certifications of the Project Management Institute (PMI) are the most likely certifications to be required or preferred*. The PMI has been operating since 1969. It is also widely available.

The CPHIMS-CA is a comparatively recent certification. It has only been offered since 2009. The fact that more than half of employers require or prefer this certification when it is relevant to their operations indicates the support that the CPHIMS-CA certification has found across the broader e-health community.

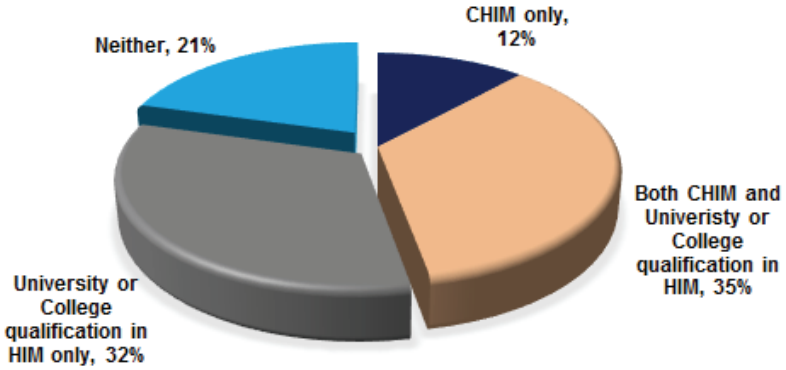
Figure 45 shows that a CPHIMS-CA certification is usually preferred or required in conjunction with a university of college qualification in health informatics. However, Figure 45 also shows that 31% of respondents believe that a university or college qualification in health informatics is sufficient to meet their skill needs, even when a CPHIMS-CA designation is relevant.

Figure 45
Preference / Requirement for CPHIMS-CA Certification and/or
University or College Qualification in Health Informatics
(Limited to Respondents indicating that
the Certification is Relevant to their Business)



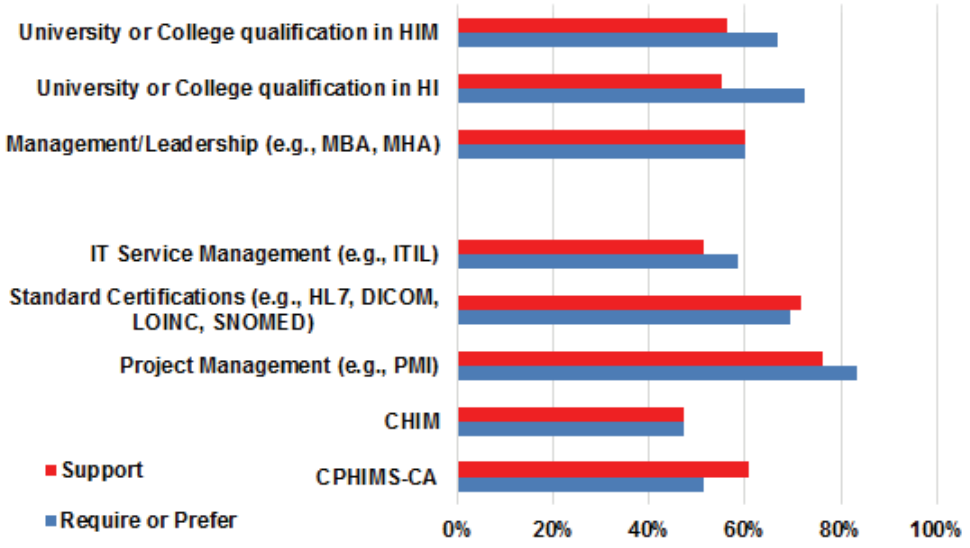
CHIM certification is required or preferred by 47% of companies for whom this certification would be relevant. Figure 46 shows that 32% of employers regard as sufficient, a university or college qualification in Health Information Management without CHIM certification. In part, this may reflect the fact that CHIMA accredits the vast majority of health information programs.

Figure 46
Preference / Requirement for CHIM Certification and/or
University or College Qualification in Health Information Management
(Limited to Respondents indicating that
the Certification is Relevant to their Business)



In addition to making a certification or post-secondary qualification a hiring requirement or preference, employers can also support their employees in obtaining these certifications. This is particularly relevant for certifications that are comparatively recent. Figure 47 shows a close correlation between requiring or preferring a certification or qualification in new hires and providing support to incumbent employees to obtain these certifications or qualifications. It is noteworthy that *more employers (60%) indicated that they would support an employee obtaining CPHIMS-CA than would make this certification a hiring criterion (50%*).

