Application for Ministerial Consent
Ontario Colleges of Applied Arts and Technology

Bachelor of Technology (Digital Health) (Honours)

ALGONQUIN COLLEGE | School of Health & Community Studies

Submitted To: Postsecondary Education Quality Assessment Board

Submitted by: Algonquin College of Applied Arts and Technology

Date of Submission: March 2016

Section 1: Introduction

Section 1.1: College and Program Information

Full Legal Name of Organization: **Algonquin College of Applied Arts and Technology**
Operating Name of Organization: **Algonquin College of Applied Arts and Technology**
Common Acronym of Organization (if applicable): **NA**
URL for Organization Homepage: **www.algonquincollege.com**
Proposed Degree Nomenclature: **Bachelor of Technology (Digital Health) (Honours)**
Location (specific address) where program is to be delivered (each location requires a location-specific consent from the Minister): **Algonquin College, 1385 Woodroffe Avenue, Ottawa, Ontario K2G 1V8**
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Section 1.2: Executive Summary

Proposed Credential Nomenclature:
Bachelor of Technology (Digital Health) (Honours)

Anticipated Program Start Date:
September 2017 – Year 1

Program Overview

Information Communications Technologies (ICT's) are a critical aspect of modern digital health ecosystems, supporting healthcare delivery through the provision of timely and reliable information for patient care, scientific research, strategic decision-making, data analytics and consumer health applications. This four-year bachelor's degree prepares students for a career in today's digital health workforce by providing knowledge, skills and competencies in the related domains of health technology studies, business technology management, and software development. Students build a multidisciplinary set of competencies through immersive learning simulations, innovative laboratory exercises and applied digital health projects in order to leverage essential technologies and systems to become successful healthcare technology professionals. Students inform and shape the future of healthcare by contributing to the design, development and improvement of innovative healthcare technologies, such as mobile health apps, hospital information systems, clinical decision aids and business intelligence applications.

Students gain theoretical and practical knowledge through online, in-class, clinical and simulation-based learning experiences. Students apply analytical and leadership skills in a hands-on, research-rich learning environment throughout the program. Students have the opportunity to further apply and refine skills and knowledge while working in project teams during a co-operative work experience in industry.

Graduates have a unique blend of practical knowledge and abilities that can be leveraged in the health, technology and business sectors. Graduates are well positioned to find employment in healthcare institutions (e.g. hospitals, clinics, public health units, laboratories), digital health consulting firms, government (both federal and provincial), or other private sector digital health solution providers. Graduates also have the option to pursue further academic studies in the field.

The Bachelor of Technology (Digital Health) (Honours) program is aligned with the learning outcomes and competencies published by the Business Technology Management (BTM) standards. Algonquin College has initiated the accreditation process with BTM.

Program Learning Outcomes

1. Analyze, design, develop, implement and maintain business systems and/or components to support strategic business requirements.
2. Manage the process of evaluating, selecting and using business systems.
3. Apply accepted methodologies, theories, concepts and practices to develop and improve business and healthcare systems.
4. Manage data using appropriate methodologies, and standards to improve healthcare and business processes and decision-making.
5. Apply the Project Management Institute's Body of Knowledge to business systems projects.

6. Apply security principles and practices in systems development and the systems environment.
7. Apply principles and skills of business management, leadership and change management in the context of business systems development.
8. Apply quality assurance and quality management principles to business systems development projects.
9. Educate a diversity of clients in the use of business technology to support, promote and improve business and healthcare processes, and healthy-living initiatives.
10. Apply effective business technology management skills to innovate in digital health targeting new and existing local and global markets.
11. Adhere to professional, ethical and legal codes and standards related to digital health.
12. Conduct and evaluate research to contribute to evidence-based practice in digital health contexts.
13. Identify and apply discipline-specific practices that contribute to the local and global community through social responsibility, economic commitment and environmental stewardship.
14. Analyze and evaluate how digital health solutions influence healthcare business practices, quality of care and patient safety.
15. Assess how differing value judgments associated with the practice of healthcare, business management and information technology impact digital health decision-making.

Curriculum Design

The curriculum has been designed to meet and exceed the honours degree level standard and provides the appropriate depth and breadth of knowledge, along with applied specialized preparation in the areas of critical thinking and scholarly research, problem solving and analysis, communications, leadership and professional capacity and autonomy within the field of Digital Health. The co-op work term and culminating project courses provide further experiential learning opportunities.

The program of study is summarized below:

YEAR	SEMESTER	COURSE TITLE
YEAR 1	SEMESTER 1	MGT4102 - Business Fundamentals
		CST3100 - Introduction to Computer Programming
		CST3101 - Database Design Fundamentals
		MAT8003 - Mathematics for Programming
		ENL1100 - Communications and Academic Writing
	SEMESTER 2	ACC4101 - Financial Accounting
		CST3102 - Programming
		CST3103 - Data Communications and Networking
		BUS0006 - Value Creation in Healthcare
		PHI1000 - Logic and Critical Thinking
YEAR 2	SEMESTER 3	ESC4300 - Basics of Supply Chain Management
		CST3104 - Introduction to Mobile Application Development
		CST3105 - Advanced Database Design and SQL
		CST3106 - Internet Architecture and Web Development
		HLT0280 - Introduction to the Canadian Healthcare System
		CST3107 - Operating Systems

YEAR	SEMESTER	COURSE TITLE
	SEMESTER 4	BUS0008 - Business Analytics and Advanced Business Intelligence
		ECO4201 – Macroeconomics
		CST3109 - Business Systems Requirements Analysis
		HLT0281 - Healthcare Concepts
		HLT0282 - Health Records and Data Standards
		PHI2000 - Introduction to Research
YEAR 3	**SEMESTER 5**	BUS0007 - Strategic Business Intelligence
		CST3110 - Enterprise Architecture
		CST3112 - Business Systems Design and Implementation
		CST3111 - Project Management for IT
		QUA2000 - Statistics
		MGT0107 - Business Technology Management
	SEMESTER 6	HLT0283 - Human Factors and Workflow Analysis
		HLT0284 - Change Management
		HLT0285 - Health Ethics, Privacy, and the Law
		SOC2000 - Introduction to Sociology
		BUS0007 - Strategic Business Intelligence
		CST3110 - Enterprise Architecture
Co-op Work Term		
YEAR 4	**SEMESTER 7**	BUS0010 - Business Systems Security, Audit and Control
		CST3115 - Enterprise Mobile Application Development
		HLT0286 - Decision Support in Healthcare
		HLT0287 - Project I
		Elective
		Elective
	SEMESTER 8	MGT6120 - Entrepreneurship
		HLT0288 - Healthcare Quality Improvement
		HLT0289 - Project II
		Elective
		Elective

Algonquin College's Strengths and Capacity to Deliver the Program

Algonquin College of Applied Arts and Technology was established in 1967 and was named after the First Nations people who lived in the area. Algonquin was formed from the merger of the Eastern Ontario Institute of Technology, established in 1957, and the Ontario Vocational Centre, established in 1965.

Dedication to student success is one of Algonquin College's primary guiding principles and is demonstrated in the quality of its programs, its staff, the continual expansion of its facilities, and by forging of strategic partnerships. Furthermore, the College strives to ensure students have access to

the education and skills training demanded by the marketplace to launch rewarding careers in their chosen fields.

With the success of thousands of alumni, an annual full-time enrolment of approximately 18,000 students, 40,000 part-time registrations and thousands of full-time and part-time employees, Algonquin makes a significant economic and social impact locally, regionally, nationally and internationally.

Algonquin continues to be committed to being one of the most comprehensive colleges in Ontario, offering a broad variety of programs, subject matter, delivery modes and program durations. Given that Algonquin is the only publicly-funded English-language college in Ottawa, Perth and Pembroke it services the needs of these areas and their surrounding communities. As a result, Algonquin will continue to expand its offerings which include a full range of programs including academic upgrading, apprenticeship, certificate, diploma, advanced diploma, graduate certificate and degree programs as well as corporate learning solutions and international education and projects. Algonquin's program mix evolves with the province's labour needs and this application for Ministerial Consent to offer a Bachelor of Technology (Digital Health) (Honours) is in response to the healthcare sector's evolving labour needs. This application further aligns with the College's strategic direction detailed within its current Strategic Plan 2012-2017[1], communicating the intent to expand degree program enrolments. Furthermore, the program aligns with the Strategic Mandate Agreement in that 'Health and Wellness' and 'Digital Technologies and Design' are identified areas of strength and proposed areas of new program growth.

Digital Health is a new and emerging field with continuous and rapid innovation. The healthcare sector is increasing its adoption and use of information and communication technologies (ICTs) ranging from very large and complex hospital information systems, to interactive information kiosks designed to engage and educate publics. At the same time, consumers are increasingly participating in their own health management through the adoption and use of personal health technologies like Fitbits, Apple Watches and the many personal health related apps designed to run on smart devices. Strategically maximizing the benefits and use of these technologies, and the data they generate, is driving demand for a new kind of healthcare worker who has a solid practical understanding of healthcare, software development and business technology management.