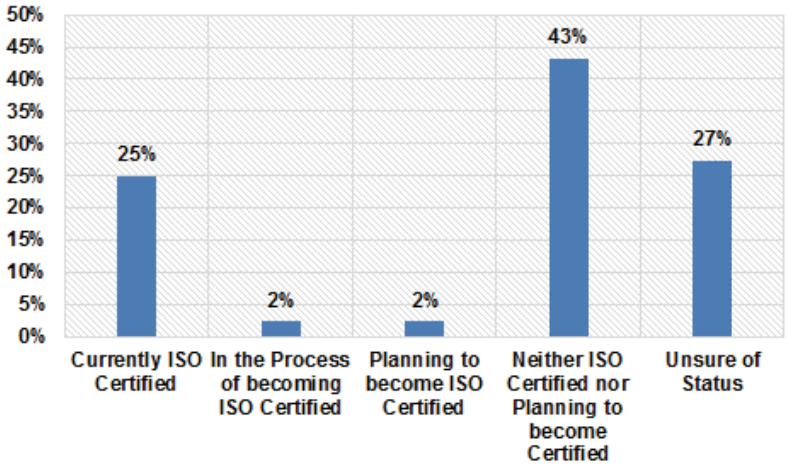
Figure 47
Percentage of Employers Preferring / Requiring a Certification or Qualification when Hiring
Compared to
Percentage of Employers Supporting Incumbent Employees to obtain the Certification or Qualification
(Limited to Respondents indicating that the Certification or Qualification is Relevant to their Business)



ISO Certification

Figure 48 shows that a quarter of survey respondents hold an ISO certification. ISO certification is a costly and time-consuming certification for a business to obtain. The prevalence of ISO certification in the e-health market will be determined largely by client requirements. Barring an increase in client requirements, it is unlikely that the ISO certification will become more widespread. *ISO certification is relevant to human resources recruitment because it is often associated with a greater propensity on the part of employers to prefer employees who have recognized industry certifications.*

Figure 48
Prevalence of ISO Certification



Conclusion

Approximately 82% of private sector staff are engaged in roles that directly pertain to implementing and supporting e-health technologies. More than half of survey respondents identified 'data analytics' and 'clinical practice and procedures' as skill areas in which they are having difficulty meeting their current human resources requirements. Forty percent also identified 'IT system architecture / data integration' as being an area of hiring difficulty. A similar proportion (38%) reported difficulty in finding 'business process / systems needs analysts'.

The nature of the e-health market may unintentionally exacerbate skills shortages by encouraging companies in the private sector to under-recruit at the career entry level. Requests for proposals almost always specify required levels of prior experience. The weight given to experience in competitive tenders is then mirrored by companies' hiring strategies.

Certifications are playing an increasingly important role. A majority of companies require or prefer these certifications when hiring new employees.

The needs of the health care system will change as it progresses through the various maturity stages in the adoption and utilization of e-health technologies. The progressive implementation of Canada Health Infoway's blueprint for e-health also changes the health sector's requirements. These changes in the healthcare system's needs create both new business opportunities for the private sector and also alter the profile of its human resources needs.

6 Conclusions and Recommendations

Overview

This report has described a changing e-health landscape. The essence of that change is a shift in emphasis. There will be a moderating of the pace of new investment and an increase in the emphasis on intensifying the utilization of e-health systems and applications and increasing the benefits derived from investments that are in place. This, in turn, will alter the profile of human resources needs in the public sector and the nature of the business opportunities for the private sector. There will be an increase in the demand for human resources that are focused on support and utilization of e-health technologies. There will be a slowing down or even a modest reduction in the demand for human resources that are focused on designing and implementing new e-health investments. After the healthcare system moves through this consolidation phase, a new wave of investment in e-health technologies should be expected. However, *for the next five years, support and utilization will dominate human resources needs*.

New technologies that will alter the profile of human resources requirements include mobile and data analytics (including 'Big Data'). Cloud technologies may also impact human resources. As these technologies are integrated into e-health strategies, there will be changes in both skills requirements and in the role of the private sector.