The proposed Bachelor of Technology (Digital Health) (Honours) program is designed to align to professional competencies as defined by professional organizations, specifically COACH (Canada's Health Informatics Association), and CIPS (Canada's Association of IT Professionals). However, we feel, and our program advisory committee agrees, that the proposed program's unique design makes it different in scope than a typical Health Informatics program (as further evidenced in Section 14). Our choice of Digital Health as the program subject matter is meant to address this difference in scope.

Currently, Algonquin offers diploma programs related to the area of study focused within the proposed Bachelor of Technology (Digital Health) (Honours). The College has established a solid reputation in the delivery of high quality healthcare programming (e.g. Nursing Science and Respiratory Therapy), advanced technology and software development programming (e.g. Computer Programmer), and business (e.g. Business Intelligence System Infrastructure). These programs are offered at various levels and through a variety of delivery modes.

[1] Strategic Plan 2012-2017, June 11, 2012, http://www.algonquincollege.com/reports/pdf/Strategic_Plan_12_17.pdf, p.16, Accessed November 2013

The Faculty of Health, Public Safety and Community Studies and School of Advanced Technology, both at the Woodroffe Campus, provide students with access to existing practical lab environments that will support the students' learning experience (see Section 6 for more detail). This will provide students with an exceptional teaching environment to engage in practical learning opportunities. The College's capacity to provide the human and physical resources required for an excellent educational experience is unsurpassed in the region. In addition, the College's ability to deliver bachelor-level education is evidenced by the success of both existing degree programs as well as collaborative degrees with local universities.

This application details the rationale for offering the Bachelor of Technology (Digital Health) (Honours), the program of study to be undertaken, and Algonquin College's capacity to deliver this program with the availability of facilities, learning resources, and the technological infrastructure used to support learning. Additionally, the majority of faculty members associated with the development and proposed teaching of the program have the required terminal credentials in their respective fields.

Opportunities for Graduates and Overview of Support and Recognition of the Program from the Profession and Other Postsecondary Institutions

During the course of developing the Bachelor of Technology (Digital Health) (Honours) program proposal, an in-depth labour market analysis was commissioned by the College to determine the need for the proposed program. In addition, several related professional bodies recently produced a detailed labour market analysis addressing the need for knowledge and skills designed into the proposed Bachelor of Technology (Digital Health) (Honours). These studies both concluded that there is a definite need for the degree program and that the credential will provide graduates with opportunities for advancement in the field, a field that encompasses health technology studies, software development, and business technology management.

Labour Market Analysis

Health Informatics and Information Management: Human Resources Outlook 2014-2019[2]
June 2014

Prepared for:

Canada Health Infoway
Canadian Health Information Management Association (CHIMA) Canadian Institute for Health Information (CIHI)
COACH – Canada's Health Informatics Association Information and Communications Technology Council (ICTC) Information Technology Association of Canada (ITAC – Health)
Graphic design courtesy of Healthcare Information Management & Communications Canada
Prepared By: Prism Economics and Analysis June 2014

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.

[2] Full Report Available online: http://www.coachorg.com/en/practices/2014-HR-Report.asp

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 ehealth 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. Figure 1 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.

Figure 1

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 ehealth 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.[3]

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,

[3] 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.

- 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

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 healthcare 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. Figure 2 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		■	■

Figure 2

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 healthcare 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*.

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December 20, 2012 **Labour Market Analysis for two new e-Health programs**

Executive Summary

Algonquin College is considering the introduction of a Bachelor of E-Health degree program aimed at the general student population, and a one-year Ontario Graduate Certificate in E-Health aimed at health or informatics professionals. The two e-health programs are multidisciplinary in nature and are proposed to combine knowledge and skills from the health sciences, informatics, and business disciplines.

Axion conducted a labour market analysis of the e-health sector to determine the nature and scope of employment opportunities in this sector and to identify the number and type of similar programs offered in Ontario. Most of this research was conducted by way of web search supplemented by interviews of a small number of high-level stakeholders.

The research indicated that there is no e-health profession. E-health tends to be grouped into two main disciplines – health informatics (HI) and health information management (HIM). Together they include at least 27 occupational categories.

Two national associations have created the first employment profile of the combined HI and HIM occupational categories because of the unavailability of official government statistical data. Their data shows a significant increase in the demand for these types of professionals over the next few years, and an even greater demand for skills upgrading. These statistics are generally consistent with those produced by the US Department of Labor, which estimates a 49% job growth in health information and health informatics. Demographic trends, changes in the healthcare sector, and technology improvements are all contributing to the high demand for professionals in e-health.

One of the unique features about e-health professionals is that they have a wide choice of employment opportunities. Employment can be found in both the private sector and the public sector and includes healthcare, government, retail, telecommunications, informatics, consulting, and manufacturing, amongst others.

The term e-health is very new and e-health post-secondary programs are even newer. There are an increasing number and variety of college and university multi-disciplinary programs in e-health, but few are located in Eastern Ontario. There may be an emerging trend to combine HI programs and HIM programs into one program.

Industry associations indicate that knowledge of the healthcare system is essential. While technical knowledge of informatics is usually important to gain entry into the profession, business analysis skills and communication skills are critical to career success. Accordingly, most industry associations recommend that e-health programs should focus increasingly on the non-technical side.

Axion feels that Algonquin College should consider setting up one or both e-health programs. Given the variety of jobs available to e-health professionals, it would be prudent for Algonquin College to establish an advisory board to assist it in aligning its e-health programs to the market reality of Eastern Ontario.

The new programs could have either an HI or HIM orientation. Through one of our interviews, we understand that Conestoga College is about to develop a combined HI and HIM undergraduate program. Two other postsecondary institutions in western Canada are apparently interested in developing a combined program. We believe it would be advantageous for Algonquin College to determine whether this is an emerging trend or whether there are other reasons for offering a combined HI and HIM.

Employer Demand Interest

There is definite interest in Ottawa for a degree program that would allow prospective students direct entry into year one, or to bridge into year two, depending on their credentials. The Bachelor of Technology (Digital Health) (Honours) Program Advisory Committee is very supportive of the proposed program and agrees with the employer demand predictions outlined in the labour market analysis. Digital health is a new and emerging area of study providing unique and innovative opportunities for employers.

The labour market analysis provides the following specific references to indicators of employer interest and demand:

- 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.
- 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.

The Advisory Committee, as well as numerous other sector representatives, have endorsed the proposed degree. This application includes recent letters of support from prominent associations and sector affiliates, among them are The Ottawa Hospital, Children's Hospital of Eastern Ontario and First Nations and Inuit Health Branch. Endorsements by the aforementioned sector affiliates provide testament to Algonquin's capacity to deliver quality programming the field of digital health.

Applicant Demand Interest

As noted within the labour market analysis, the proposed program provides a unique combination of knowledge and skills that is not easily comparable to other offerings. There is, however, one related college degree program that exists, Conestoga's Bachelor of Applied Health Information Science, which can be used to roughly assess the potential demand for this degree. The data provided in Figure 3 was obtained from the Ontario College Application Service and indicates existing demand for Conestoga's program.

Bachelor of Applied Health Information Science (Conestoga)

	APPLICATION				REGISTRATION				ENROLMENT			
Applicant Year/Type	2011	2012	2013	2014	2011	2012	2013	2014	2011	2012	2013	2014
BOTH	94	116	137	137	21	20	31	32	23	21	31	33
DIRECT	38	32	57	62	11	4	12	16	11	5	12	16
NON-DIRECT	56	84	80	75	10	16	19	16	11	16	19	16

Additionally, surveys were conducted within students from Algonquin College's existing Computer Engineering Technology – Computing Science Ontario College Advanced Diploma program and the Computer Programmer Ontario College Diploma programs on March 19, 2015.

Table 1: Algonquin Student Demand Survey

	Total Interest	Extremely	Very	Somewhat
Bachelor of Technology (Digital Health) (Honours)	**45**	**5**	**13**	**27**
Bachelor of Technology (Business Sys. Dev.)	**63**	**10**	**19**	**34**
Overlap	**40**			
Would have taken the program?	**53**			
Continue at Algonquin?	**65**			
Number of Participants	**99**			

Student interest surveys were conducted to gauge how much interest Algonquin College 1st year computer science students might have in bridging into either our proposed Bachelor of Technology (Digital Health) (Honours) or (Business Systems Development) programs, which are being designed to share a significant percentage of courses throughout both programs. Of the 99 responses, 45 students expressed interest in the Digital Health program (Table 1), while 63 expressed interest in

the Business Systems Development program (40 of those 63 students were interested in both programs). When asked, 53 students indicated that they would have enrolled in one of the two programs had it been offered when they were applying to Algonquin College. Sixty-three (63) students indicated that they plan to continue their studies at Algonquin upon completion of their current program.

The School of Business asked current students to participate in a survey on April 4, 2015. Among other questions, there were two relative to the proposed Bachelor of Technology – Business Systems Development.