Skills shortages will continue to be a serious risk for the healthcare system. The anticipated moderation in the pace of new investment will not remove the risk of skills shortages, although it will alter the professional roles affected. Replacement demand, arising from retirements will be the principal driver of hiring requirements.

On the implementation side, skills shortages can lead to unexpected delays, cost over-runs, lengthy organizational disruptions, and sub-optimal design and execution of projects. On the operations and support side, skills shortages can result in chronic or prolonged periods of understaffing which, in turn, lead to lower levels of utilization of e-health technologies, a decrease in system and application availability and reliability, and morale problems. Patient care also may be affected adversely.

The risk of skills shortages depends, in part, on the level of investment activity over the next five years. This report estimated human resources needs based on three investment scenarios. Figure 48 summarizes the professional roles that are at 'high risk' of skills shortage under the three investment scenarios. These professional roles should be the focus of proactive human resources planning to avert skills shortages.

Figure 49
Professional Roles at 'High Risk' of Skills Shortage
Prism Economics and Analysis

	Low Investment Scenario	Moderate Investment Scenario	High Investment Scenario
Senior IT Management			
Architecture			
Application Implementation and Support			
Security			
Quality Assurance and Testing			
Privacy			
Standards			
Data Quality Management			
Information Governance			
Risk Management			
Business Analysis			
Change Management			
Project Management			
Analysis and Evaluation (Data Analytics roles)			
Senior Clinical Information			
Clinical Analysis			

A complete list of all professional roles and the expected degree of skills shortage risk under each of the three investment scenarios can be found at the end of Chapter four.

Recommendations

1. *There is a need to systematically monitor trends in the supply and demand for professionals in Health Informatics (HI) and Health Information Management HIM).* Of particular importance is the need to track enrolment and graduation trends in post-secondary HI and HIM programs. There is also a need to monitor trends in the adoption of new technologies that are altering skill requirements.

2. *The principal challenge facing the public sector over the next five years will be the loss of experienced HI and HIM human resources as a result of retirements*. In purely quantitative terms, the substantial expansion of post-secondary programs in HI and HIM addresses this problem. However, recent graduates

are not equivalent to experienced professionals. *To reduce the looming skills gap, post-secondary institutions need to partner with employers in the public sector and private sector to integrate co-op semesters and internships into HI and HIM training where this is not already being done*. There is an important role for organizations like Canada Health Infoway, CHIMA, COACH, ICTC, and ITAC-Health to promote and facilitate this strategy. At the same time, *employers in the public sector need to commit to succession planning to ensure sufficient hiring at the entry level to meet long-term needs*.

3. *Public sector procurement strategies for e-health expertise need to align with strategic human resources goals.* It is common practice for the public sector to specify experience requirements in requests for proposals (RFPs). This reduces risk in project implementation. However, an overly narrow adherence to this practice creates another risk which is of greater long-term significance, namely insufficient private sector hiring of entry-level professionals. Over the long run, this can result in a shortage of experienced professionals to replace those who retire. The public sector bears the consequence of this shortage in the form of high costs and a diminished pool of qualified proponents. In other fields where experience requirements in RFPs can unintentionally constrict the flow of new entrants into the professional work force, procurement strategies have been adjusted. The favoured approach is to give preference to proponents that augment their assignment teams with entry-level and junior professionals without weakening the overall experience required for the project. The healthcare sector should explore the potential scope for such innovation in its e-health procurement strategies.

4. There is a need to *expand the range of structured and certified skills upgrading and skills broadening opportunities* for professionals who are in the e-health field or who wish to transition into this field.

5. Although the curricula for students in medicine, nursing, and pharmacy now incorporate training in e-health technologies, there is a gap in the opportunities for practicing clinical professionals to acquire these skills through continuing professional development. If this gap is not addressed, it could hamper efforts to expand the utilization of e-health technologies and optimize the use of those technologies. *It is important therefore to expand the opportunities for clinical professionals to acquire clinical informatics and health information management skills*.