After you complete your current program, do you think that you will continue your education at the college or university level in the future?

Response	Chart	Percentage	Count
Definitely will		48%	28
Possibly will		24%	14
Undecided		19%	11
Possibly not		7%	4
Definitely not		2%	1
	Total Responses		58

Algonquin College is considering offering several Four Year Degree Programs. How interested would be you in taking the following programs at Algonquin College, recognizing that there would be tuition fees and expenses involved?

	Extremely interested	Very interested	Somewhat interested	Not very interested	Not at all interested	Unsure, more information required	Total Responses
Bachelor of Technology (Business Systems Development)	5 (11%)	4 (9%)	10 (22%)	9 (20%)	13 (29%)	4 (9%)	45
Bachelor of Technology (Digital Health)	2 (4%)	4 (9%)	10 (22%)	11 (24%)	14 (31%)	4 (9%)	45
Bachelor of Commerce (Strategic Human Resources)	9 (20%)	6 (14%)	13 (30%)	6 (14%)	8 (18%)	2 (5%)	44
Bachelor of Commerce (Digital Marketing)	9 (20%)	7 (16%)	15 (33%)	9 (20%)	5 (11%)	0 (0%)	45
Bachelor of Commerce (Leadership)	10 (21%)	10 (21%)	10 (21%)	5 (10%)	5 (10%)	8 (17%)	48
Bachelor of Commerce (Supply Chain Management)	11 (24%)	4 (9%)	13 (28%)	9 (20%)	6 (13%)	3 (7%)	46

Combined responses from these two surveys indicate levels of student demand consistent with Conestoga's current program numbers.

The addition of the Bachelor of Technology (Digital Health) (Honours) to the College's existing programming would expand the educational opportunities for further academic study and lifelong learning. Graduates of the Bachelor of Technology (Digital Health) (Honours) program may receive consideration for admission to select graduate programs. Evidence of this is included in Section 13.

In summary, data from the labour market analysis, student surveys, and sector employers, along with trends within the field of engineering affirm the need for a Bachelor of Technology (Digital Health) (Honours) degree program. There is strong support from community stakeholders for the proposed curriculum as well as a commitment to provide co-op placements, in-class project experiences, and employment opportunities. It is anticipated that graduates of the Bachelor of Technology (Digital Health) (Honours) program will become future leaders within the Digital Health sector and will be sought by employers locally, provincially, nationally and internationally.

Section 1.3: Program Abstract

This four-year Bachelor of Technology (Digital Health) (Honours) program provides students with knowledge in three related domains—health technology studies, software development, and business technology management—equipping graduates with the skills and competencies needed to perform in today's digital health workforce. Graduates have theoretical and practical knowledge gained through online, in-class, clinical and simulation-based learning experiences. These experiences enable graduates to analyze, design, develop, implement and maintain cutting-edge software, business systems and/or components to support strategic business requirements in and beyond the healthcare sector. Graduates can conduct, evaluate and support research, and apply evidence to patient-centred digital health solutions. They may seek employment in healthcare institutions (e.g. hospitals, clinics, public health units, laboratories), digital health consulting firms, government (both federal and provincial), or other private sector digital health solution providers. Graduates inform and shape the future of healthcare by contributing to the design, development and improvement of innovative healthcare technologies, such as mobile health apps, hospital information systems, clinical decision aids and business intelligence applications. Graduates may also choose to pursue further academic study in fields related to healthcare, business or information technology.

Section 2: Degree Level Summary

This section provides a summary of the program features and resources that ensure the proposed Bachelor of Technology (Digital Health) (Honours) program meets the Board's standard for a Baccalaureate/Bachelor Honours degree. Although the six categories are treated independently for the purposes of this discussion, the proposed degree level program integrates the elements of the standard in a holistic fashion, and creates opportunities for students to demonstrate more than one of the categories in any given performance. This alignment between the Board's standard and the proposed degree level program learning outcomes, and between the proposed degree level learning outcomes and the courses that make up the proposed Bachelor of Technology (Digital Health) (Honours) program was monitored throughout the development of the program (See Section 4.3: Learning Outcomes).

The outcomes of the Bachelor of Technology (Digital Health) (Honours) degree program are designed to deliver broadly-educated graduates who possess the general and specialized knowledge, interdisciplinary perspectives, competencies, skills and values required by industry, and who are well prepared to manage, deal with and adapt to the challenges of today's diverse and ever-changing professional work environments, within both domestic and global contexts.

For this summary, key points will be highlighted for each of the six categories of knowledge and skills that form the Board's standard for a Baccalaureate/Bachelor Honours degree.

Depth and Breadth of Knowledge

The proposed Bachelor of Technology (Digital Health) (Honours) is developed to provide students with the necessary knowledge and skills using a scaffolded approach to learning in a thoroughly interdisciplinary program. The program is designed with a series of curriculum components that provide a solid foundation followed by progressively multifaceted levels of knowledge, skills, competencies, and increasingly complex theory and its application to practice in the digital health environment. While developing strong competencies in health technology studies, software development and business technology management is fundamental to the degree focus, the curriculum as a whole recognizes the critical requirement of ensuring that students develop a breadth of knowledge across a range of disciplines, including those outside of the core disciplines. While the core components of the curriculum allow students to gain significant depth in their specific area of study, students devote at least twenty percent (20%) of their studies to content outside of the discipline, through a combination of mandated and free elective non-core courses. This interaction with other fields of study provides students with a breadth of learning through which they continue to develop and exercise critical thinking and analytic skills. Moreover, students develop an appreciation and aptitude for a diversity of research methodologies that enable them to examine and interpret a greater array of hypotheses and assumptions beyond the specific discipline of digital health. This ensures that graduates are cognizant of, and responsive to, their responsibilities as global citizens.

There are four areas of emphasis that will be reflected throughout the program: 1) the structure and current accepted practices and values of the Canadian healthcare system as they relate to digital health technologies; 2) accepted principles and methodologies of software development; 3) accepted principles and methodologies of business technology management; and 4) the principles and methodologies of academic research.

The program exposes students to a spectrum of current research in the field of digital health and engages them in faculty-mentored research through a range of applied projects, a capstone project and assignments. The first year of study provides a broad introduction to a range of current topics,

methodologies and principles in health technology studies, business and software development that are more fully developed throughout the program. Courses such as Business Fundamentals, Programming, Value Creation in Healthcare, and Logic and Critical Thinking provide students with foundational principles and concepts that will be built upon throughout the program of study. The second and third years of study include a strong focus on health technology studies (including specific clinical applications), strategic business analysis and intelligence, and advanced software development principles and techniques. The fourth year allows students to explore advanced topics in digital health and apply their learning through research and applied work on capstone projects.

The applied nature of the program allows for an increasing depth and expectation of discussion, critical thinking, ethical problem solving and review of evidence in all of the courses. Combined with a co-op work experience, students develop the essential research skills to undertake the capstone research project in the final year of the program. This project will allow students to showcase their critical thinking and analytical skills within the context of the knowledge acquired throughout the program.

Conceptual and Methodological Awareness/Research and Scholarship

In the first year, students engage the building blocks of the digital health landscape including an introduction to value creation in healthcare, business fundamentals, mathematics, problem-solving, computer programming, as well as practical skills related to business, communication and critical thinking. Courses in the first year of study lay the conceptual and practical foundations students require for a thorough understanding of the complex relationship between software development, business, and the healthcare sector.

Beginning in the second year and carrying through the third year of the program, students gain further exposure to health technology studies, strategic business thinking and software development. Students move beyond theory to engage software development and strategic business thinking in the context of healthcare practice. At this point in the program, problems arise and are being analyzed and solved as theoretical knowledge is applied directly to practical applications within digital health. Through the use of varying methods of enquiry and application of current research, methodologies and practices in the discipline, students connect the pieces while designing, developing, implementing and maintaining digital health solutions. Additionally, the core conceptual and methodological awareness is reinforced through the non-core curriculum, including the Research Methods course, as well as upper level electives that require students to further broaden and develop their intellectual toolbox and advance their approach to scholarly activity. Thus, non-core courses improve students' ability to develop and sustain arguments, and problem solve in and outside of the core digital health context.

The coursework in the final year of the program complements the final project and introduces a number of advanced topics including entrepreneurship, decision-support in healthcare, as well as business systems security, audit and control. The students' abilities evolve as they are exposed to real-world healthcare environments through participation in both hi-fidelity simulation lab settings and work-integrated learning experiences in co-operative education. The fourth-year project culminates much of students' acquired skills and knowledge, allowing them the opportunity to engage in much of the full spectrum of digital health solution development and integration.

The learning environment in which the students collaborate with faculty will encourage not only the development of logical and sustained arguments, but also the appropriate interpretations and use of research. As they progress through the program, students develop a greater level of autonomy, and

it is the combination of astute commentary on, and use of, scholarship in the discipline and demonstrated academic integrity in the documentation of their research that provides evidence of their intellectual growth during their studies.

Communication Skills

Within the digital health context, communication skills are an essential foundation for success. The importance of effective communication with a variety of stakeholders representing various sectors (e.g. healthcare, business, high-tech), and their related professions, has been captured throughout many of the degree level program learning outcomes. In order to prepare students for the work experiences that are part of the program, but also for employment upon graduation, the development of written and oral communication skills is threaded throughout the program with progressive levels of difficulty and exposure to discipline-, and sector-specific techniques.

Beginning with non-core courses offered during the first year of study, students examine fundamental communication and critical thinking skills that apply across a wide range of disciplines and ensure the ability to make meaningful connections with non-specialist audiences on topics of increasing complexity. Core courses like Value Creation in Healthcare, Strategic Business Intelligence, Healthcare Concepts, Health Ethics, Privacy and the Law, and Change Management help students to appreciate the role of a diverse set of stakeholders. They also allow students to further develop techniques for communicating with specialists, while providing some familiarity with the issues that could arise during co-op work term and applied project experiences. Advanced courses in Business Analytics and Advanced BI, Change Management, Healthcare Quality Improvement, Project Management for IT, and Decision Support in Healthcare focus on the ability to communicate both strategically and tactically, each of which is an integral part of obtaining and maintaining employment. These courses provide students with additional techniques and concepts to help them meet the expectations they will encounter upon graduation.

Beyond specific courses that address communication skills, the need for effective communication of structured and coherent arguments is built into many of the courses through the assignments. Whether in the form of presentations, lab reports, technical reports, or seminars, students are expected to present and document their research findings in a manner that is consistent with the professional requirements of the discipline.

Application of Knowledge

The proposed Bachelor of Technology (Digital Health) (Honours) program integrates theoretical knowledge with practical applications throughout the program. The curriculum is designed to provide numerous opportunities for students to demonstrate the practical integration and application of understanding, knowledge, skills and competencies acquired throughout the program to help them develop a strong foundation in the profession. For example, the program includes the integration of clinical simulation components in several courses. This provides students with multiple opportunities to apply their skills in real-world and scenario-based settings. Applied research opportunities, guest speakers, case studies, clinical simulations, and collaborative partnerships are major learning strategies integrated into the program to encourage the application of higher-level learning via the application of knowledge.

Technology plays a crucial role in the program as a tool for the collection, interpretation, storage, communication, and presentation of ideas and data. Students begin with common tools that are used across a number of disciplines and continue to develop expertise with software development tools and applications in a variety of contexts. In subsequent years, students work with more discipline-specific tools and software as they evaluate increasingly complex business systems that

can involve an integrated array of digital health components (e.g. hospital information systems, lab ordering systems, electronic medical records, and consumer-oriented health apps). Students demonstrate the culmination of knowledge and applied learning in a full year capstone project that provides them with in-depth learning experiences.

Moreover, the program is structured to prepare students for progressive levels of responsibility in their work experience. The co-op work experience allows students to bring together the knowledge and skills developed over the first three years of the program. It exposes students to the real life work environment to help develop professional communication skills, technical problem-solving abilities and a respect and understanding of project delivery timelines. Through the lens of real-world experience, the application of concepts and principles from within and outside the discipline is understood as a necessary component of success in the workplace. Over the fourth year of the program, work experience merges with more advanced theories and concepts to prepare students for increased responsibility and leadership development, as determined by their more developed ability to make sound judgments, propose solutions, and solve problems. Fourth-year project courses challenge students to apply their accumulated knowledge and skills to real-world projects in digital health.

Professional Capacity/Autonomy

As a discipline driven by professional reputation, and one that relies heavily on the autonomy and integrity of its practitioners, this category of the Board's standard has been deeply integrated into the program of study as indicated by the following degree level program learning outcomes:

1. Analyze, design, develop, implement and maintain business systems and/or components to support strategic business requirements.
3. Apply accepted methodologies, theories, concepts and practices to develop and improve business and healthcare systems.
4. Manage data using appropriate methodologies, and standards to improve healthcare and business processes and decision-making.
6. Apply security principles and practices in systems development and the systems environment.
7. Apply principles and skills of business management, leadership and change management in the context of business systems development.
8. Apply quality assurance and quality management principles to business systems development projects.
10. Apply effective business technology management skills to innovate in digital health targeting new and existing local and global markets.
11. Adhere to professional, ethical and legal codes and standards related to digital health.
12. Conduct and evaluate research to contribute to evidence-based practice in digital health contexts.
13. Identify and apply discipline-specific practices that contribute to the local and global community through social responsibility, economic commitment and environmental stewardship.

While certain courses within the program play a much stronger role in supporting these program learning outcomes, they are threaded throughout the program of study and are integral to the co-op work term and culminating project courses in the final year. In addition, teamwork is an important part of the program from the very beginning, and problem-based learning is used as an instructional methodology throughout the four years of the program. Both of these approaches support qualities

and transferable skills, such as the ability to solve problems and make decisions in complex contexts, which will position graduates to contribute in and beyond their employment.

Finally, non-core courses for the program have been included to support and encourage a broader intellectual engagement with not only the local community, but also the global community as it continues to grow and evolve. Students develop a sense of personal responsibility and accountability within an inclusive, reflexive and critical civic discourse that is the hallmark of a bachelor's degree level education.

Awareness of Limits of Knowledge

From the beginning of the program, students are faced with the uncertainty, ambiguity, and limits of knowledge due to the constantly evolving nature of the field. In order to deal with change effectively and professionally, students develop a firm awareness of their roles within an integrated educational or project-oriented team. Moreover, the program of study takes into account the continuous pace of change and its impact on the increasing complexity of problems in digital health by encouraging open-minded and creative thinking.

Courses are structured to introduce students to a number of core learning principles, legislative and regulatory guidelines, professional values, and theoretical perspectives that influence the digital health ecosystem. Though widely used, there are varying degrees of certainty surrounding the use and application of these principles, guidelines, values and perspectives. Uncertainty is then connected to real world applications, through case studies and simulation activities that are embedded throughout the program as a means of assessing, interpreting and ultimately adapting approaches to problem solving. Students are made aware of the uncertainty, ambiguity, and limits of knowledge when interpreting others' research, and also when designing and undertaking their own research activities. Working in both a people and technology-oriented profession imposes additional levels of ambiguity and unpredictability. Students must be aware of these conditions of knowledge so that they can develop strategies to address the various challenges they introduce in practice.

Through iteration and a gradual increase in problem solving complexity, the Bachelor of Technology (Digital Health) (Honours) program presents students with learning opportunities that reinforce the many ways that knowledge is limited, ambiguous and uncertain. Students develop an appreciation that each problem must be faced as a unique challenge, often requiring the development of new research, theories and methodologies, new interpretations of old data, and new appreciations for the complex interactions typical of interdisciplinary knowledge use environments.

Section 3: Admission, Promotion, and Graduation

The requirements for admission are appropriate to the learning outcomes of the program and the degree level standard. The Bachelor of Technology (Digital Health) (Honours) meets the minimum admission requirements stipulated for a bachelor's program. An Ontario Secondary School Diploma or equivalent and six university or university/college courses are required at the Grade 12 level with a minimum overall average of 65% as per the benchmark, along with a minimum grade of 60% for the required Grade 12 (U) or (M) courses. Should the number of qualified applicants exceed the number of available places, applicants will be selected based on academic achievement on the basis of their proficiency in English and Mathematics. Admission procedures are further outlined in Policy AA04: Admissions.

Section 3.1: Admission Requirements for Direct Entry

	Program Admission Requirements

Academic	• Ontario Secondary School Diploma (OSSD) or equivalent.
	• A minimum of six (6) Grade 12 U or M courses including two (2) required U or M level courses and four additional U or M level courses
	• The following Grade 12 courses, or equivalent, are required:
	  • one Grade 12 U or M English course
	  • one Grade 12 U or M Math course
	  • Four (4) other Grade 12 U or M courses
	  • A grade of 60% in the required courses and an overall average of 65% in the six Grade 12 U or M courses. (Ontario Academic Courses (OAC) can replace or be used in combination with U or M courses.)
	• Applicants with International transcripts must provide proof of either: IELTS-International English Language Testing Service-Overall band of 6.5 with a minimum of 6.0 in each band; OR TOEFL-Internet-based (iBT)-overall 90, with the minimum in each component: Reading: 22; Listening: 22; Speaking: 24, Writing: 22

Related work/volunteer experience	N/A
Other (e.g., portfolio, specialized testing, interview, G.R.E., etc.)	N/A

Section 3.2: Admission Policies and Procedures for Mature Students

Mature student admission requirements are as follows:

Mature student admission requirements are noted below: Requirements for mature students *(19 years of age or older and without a high school diploma at the start of the program)*	• Mature students are applicants who have not achieved the Ontario Secondary School Diploma (OSSD) or its equivalent and who are at least 19 years of age on or before the commencement of the program in which they intend to enrol. Mature students have demonstrated academic abilities equivalent to those of Ontario high school graduates, verified by successful completion of courses at the postsecondary level and meet the following criteria: • Grade 12 U or M English • Grade 12 U or M Mathematics • Four additional Grade 12 U or M courses • A minimum grade of 60% required in each course and an overall average of 65% in the six Grade 12 U or M courses. (Ontario Academic Courses (OAC) can replace or be used in combination with U or M courses.)