■

Appendices

Appendix A: Detailed Forecasts of Demand and Hiring Requirements

Information Technology	Estimated Employment 2014	Estimated Employment 2019			Replacement Demand 2014-2019	Hiring Requirements 2014-2019		
		Low Investment Scenario	Moderate Investment Scenario	High Investment Scenario		Low Investment Scenario	Moderate Investment Scenario	High Investment Scenario
Senior IT Management	1,250	1,347	1,414	1,521	157	254	322	428
Architecture / Development	1,250	1,130	1,250	1,449	157	37	157	356
Application Implementation/Support	7,000	7,222	7,681	8,415	881	1,103	1,563	2,296
Security	350	361	384	421	44	55	78	115
Quality Assurance/Testing	800	723	800	927	101	24	101	228
Help Desk	4,950	5,333	5,600	6,022	623	1,006	1,274	1,696
Network, Storage & Other Infrastructure Support	4,900	5,055	5,377	5,890	617	772	1,094	1,607
	20,500	**21,170**	**22,507**	**24,645**	**2,581**	**3,251**	**4,588**	**6,726**

Note: Column totals may not sum correctly owing to rounding,

Health Information Management	Estimated Employment 2014	Estimated Employment 2019			Replacement Demand 2014-2019	Hiring Requirements 2014-2019		
		Low Investment Scenario	Moderate Investment Scenario	High Investment Scenario		Low Investment Scenario	Moderate Investment Scenario	High Investment Scenario
Senior Health Information Management	450	485	509	547	57	91	116	154
Privacy	350	361	384	421	44	55	78	115
Standards	350	361	384	421	44	55	78	115
Data Quality Management	400	431	453	487	50	81	103	137
Information Governance	50	52	55	60	6	8	11	16
Health Records Management	1,500	1,616	1,697	1,825	189	305	386	514
Coding and Classifications	2,600	2,801	2,942	3,163	327	528	669	891
	5,700	**6,106**	**6,423**	**6,924**	**718**	**1,124**	**1,441**	**1,942**

Note: Column totals may not sum correctly owing to rounding,

Canadian Health System Management and Administration	Estimated Employment 2014	Estimated Employment 2019			Replacement Demand 2014-2019	Hiring Requirements 2014-2019		
		Low Investment Scenario	Moderate Investment Scenario	High Investment Scenario		Low Investment Scenario	Moderate Investment Scenario	High Investment Scenario
Senior eHealth Leadership	100	108	113	122	13	20	26	34
Policy and Strategic Planning	800	820	840	840	101	121	141	141
Risk Management	100	90	100	116	13	3	13	29
Business Analysis	1,200	1,085	1,200	1,391	151	36	151	342
	2,200	**2,103**	**2,253**	**2,469**	**277**	**180**	**330**	**546**

Organizational Behaviour and Management	Estimated Employment 2014	Estimated Employment 2019			Replacement Demand 2014-2019	Hiring Requirements 2014-2019		
		Low Investment Scenario	Moderate Investment Scenario	High Investment Scenario		Low Investment Scenario	Moderate Investment Scenario	High Investment Scenario
Product / Service Support	1,200	1,293	1,358	1,460	151	244	309	411
Change Management	450	464	494	541	57	71	100	148
Training and Development	475	429	475	551	60	14	60	135
Process Improvement	275	296	311	335	35	56	71	94
	2,400	**2,483**	**2,638**	**2,886**	**302**	**385**	**540**	**788**

Note: Column totals may not sum correctly owing to rounding,

Project Management	Estimated Employment 2014	Estimated Employment 2019			Replacement Demand 2014-2019	Hiring Requirements 2014-2019		
		Low Investment Scenario	Moderate Investment Scenario	High Investment Scenario		Low Investment Scenario	Moderate Investment Scenario	High Investment Scenario
Senior Project Management	570	515	570	661	72	17	72	163
Project Management	1,630	1,473	1,630	1,890	205	49	205	465
	2,200	**1,989**	**2,200**	**2,550**	**277**	**66**	**277**	**627**

Analysis and Evaluation	Estimated Employment 2014	Estimated Employment 2019			Replacement Demand 2014-2019	Hiring Requirements 2014-2019		
		Low Investment Scenario	Moderate Investment Scenario	High Investment Scenario		Low Investment Scenario	Moderate Investment Scenario	High Investment Scenario
Analysis and Evaluation	**4,700**	**4,818**	**4,935**	**4,935**	**592**	**709**	**827**	**827**

Clinical Informatics	Estimated Employment 2014	Estimated Employment 2019			Replacement Demand 2014-2019	Hiring Requirements 2014-2019		
		Low Investment Scenario	Moderate Investment Scenario	High Investment Scenario		Low Investment Scenario	Moderate Investment Scenario	High Investment Scenario
Senior Clinical Information	250	269	283	304	31	51	64	86
Clinical Analyst	1,950	2,101	2,206	2,372	246	396	502	668
	2,200	**2,370**	**2,489**	**2,677**	**277**	**447**	**566**	**754**

Note: Column totals may not sum correctly owing to rounding.