The electronic policies file (Section 16: Policies) includes policies and procedures pertaining to the admission of mature students within the following:

Policy AA04: Admissions

Section 3.3: Promotion and Graduation Requirements

Policies governing academic remediation, sanctions and suspension for students who do not meet minimum achievement requirements are detailed broadly in Policy AA39: Program Progression and Graduation Requirements. Individual course outlines specify course and/or program specific promotion requirements as well as requirements for supplemental exams where available. Policy AA14 provides details on the College's Grading System that are easily understandable, meaningful and convertible to other postsecondary institutions and employers through the use of designated percent, letter and numeric grade equivalents. The Grading System also allows for a Grade Point Average (GPA) calculation here described:

The grade point average is a weighted average. It is calculated as follows:

Each course is designated as having normative total instructional hours that is the designated number of hours within which the course learning requirements may be achieved, regardless of variations in delivery. The number of grade points per course is determined by multiplying the normative total instructional hours of the course by the numeric value of the grade earned in that course. The resulting number is called the grade point total. The grade point total is divided by the total number of normative instructional hours for courses with grades having numeric value. For the purpose of this calculation, a grade of "F" has a value of "0". The resulting quotient is the grade point average.

$$\frac{\text{Grade Point Total}}{\text{Total Normative Hours}} = \text{Grade Point Average (G.P.A.)}$$

Policy AA26: Course Outlines and Course Section Information, includes provisions to ensure that regardless of the grading scheme, grades for acceptable performance correspond to student work that demonstrates the degree level standard has been achieved through alignment with degree level program outcomes and course learning requirements. Furthermore, the evaluation methods or instruments are linked directly to the course learning requirements being addressed in the course.

The proposed Bachelor of Technology (Digital Health) (Honours) program promotion and graduation requirements have been aligned to meet the benchmark requirements depicted in the following table:

Program Requirement	Level of Achievement	
	Promotion	Graduation
Minimum overall average acceptable achievement in non-core requirements	**C- (60-62%)**	**C- (60-62%)**
Level of overall achievement expected in the core discipline(s) of study	**C (63-66%)**	**C (63-66%)**
Co-op Work Terms	**Pass**	**Pass**
Minimum overall acceptable achievement for progression (across all degree requirements, including the breadth and discipline-related requirements)	**C- (60-62%)**	**C- (60-62%)**

Several policies govern promotion and graduation requirements. The electronic policies file (Section 16: Policies), includes policies and procedures pertaining to the promotion and graduation requirements within the following:

Policy AA13: Evaluation of Student Learning
Policy AA14: Grading System
Policy AA26: Course Outlines and Course Section Information
Policy AA39: Program Progression and Graduation Requirements
Policy AA40: Academic Advising

Section 3.4: Advanced Standing Policies and Requirements

Options for advanced standing and credit recognition, with well-established policies available to detail procedures and eligibility requirements, are available to students.

Degree Completion Arrangements

Numerous pathways were examined with diploma and advanced diploma programs related to the degree program. After close scrutiny of affiliated programs, it was determined that there are two main reasons that bridging options are limited for this program. First, the Bachelor of Technology (Digital Health) (Honours) degree is a mix of health technology studies, software development and business technology management. In order to provide a balanced program of study, and to properly align courses to account for the overall learning objectives, each of those three knowledge areas is spread throughout the four years, rather than being concentrated within a few semesters. Second, this program was developed in conjunction with another proposed degree program at Algonquin College, namely the Bachelor of Technology (Business Systems Development). In the development of both proposed degree programs, it was felt that there was significant overlap in the early parts of program and the development encouraged a common first year, as well as additional shared courses throughout the remainder of the program. The results limit bridging options for anyone entering from a "single knowledge domain" program, such as computer science. This is because equivalent credits tend to be recognized for courses throughout the four years of our program of study.

Graduates from the Computer Engineering Technology – Computing Science Ontario College Advanced Diploma program would receive credit for 14 courses towards advanced standing within the proposed degree. Although students should be able to complete the degree in approximately 2 ½ years, the positioning of the courses do not allow for a bridge providing a smooth entry point into the degree studies. Instead, a customized program of study, including a combination of reach back and reach forward courses, would be designed for graduates of this program.

Graduates from the Computer Programmer Ontario College Diploma program would receive credit for 14 courses towards advanced standing within the proposed degree. Although students should be able to complete the degree in approximately 2 ½ years, the positioning of the courses do not allow for a bridge providing a smooth entry point into the degree studies. Instead, a customized program of study, including a combination of reach back and reach forward courses, would be designed for graduates of this program.

Table: Admission Details for Degree Completion Arrangements

Program Of Non-Degree Study	Courses Students Receive Towards the Degree	Special Requirements For Entry Into Arrangement	Point of Entry Into the Degree Program
1. Computer Engineering Technology – Computing Science Ontario College Advanced Diploma	14	An overall GPA of 2.7 (70%) minimum	*
2. Computer Programmer Ontario College Diploma	14	An overall GPA of 2.7 (70%) minimum	*

*As noted above, the positioning of courses did not allow for a smooth point of entry.

The gap analysis (See Section 4.10: Gap Analysis) for each program of prior study demonstrates the means by which the degree program learning outcomes are met.

Advanced placement based on prior learning assessment is feasible with the understanding that degree program Prior Learning Assessment and Recognition (PLAR) candidates can be awarded no more than fifty percent (50%) of the total number of hours of the program of study based on PLAR. The eligibility criteria and procedures for PLAR are detailed in Policy AA06: Prior Learning Assessment and Recognition (PLAR).

The electronic policies file (Section 16: Policies) includes policies and procedures pertaining to advanced standing within the following:
Policy AA 05: Advanced Standing
Policy AA 06: Prior Learning Assessment and Recognition (PLAR)
Policy AA 09: Transfer of Academic Credit (Internal)
Policy AA 10: Transfer of Academic Credit (External)

Section 4: Program Content

This section, with its subsequent sub-sections of supporting material, demonstrates the rigour, breadth and depth that have been built into the proposed Bachelor of Technology (Digital Health) (Honours) program to ensure that the program is consistent with the degree level standard. The supporting materials speak to all twelve (12) of the Board's benchmarks for program content.

Throughout the development of the program, the degree level standard and the Board's benchmarks have been a constant reference point. In fact, the decision to undertake the development of the proposed Bachelor of Technology (Digital Health) (Honours) program was based not only on the employer demand for graduates in this discipline, but also on the natural alignment between the field of practice and the degree level standard. Digital health, as a discipline, is based on a balance of interdisciplinary theory and practice and so the program needs to follow suit in order for graduates to be prepared for employment. The development has also adopted a layered approach where each consecutive year of study adds complexity to the knowledge and skills from previous years. Each year of the program includes at least one course from each of the three knowledge domains that contribute to the overall digital health knowledge and skill base—health technology studies, software development, and business technology management—ensuring students obtain a balanced focus on each domain, and integrate the nature of current knowledge in these areas.

The fifteen program learning outcomes are based on research examining various postsecondary institutions within North America, and core competencies identified by professional organizations (e.g. COACH), as well as feedback from industry partners through our Program Advisory Committee (PAC). During focus group activities PAC members identified the skills, knowledge and attributes that they are seeking in graduates.

As a discipline, there currently are no accreditation or certification bodies required for entry to practice for the degree program graduates. However, we are seeking accreditation for the program from the Canadian Information Processing Society (CIPS), under their Business Technology Management designation (see Section 4.2 for more details).

The program of study has been designed for the achievement and demonstration of the learning outcomes that describe the knowledge and skills of graduates. The proposed program strikes a reasonable balance for the time spent on content that is appropriate to the stated learning outcomes. No single knowledge domain within the discipline takes precedence over another and as students move through the co-op work experience and into the final year of study, there is increased emphasis placed on using a variety of knowledge, skills and attitudes to solve current and emerging problems in the discipline. To further prepare students for their work experience and future employment, a wide range of assessments are built into the courses that are a part of the proposed program of study. These assessments are aligned with the outcomes for each course (See Section 4.7: Course Outlines) to ensure that there is ample demonstration of stated outcomes and that students have consistent, regular, and meaningful feedback on their achievement levels.

It is, however, the co-op work experience and fourth-year capstone project that provides students with the most information about their ability to apply knowledge and skills in practice and their direction for future studies both within and beyond the program. The fourteen-week co-op work term, situated between the third and fourth years of study (See Section 4.6: Work Experience) allows students to connect their expanding knowledge and skills to the workplace. The capstone

project allows students to continue building on that work-integrated learning approach by defining and developing a substantial piece of work in student teams. The articulated outcomes for the work experience and capstone project speak to a progression in responsibility and performance as students move towards graduation. At the same time, the assessment methods that are in place call upon the knowledge from both the core courses and the substantive and current content presented in the non-core curriculum.