	Estimated Employment 2009	Estimated Employment 2014 +/- 10%	Estimated Employment 2019		
			Low Investment Scenario	Moderate Investment Scenario	High Investment Scenario
Information Technology	15,910 to 19,090	20,500	21,170	22,507	24,645
Health Information Management	4,130 to 5,800	5,700	6,106	6,423	6,924
Canadian Health System Management and Administration	not estimated	(2,200)*	2,103*	2,253*	2,469*
Project Management	1,870 to 2,210	2,200	2,483	2,638	2,886
Organizational and Behavioural Management	3,030 to 3,580	2,400	1,989	2,200	2,550
Analysis and Evaluation	3,270 to 3,920	4,700	4,818	4,935	4,935
Clinical Informatics	980 to 1,160	2,200	2,370	2,489	2,677
Total	29,370 to 35,780	39,900	41,038	43,445	47,086

* this estimate is offered with a caution

Appendix B: Technical Appendix

Overview of Forecast Methodology

The forecasting model uses the following procedures:

1. Estimates are developed for 2014 HI and HIM employment;
2. Estimates are developed for growth demand and replacement demand;
3. Estimates of growth demand and replacement demand for specific Professional Role Groups or professional roles are adjusted based on survey data;
4. Hiring requirements are computed based on the impact of growth demand and replacement demand;
5. Risk rankings for shortages are developed based on survey data and a comparison of hiring requirements with supply side indicators (e.g., post-secondary programs).

Estimates of 2014 HI and HIM Employment

The estimates of HI and HIM employment in 2014 are based on five sources:

- the 2011 National Household Survey,
- the 2014 HI and HIM Public Sector Survey, administered by COACH for this study,
- the 2014 HI and HIM Private Sector Survey, administered by COACH for this study,
- administrative data provided by CHIMA, and
- the *2009 HI/HIM Report* which drew on
    - the 2001 and 2006 Census,
    - surveys of the public and private sector,
    - CHIMA administrative data, and
    - an Ontario survey designed and administered by the Ontario Hospital Association (77 of 153 hospitals).

Professional Roles

The forecast uses the taxonomy of HI and HIM professional roles described in the *Health Informatics*

Professional Core Competencies, v. 3.0 developed by COACH and the *Learning Outcomes in Health Information Management (LOHIM Document), 2010* developed by CHIMA. Both documents were validated by industry stakeholders.

HI and HIM professional roles are distinct from occupations. *An HI or HIM professional role refers to a set of specialized functions that requires specific training or experience and which arises in the context of implementing, supporting or working with e-health technologies*. In some workplaces, HI or HIM professionals may perform more than one professional role. In other workplaces, an individual may perform a single professional role and his or her employer may view this professional role as being equivalent to an occupation. Individual professional roles that have a similar focus or orientation are grouped together in the seven 'Professional Role Groups'.

2014 HI & HIM Human Resources Surveys

The 2014 HI & HIM Human Resources Surveys were administered over the web from October 2013 to February 2014. The public sector survey was administered in both English and French. The surveys are mounted at:

Public Sector Survey (English):
http://www.prismsurveys.com/surveys/eHPublicSurvey/eHPublicSurvey.htm

Public Sector Survey (French):
http://www.prismsurveys.com/surveys/eHPublicSurveyFr/eHPublicSurveyFr.htm

Private Sector Survey
http://www.prismsurveys.com/surveys/PrivateSectorSurvey/PrivateSectorSurvey.htm

The 2014 HI and HIM Public Sector Survey received responses from 45 regional or provincial administrative bodies or hospitals. This compared with 35 respondents in 2009. The 2014 survey provided information on 2,030 HI and HIM employees.

The 2014 HI and HIM Private Sector Survey received responses from 51 companies. This compared with 45 companies that participated in the 2009 survey. These companies reported that they employ over 3,800 staff whose primary focus is e-health. The survey list was compiled using lists provided by ITAC-Health, COACH and also the list used in the 2009 survey.

2006 Census and 2011 National Household Survey

Data from the 2006 Census data were used at the 3-digit NAICS and 3-digit NOC-S level.

Data from the 2011 National Household Survey (NHS) were used at both the 3-digit and 4 digit North American Industrial Classification System (NAICS) and National Occupation Classifications (NOC) level. The

NOC coding used in the 2011 NHS provided a more reliable estimate of the number of HIM professionals than the 2006 Census.

Although there are differences between the NOC coding for IT and HIM occupations and the professional roles used in this report, the NHS nevertheless provides a useful foundation for anchoring overall estimates for these Professional Role Groups. Business Analysts are also commensurate with a specific NOC classification. Persons in IT, HIM and Business Analyst professional roles account for almost 70% of the estimated total HI and HIM employment.

Growth Demand

Growth demand refers to the increase in employment attributable to changes in e-health investment and changes in the base of e-health systems and applications. Changes in the employment in some professional roles (*e.g.* project managers and business analysts) are more strongly associated with changes in the rate of new investment in e-health technologies. On the other hand, there are other professional roles (e.g., service desk, network support) for which changes in employment are more strongly associated with increases in the installed base of e-health systems and applications. The report refers to these employment effects respectively as the investment effect and the operations, support and optimization effect. The distinction is between employment demand which is inherently cyclical because it is tied to the investment cycle (the implementation effect) and employment demand which is ongoing (the operations, support and optimization effect) because it is tied to the installed base of e-health systems and applications.

The estimate for the trend in new investment in e-health technologies is based on: (1) Canada Health Infoway's reports on approved projects and monies expended on projects, and (2) provincial announcements on e-health spending intentions. These data were also compared to similar data used in the 2009 report to support the conclusion that new investment is likely to moderate and that emphasis will shift to optimizing recent investments and increasing utilization. The overall trend in economic growth is also an important factor as this shapes the capacity of the federal and provincial government to support major new e-health investments. Overall growth forecasts were based on the Conference Board of Canada, the *Economist* Intelligence Unit and the Bank of Canada. These were set out in the report. The inference from these forecasts is that growth will be moderate and that the fiscal position of governments will be constrained. In some jurisdictions, other demands are competing for investment resources, for example, public transit in Ontario.

Trends in the growth of the installed base of e-health systems and applications are based on: (1) data from the Canadian Institute for Health Information (CIHI) on the share of IT in hospital operating costs, (2) survey data (described in the report) on physician adoption of electronic medical records, and (3) data on the distribution of Canadian hospitals in the HIMSS Analytics seven-stage model of implementation. These seven stages are described in Appendix F.

The report presents three scenarios with their corresponding implications for the growth in demand of professional HI and HIM roles. These are reproduced below:

	Low Investment Scenario	Moderate Investment Scenario	High Investment Scenario
	Implementation Demand		
Annual Rate Employment Growth relative to 2014	-2.0%	0.0%	3.0%
Five Year Cumulative Employment Growth relative to 2014	-9.6%	0.0%	15.9%
	Support and Operations Demand and Optimization		
Annual Rate Employment Growth relative to 2014	1.5%	2.5%	4.0%
Five Year Cumulative Employment Growth relative to 2014	7.7%	13.1%	21.7%

Replacement Demand

Replacement demand refers to hiring requirements that arise as a result of retirements. It is important to stress that replacement demand is *not* commensurate with turnover. Replacement demand is estimated at the sector level. Turnover occurs at the level of individual employers. Employees who move from one employer to another within the same sector increase turnover, but have no effect on overall replacement demand.

The report uses a retirement estimate of 2.4% which is commensurate with the estimate used by Employment and Social Development Canada (ESDC) in its Canadian Occupational Projection System (COPS).

Hiring Requirements Estimates

Estimates of growth demand (three scenarios) and replacement demand were applied to the 2014 employment estimates to generate the first iteration of estimates for hiring requirements. Where appropriate, the growth demand estimates were then conservatively adjusted for specific Professional Role Groups or professional roles based on data from the 2014 surveys.