The breadth requirement for the proposed Bachelor of Technology (Digital Health) (Honours) program adheres to the Board's benchmarks for balancing core and non-core studies, but it also benefits the graduates and the broader community of which the graduates will be a part. This is possible through the development of detailed, focused, non-core courses that, in addition to providing elective choices, demonstrate a serious commitment to the transferable skills found in a variety of modes of analysis outside the core field of study. Students have access to breadth and depth in their non-core studies. The learning opportunities in mandatory non-core courses ensure that students develop more than an introductory knowledge in a range of disciplines. Beginning in the first year, communication skills, quantitative reasoning and critical thinking are addressed in discrete courses, and the development of this knowledge and these skills are encouraged throughout the program. Using these skills, students have the opportunity through other mandatory non-core courses (e.g., Introduction to Sociology) and free electives to develop an understanding of a variety of content areas that will further enhance their future work in diverse settings. Content related to Ontario and Canada will play a substantial role in content area examination, but the realities of a global marketplace are also a part of the current knowledge in the breadth studies.

The Program Advisory Committee has provided additional assurance that the appropriate levels of Ontario and Canadian content are in place throughout the entire program, in core, non-core and the co-op work term. These experts in the field, employers and sector representatives have confirmed the currency of the curriculum and its relevance to the field. Moreover, they have unanimously endorsed the program (See Section 4.1: Program Advisory Committee).

Section 4.1: Program Advisory Committee

As part of the original development of the proposed Bachelor of Technology (Digital Health) (Honours), members of the Program Advisory Committee (PAC) participated in a half-day focus group intended to provide input and guidance on its development. The PAC met several times between August 2013 and August 2014. The following table contains the membership of the Bachelor of Technology (Digital Health) (Honours) PAC.

Name, Occupation	Employer	Related Credentials	Professional Affiliations
Tyson Roffey, VP & CIO (Interim)	The Hospital for Sick Children (SickKids)	CIPP/IT	International Associations of Privacy Professionals
Carolyn Dupéré, Application Manager, Information Systems	Bruyere Continuing Care	N/A	N/A
Amir Afkham, Senior Project Manager	Champlain Local Health Integration Network	BEng (Hnrs)	COACH: Canada's Health Informatics Association
Melissa Dougherty Director, Nursing Professional Practice/Clinical Informatics, Childbirth & Inpatient Surgery	Queensway Carleton Hospital	Registered Nurse (RN); MSc (Nursing)	Registered Nurses Association of Ontario (RNAO); Canadian Nurses Association (CNA)
Lorraine Hart, EORLA Integrated Quality Manager	Eastern Ontario Regional Laboratory Association	MLT, BMLSc, LQM	Canadian Society for Medical Laboratory Science (CSMLS); Ontario Society of Medical Technologists (OSMT); College of Medical Laboratory Technologists of Ontario (CMLTO)
Wojtek Michalowski, Full Professor, Lead, MET Research Group	Telfer School of Management, University of Ottawa	PhD	Canadian Operations Research Society; Decision Sciences Institute; INFORMS; IEEE Systems, Man, Cybernetics

Name, Occupation	Employer	Related Credentials	Professional Affiliations
Ernie Dal Grande, National Manager - eHealth Infostructure Program (Retired)	Health Canada - First Nations and Inuit Health Branch (retired)	BA, Politcal Science	N/A
Mary Lou Flemming, Practice Management Consultant	Ontario MD	N/A	N/A
Wayne Gudbranson, CEO (founder)	Branham Group	BA, M.A. (Political Science)	N/A
Todd MacCallum, National Sales Driector	BridgeHead Software	CPHIMS - COACH/HIMSS	President-Elect HIMSS Ontario Chapter
Anthony Mar, CEO and Founder	Cliniconex	N/A	N/A

PROGRAM ADVISORY COMMITTEE
Bachelor of Technology (Digital Health)
MINUTES

The following minutes are in reverse chronological order. As the PAC was crucial to the development of two programs, the following meeting minutes have been modified to reflect only the relevant discussions pertaining to the development of the proposed degree.

MOTION OF SUPPORT FOR BACHELOR OF TECHNOLOGY (DIGITAL HEALTH)

Tyson Roffey MOVED and Anubha Sant SECONDED that the Digital Health Advisory Committee has reviewed the curriculum as presented for the Bachelor of Technology (Digital Health) degree, supports the need for this program in the community, and recommends this program for approval to the President's Council and to the Board of Governors.

March 25, 2015
(Virtual Meeting)

Ernie Dal Grande (PAC Chair) Wednesday, March 25, 2015 11:13 AM

Dear PAC Members good morning.

After a very long winter for all, we are happy to report that Algonquin has completed the course development for the Bachelor of Technology (Digital Health) program. See attached the final version of the program of study for your review.

As you may recall at our last meeting August 26th, 2014, Algonquin outlined a range of challenges in course design to meet a variety of requirements for this degree program. The program of study attached below is the result of an intensive collaborative process. As the program is delivered curriculum updates and modifications will occur during the regular review cycles.

So in order to get the proposed program through the Algonquin internal vetting process a motion of support for this program must be tabled. This is a very similar process to the one we went through for the Graduate Certificate.

The wording of the motion is as follows:

'Name' MOVES that the Bachelor of Technology (Digital Health) Advisory Committee has reviewed the curriculum as presented for the Bachelor of Technology (Digital Health), supports the need for this program in the community, and recommends this program for approval to the President's Council and to the Board of Governors.

I would ask that one PAC member MOVE the motion electronically and that another PAC member SECOND it electronically by using a "reply all". I also ask that the rest of the PAC members indicate their support, either a YES or NO vote using "reply all". I, Ernie Dal Grande, am indicating YES with my support for this program.

Due to Algonquin time constraints, I'm hoping you would please respond electronically by Thursday afternoon.
Thank you and look forward to your responses.

Tyson Roffey Wednesday, March 25, 2015 1:18 PM

Hi, I will move the motion...
Thx
Tyson

Anubha Sant Wednesday, March 25, 2015 3:22 PM
Hello,
I second the motion.
Anubha

Wojtek, Michalowski Wednesday, March 25, 2015 3:25 PM
Yes.

Wojtek Michalowski
Sent from my iPhone

Hart, Lorraine Wednesday, March 25, 2015 3:35 PM
Yes

Michael Pluscauskas Wednesday, March 25, 2015 3:31 PM
Yes forgot to reply all last time)

Michael

Dr.Sandra Irobi Wednesday, March 25, 2015 8:37 PM
Yes!!!

Carolyn Dupéré Thursday, March 26, 2015 8:03 PM
I, Carolyn Dupere, am indicating YES with my support for this program.

Dougherty, Melissa Thursday, March 26, 2015 8:33 PM
Yes.
Thank you.
Melissa Dougherty

Fleming, MaryLou [marylou.fleming@ontariomd.com]
Friday, March 27, 2015 2:55 PM

Yes.

Thank you,
Mary Lou Fleming

ALGONQUIN COLLEGE
Faculty of Health, Public Safety and Community Studies
Digital Health Advisory Committee Meeting
Tuesday August 26, 2014; 13:00-15:00
Woodroffe Campus - P107

Present:

Marlene Tosh, Co-Chair (Algonquin College)	Ann Hogan (TOH-Research)	Tyson Roffey (CHEO)	Andy Pridham - AC (Algonquin College)
Stephen Murphy (Algonquin College)	Lorraine Hart	Wojtek Michalowski	Albert Dudley
Jason Millar (Algonquin College)	Barbara Foulds Dean	Carolyn Dupéré (Bruyere Continuing Care)	Matthew Hull (Recorder) (Algonquin College)
Ernie Dal Grande, Chair (Health Canada)	Todd McCallum Beacon Partners	Kevin Holmes	
Anthony Mar (Cliniconex)	Mike Pluscauskas (Consultant)		

	KEY POINTS	Action Items
1.	**Welcome and Introductions** **Ernie del Grande** • After calling the meeting to order, the chair welcomed all in attendance and gave opportunity for each to introduce themselves. • Ernie clarified that the purpose of the meeting was to update the committee on the POS and the status of the graduate certificate program and to also discuss the current development that has been completed for the degree program offering. The meeting will focus primarily on the degree program as feedback from the committee is important at this point in the development. • Agenda for this meeting was reviewed and approved by the committee.	
2.	**Motion to accept the agenda; Motion to accept minutes of March 27, 2014 PAC meeting.**	
3.	**Bachelor's Degree in Digital Health** • Jason gave a broad overview of the current status of the program development. He shared the program learning outcomes (PLOs), and then he shared the Program of Study as a draft document (attached).	