Rankings of Shortage Risk

Ranking for risk of shortage are judgements based on: (1) vacancy rate indicators in the public sector survey, (2) current and expected recruitment challenges in the private sector survey, (3) the magnitude of the expected hiring requirement, (4) consideration of the post-secondary system's capacity to generate graduates, and (5) inferences from technology trends, third party reports, and the trade press. It should be noted that data on enrolment and graduation trends in HI and HIM programs is not currently available, although there is information on the number of programs and on some of the announced plans to create new programs.

■

Appendix C: HIMSS 7-Stage EMRAM Model

HIMSS Electronic Medical Record (EMR) Adoption Model (EMRAM)

for the Hospital Sector

Canada EMR Adoption Model SM			
Stage	Cumulative Capabilities	2013 Q4	2014 Q1
Stage 7	Complete EMR; CCD transactions to share data; Data warehousing; Data continuity with ED, ambulatory, OP	0.0%	0.0%
Stage 6	Physician documentation (structured templates), full CDSS (variance & compliance), full R-PACS	0.6%	0.6%
Stage 5	Closed loop medication administration	0.0%	0.5%
Stage 4	CPOE, Clinical Decision Support (clinical protocols)	3.8%	3.6%
Stage 3	Nursing/clinical documentation (flow sheets), CDSS (error checking), PACS available outside Radiology	32.2%	32.5%
Stage 2	CDR, Controlled Medical Vocabulary, CDS, may have Document Imaging; HIE capable	29.1%	28.9%
Stage 1	Ancillaries - Lab, Rad, Pharmacy - All Installed	14.5%	14.5%
Stage 0	All Three Ancillaries Not Installed	19.8%	19.4%
Data from HIMSS Analytics® Database ©2012		N = 640	N = 640

PLEASE NOTE: These graphics are an abbreviated version of the HIMSS Analytics EMR Adoption Model. All organizations must secure permission to post our model on any public notices and to obtain their score they must complete the HIMSS Analytics study prior to validation of their score.

Appendix D: Steering Committee

Gail Crook (Co-Chair)
CEO and Registrar
Canadian Health Information Management Association

Don Newsham (Co-Chair)
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Appendix E: CHIMA Practice Briefs

CHIMA Practice Briefs[28]

• Assessing and Improving EHR Data Quality	• HIM Role in Patient Safety
• Building an EMPI	• Incident Management
• Checklist of HIM Readiness	• Identity Theft: Impact on HIM Operations
• Computer Assisted Coding	• IT Primer for Interoperable Health Information
• Data for Electronic Patient Record Documentation	• Limiting Disclosure - the 'Lock Box'
• Data Standards: Quality and Interoperability	• Personal Health Record in the HER
• Disaster Planning for Health Information Services	• Principles of Electronic Health Records
• EHR Career Opportunities	• Privacy and Security in a Health Information Exchange
• Electronic Document Management as a Component of the HER	• Research
• Email as a Provider-Patient Communication	• RHIO Landscape
• Essential People Skills for EHT Implementation Success	• Role of HIM Professional in Primary Care
• Facsimile Transmission of Health Information	• SNOMED CT
• Guidelines for Developing a Data Dictionary	• Speech Recognition
• Guidelines for EHR Documentation to Prevent Fraud	• Standards Councils
• Health Data Access, Use and Control for Secondary Uses	• Visioning eHIM: Process of Imagining and Anticipating HIM's Future
• Health Information Management and Health Information Technology	• Wireless Communication: Safeguarding Privacy and Security
• Health Level 7	• Writing a Business Case
• HIM Profession in Tele-medicine	

[28] A description of the CHIMA practice briefs can be found at: https://www.echima.ca/professional-practice-brief-documents

Appendix F: COACH Guidelines / White Papers

Guidelines

- ***2013 Guidelines for the Protection of Health Information Main Edition***
- ***Putting it into Practice: Privacy and Security for Healthcare Providers Implementing Electronic Medical Records - 2013 Guidelines for the Protection of Health Information Special Edition***
- ***2013 eHealth Safety Guidelines***
- ***2014 Access Audits for Electronic Health Records Special Edition***
- ***2014 Privacy and Security for Patient Portals Special Edition***

White Papers

- ***Canadian EMR Adoption and Maturity Model: A Multi-Jurisdiction Collaborative and Common Model White Paper (February 2013)***
- ***White Paper on eHealth Adoption (November 2011)***
- ***Governing the Electronic Health Record - Crossing Traditional Boundaries of Healthcare Governance (2013)***