	KEY POINTS	Action Items
	• The PAC was reminded that the college is developing two degrees under the umbrella title Bachelor of Technology. The Faculty of Advanced Technology will develop the degree in Business Systems Development and the Faculty of Health, Public Safety and Community Studies is creating the degree in Digital Health. Andy Pridham, Chair in Advanced Technology, explained the overlapping of these two degrees. • Jason further clarified that there would likely be a sharing of the same courses in year one, and some more in year two. This would be followed by a streaming to one degree or the other in year three when a definite separation of courses by subject would occur.	
	PAC Discussion of Degree POS • There were many questions and comments about the POS after these initial explanations were presented by Jason. Overall the committee was satisfied with the POS but interested in sharing ideas that might create a better flow in the presentation of courses and knowledge. Comments that were shared include: 1. Members expressed concerns regarding the title "Bachelor of Technology" – Digital Health". The use of the word technology was a concern as some felt "technology" was too vague and for some professionals the term implies too practical without the word academics. Others were comfortable with the title and have no concerns. 2. Two of the members felt that the absence of health courses until year 2 might discourage participants who wanted the digital health stream. It was suggested that students might be bored and lose interest. 3. There were many suggestions regarding the order in which courses needed to be offered and delivered. Several versions were suggested and Jason agreed he would take them all into consideration as development continues. 4. There were additional ideas concerning missing courses like Biomedical Concepts as well as combining courses with Decision Support and Business Analytics. 5. All suggestions were noted and recorded on the electronic documents so they could be considered and integrated as development progresses. Jason encouraged PAC to forward any other ideas or suggestions to him electronically.	Jason to modify POS to take into account PAC suggestions re course flow and content.
6.	**Course Outline Development** • Jason explained and highlighted for PAC the courses that will require development for the digital health stream: Ernie suggested Jason draft a letter and send it to the members so each would have a clear accurate description they could share with potential course writers. All agree this would be helpful. • Jason agreed to draft such a letter.	Jason to draft a letter re course development and send out to PAC.

The meeting adjourned at 15:00

ALGONQUIN COLLEGE

Faculty of Health, Public Safety and Community Studies
Digital Health Advisory Committee Meeting
Thursday March 27, 2014
13:00-15:00
WOODROFFE Campus – P105

Present:

Marlene Tosh, Co-Chair (Algonquin College)	Ann Hogan (TOH-Research)	Tyson Roffey (CHEO)	Andy Pridham (Algonquin College)
Stephen Murphy (Algonquin College)	Kevin Holmes (Algonquin College)	Chris Janzen (Algonquin College)	Michelle Morley (Algonquin College)
Jason Millar (Algonquin College)	Mike Pluscauskas (Consultant)	Carolyn Dupere (Bruyere Continuing Care)	Albert Dudley (Algonquin College)
Ernie Dal Grande, Chair (Retired, Health Canada)	Debra Clendenning	Sandra Irobi (ICTC)	Lorraine Hart (EORLA)
Barb Foulds (Algonquin College)		Alicia Gibson (Recorder) (Algonquin College)	

	KEY POINTS	ACTION ITEMS
1.	**Welcome and Introductions** • Marlene introduced herself, welcomed everyone, and provided a brief description of her role. • Marlene indicated the purpose of the meeting and presented the agenda.	
2.	**Motion to accept the agenda; Motion to accept minutes of Oct 8, 2013 PAC meeting.** • Agenda has been accepted as corrected. • Minutes, Section 7 update: Upon discussion, E-health vs Digital Health program name. Digital Health is a term used broadly within the industry. Revise minutes of Oct. 8 to reflect the fulsome discussion that the committee shared. • Motion to accept the minutes as corrected by T. Roffey.	Marlene
3.	**Bachelor's Degree in Digital Health** 1. Review – PAC Feedback from August Meeting (Jason) • Notes from Jason 2. Draft PLO's (Jason) • Powerpoint from Jason. • Kevin suggested incorporating Consumer Health, International Healthcare Systems, and Finance into the program of study. 3. Program of Study Considerations (Jason & Steve) 50% PhD's subject matter experts will develop the final program of study.	Jason to communicate need for

	KEY POINTS	ACTION ITEMS
	4. Q&A (group) Course Development Process Overview & Timeline Update (Steve)	qualified individuals
4.	**Closing remarks (Jason, Ernie)** • Jason showed his appreciation for the continued support to the program advisory committee. • Marlene suggested another meeting in May to focus on the degree.	

The meeting adjourned at 15:00

NOTE: Please amend the minutes of October 8, 2013, section #7 to reflect:

Members joined in a fulsome discussion regarding the appropriate title for the graduate certificate as well as the degree program. Several comments were made regarding “e-health” which has been used in our discussions to date. Overall members felt this term might carry some negative connotation in the province but more importantly the “e-health” terminology is no longer an accurate or comprehensive descriptor of technology in healthcare. The members concurred healthcare has moved into a digital environment and the new programs should reflect the present day reality. The committee members were in agreement that “digital health” be used as the most appropriate title and descriptor for both programs.

An initial Program Advisory Committee (PAC) meeting was also held on August 27, 2013, during which the PAC participated in a half-day focus group session to determine the content and direction for two Digital Health programs planned for Algonquin College. Notes for this focus group reflect brainstorming ideas of content, factors for consideration and other variables that could inform the future development of these programs.

Section 4.2: Professional Accreditation

BTM is a Canadian Information Processing Society (CIPS) accreditation for technology management programs. The accreditation was developed in 2009, making it a relatively new designation. There are currently eighteen (18) BTM accredited programs at Canadian Colleges and Universities. We are in the process of pursuing BTM accreditation for this proposed Bachelor of Technology (Digital Health) (Honours) program. BTM accreditation can only be finalized once the program graduates its first cohort of students, at which time the program is audited by CIPS. BTM accreditation will give our graduates the opportunity to gain membership as professional CIPS members with BTM certification.

Section 4.3: Learning Outcomes

The proposed Bachelor of Technology (Digital Health) (Honours) has been developed to meet the following degree level program learning outcomes:

The graduate has reliably demonstrated the ability to:

1. Analyze, design, develop, implement and maintain business systems and/or components to support strategic business requirements.
2. Manage the process of evaluating, selecting and using business systems.
3. Apply accepted methodologies, theories, concepts and practices to develop and improve business and healthcare systems.
4. Manage data using appropriate methodologies, and standards to improve healthcare and business processes and decision-making.
5. Apply the Project Management Institute's Body of Knowledge to business systems projects.
6. Apply security principles and practices in systems development and the systems environment.
7. Apply principles and skills of business management, leadership and change management in the context of business systems development.
8. Apply quality assurance and quality management principles to business systems development projects.
9. Educate a diversity of clients in the use of business technology to support, promote and improve business and healthcare processes, and healthy-living initiatives.
10. Apply effective business technology management skills to innovate in digital health targeting new and existing local and global markets.
11. Adhere to professional, ethical and legal codes and standards related to digital health.
12. Conduct and evaluate research to contribute to evidence-based practice in digital health contexts.
13. Identify and apply discipline-specific practices that contribute to the local and global community through social responsibility, economic commitment and environmental stewardship.
14. Analyze and evaluate how digital health solutions influence healthcare business practices, quality of care and patient safety.
15. Assess how differing value judgments associated with the practice of healthcare, business management and information technology impact digital health decision-making.

Alignment of Program Learning Outcomes with Degree Level Standard

	1. Depth and Breadth of Knowledge						2. Knowledge of Methods	3. Application of Knowledge			4. Communication Skills	5. Awareness of Limits of Knowledge	6. Professional Capacity Autonomy		
	a)	b)	c)	d)	e)	f)		a)	b)	c)			a)	b)	c)
Degree level Learning Outcomes	Developed knowledge of key concepts, methodologies, current advances, theoretical approaches and assumptions in the discipline and in a specialized area of a discipline	Inter- and Intra-disciplinary knowledge and relationships	Research, analysis and assessment of hypotheses relevant to one or more of the major fields in a discipline	Research experience in an area of the discipline	Critical thinking and analytical skills inside and outside the discipline	Learning outside the discipline	Methods of enquiry or creative activity, or both, in their primary area of study. (evaluate and devise arguments, and comment on scholarship)	Critical use of qualitative and quantitative information	Use a range of established techniques	Critical use of scholarly reviews and primary sources	Communicate accurately and reliably, orally and in writing, to a range of audiences	Limits to their own knowledge and ability, ambiguity and limits to knowledge and influence analyses and interpretations	Qualities and transferable skills in the area of personal and interpersonal skills	Manage lifelong learning, personally and professionally	Academic integrity and social responsibility
1. Analyze, design, develop, implement and maintain business systems and/or components to support strategic business requirements.	X	X	X	X	X		X	X	X			X		X	

	1. Depth and Breadth of Knowledge						2. Knowledge of Methods	3. Application of Knowledge			4. Communication Skills	5. Awareness of Limits of Knowledge	6. Professional Capacity Autonomy		
	a)	b)	c)	d)	e)	f)		a)	b)	c)			a)	b)	c)
Degree level Learning Outcomes	Developed knowledge of key concepts, methodologies, current advances, theoretical approaches and assumptions in the discipline and in a specialized area of a discipline	Inter- and Intra-disciplinary knowledge and relationships	Research, analysis and assessment of hypotheses relevant to one or more of the major fields in a discipline	Research experience in an area of the discipline	Critical thinking and analytical skills inside and outside the discipline	Learning outside the discipline	Methods of enquiry or creative activity, or both, in their primary area of study. (evaluate and devise arguments, and comment on scholarship)	Critical use of qualitative and quantitative information	Use a range of established techniques	Critical use of scholarly reviews and primary sources	Communicate accurately and reliably, orally and in writing, to a range of audiences	Limits to their own knowledge and ability, ambiguity and limits to knowledge and influence analyses and interpretations	Qualities and transferable skills in the area of personal and interpersonal skills	Manage lifelong learning, personally and professionally	Academic integrity and social responsibility
2. Manage the process of evaluating, selecting and using business systems.	X	X	X	X	X		X	X			X		X	X	
3. Apply accepted methodologies, theories, concepts and practices to develop and improve business and healthcare systems.	X		X	X	X		X	X	X	X	X		X		X

Degree level Learning Outcomes	1. Depth and Breadth of Knowledge						2. Knowledge of Methods	3. Application of Knowledge			4. Communication Skills	5. Awareness of Limits of Knowledge	6. Professional Capacity Autonomy		
	a)	b)	c)	d)	e)	f)		a)	b)	c)			a)	b)	c)
	Developed knowledge of key concepts, methodologies, current advances, theoretical approaches and assumptions in the discipline and in a specialized area of a discipline	Inter- and Intra-disciplinary knowledge and relationships	Research, analysis and assessment of hypotheses relevant to one or more of the major fields in a discipline	Research experience in an area of the discipline	Critical thinking and analytical skills inside and outside the discipline	Learning outside the discipline	Methods of enquiry or creative activity, or both, in their primary area of study. (evaluate and devise arguments, and comment on scholarship)	Critical use of qualitative and quantitative information	Use a range of established techniques	Critical use of scholarly reviews and primary sources	Communicate accurately and reliably, orally and in writing, to a range of audiences	Limits to their own knowledge and ability, ambiguity and limits to knowledge and influence analyses and interpretations	Qualities and transferable skills in the area of personal and interpersonal skills	Manage lifelong learning, personally and professionally	Academic integrity and social responsibility
4. Manage data using appropriate methodologies, and standards to improve healthcare and business processes and decision-making.	X	X	X	X	X		X	X	X						X
5. Apply the Project Management Institute's Body of Knowledge to business systems projects.	X	X			X		X	X	X		X		X		

	1. Depth and Breadth of Knowledge						2. Knowledge of Methods	3. Application of Knowledge			4. Communication Skills	5. Awareness of Limits of Knowledge	6. Professional Capacity Autonomy		
	a)	b)	c)	d)	e)	f)		a)	b)	c)			a)	b)	c)
Degree level Learning Outcomes	Developed knowledge of key concepts, methodologies, current advances, theoretical approaches and assumptions in the discipline and in a specialized area of a discipline	Inter- and Intra-disciplinary knowledge and relationships	Research, analysis and assessment of hypotheses relevant to one or more of the major fields in a discipline	Research experience in an area of the discipline	Critical thinking and analytical skills inside and outside the discipline	Learning outside the discipline	Methods of enquiry or creative activity, or both, in their primary area of study. (evaluate and devise arguments, and comment on scholarship)	Critical use of qualitative and quantitative information	Use a range of established techniques	Critical use of scholarly reviews and primary sources	Communicate accurately and reliably, orally and in writing, to a range of audiences	Limits to their own knowledge and ability, ambiguity and limits to knowledge and influence analyses and interpretations	Qualities and transferable skills in the area of personal and interpersonal skills	Manage lifelong learning, personally and professionally	Academic integrity and social responsibility
6. Apply security principles and practices in systems development and the systems environment.	X		X		X		X		X						

	1. Depth and Breadth of Knowledge						2. Knowledge of Methods	3. Application of Knowledge			4. Communication Skills	5. Awareness of Limits of Knowledge	6. Professional Capacity Autonomy		
	a)	b)	c)	d)	e)	f)		a)	b)	c)			a)	b)	c)
Degree level Learning Outcomes	Developed knowledge of key concepts, methodologies, current advances, theoretical approaches and assumptions in the discipline and in a specialized area of a discipline	Inter- and Intra-disciplinary knowledge and relationships	Research, analysis and assessment of hypotheses relevant to one or more of the major fields in a discipline	Research experience in an area of the discipline	Critical thinking and analytical skills inside and outside the discipline	Learning outside the discipline	Methods of enquiry or creative activity, or both, in their primary area of study. (evaluate and devise arguments, and comment on scholarship)	Critical use of qualitative and quantitative information	Use a range of established techniques	Critical use of scholarly reviews and primary sources	Communicate accurately and reliably, orally and in writing, to a range of audiences	Limits to their own knowledge and ability, ambiguity and limits to knowledge and influence analyses and interpretations	Qualities and transferable skills in the area of personal and interpersonal skills	Manage lifelong learning, personally and professionally	Academic integrity and social responsibility
7. Apply principles and skills of business management, leadership and change management in the context of business systems development.	X	X			X		X	X	X		X		X	X	

	1. Depth and Breadth of Knowledge						2. Knowledge of Methods	3. Application of Knowledge			4. Communication Skills	5. Awareness of Limits of Knowledge	6. Professional Capacity Autonomy		
	a)	b)	c)	d)	e)	f)		a)	b)	c)			a)	b)	c)
Degree level Learning Outcomes	Developed knowledge of key concepts, methodologies, current advances, theoretical approaches and assumptions in the discipline and in a specialized area of a discipline	Inter- and Intra-disciplinary knowledge and relationships	Research, analysis and assessment of hypotheses relevant to one or more of the major fields in a discipline	Research experience in an area of the discipline	Critical thinking and analytical skills inside and outside the discipline	Learning outside the discipline	Methods of enquiry or creative activity, or both, in their primary area of study. (evaluate and devise arguments, and comment on scholarship)	Critical use of qualitative and quantitative information	Use a range of established techniques	Critical use of scholarly reviews and primary sources	Communicate accurately and reliably, orally and in writing, to a range of audiences	Limits to their own knowledge and ability, ambiguity and limits to knowledge and influence analyses and interpretations	Qualities and transferable skills in the area of personal and interpersonal skills	Manage lifelong learning, personally and professionally	Academic integrity and social responsibility
8. Apply quality assurance and quality management principles to business systems development projects.	X		X		X		X	X	X		X				

	1. Depth and Breadth of Knowledge						2. Knowledge of Methods	3. Application of Knowledge			4. Communication Skills	5. Awareness of Limits of Knowledge	6. Professional Capacity Autonomy		
	a)	b)	c)	d)	e)	f)		a)	b)	c)			a)	b)	c)
Degree level Learning Outcomes	Developed knowledge of key concepts, methodologies, current advances, theoretical approaches and assumptions in the discipline and in a specialized area of a discipline	Inter- and Intra-disciplinary knowledge and relationships	Research, analysis and assessment of hypotheses relevant to one or more of the major fields in a discipline	Research experience in an area of the discipline	Critical thinking and analytical skills inside and outside the discipline	Learning outside the discipline	Methods of enquiry or creative activity, or both, in their primary area of study. (evaluate and devise arguments, and comment on scholarship)	Critical use of qualitative and quantitative information	Use a range of established techniques	Critical use of scholarly reviews and primary sources	Communicate accurately and reliably, orally and in writing, to a range of audiences	Limits to their own knowledge and ability, ambiguity and limits to knowledge and influence analyses and interpretations	Qualities and transferable skills in the area of personal and interpersonal skills	Manage lifelong learning, personally and professionally	Academic integrity and social responsibility
9. Educate a diversity of clients in the use of business technology to support, promote and improve business and healthcare processes, and healthy-living initiatives.		X			X				X	X	X			X	X

	1. Depth and Breadth of Knowledge						2. Knowledge of Methods	3. Application of Knowledge			4. Communication Skills	5. Awareness of Limits of Knowledge	6. Professional Capacity Autonomy		
	a)	b)	c)	d)	e)	f)		a)	b)	c)			a)	b)	c)
Degree level Learning Outcomes	Developed knowledge of key concepts, methodologies, current advances, theoretical approaches and assumptions in the discipline and in a specialized area of a discipline	Inter- and Intra-disciplinary knowledge and relationships	Research, analysis and assessment of hypotheses relevant to one or more of the major fields in a discipline	Research experience in an area of the discipline	Critical thinking and analytical skills inside and outside the discipline	Learning outside the discipline	Methods of enquiry or creative activity, or both, in their primary area of study. (evaluate and devise arguments, and comment on scholarship)	Critical use of qualitative and quantitative information	Use a range of established techniques	Critical use of scholarly reviews and primary sources	Communicate accurately and reliably, orally and in writing, to a range of audiences	Limits to their own knowledge and ability, ambiguity and limits to knowledge and influence analyses and interpretations	Qualities and transferable skills in the area of personal and interpersonal skills	Manage lifelong learning, personally and professionally	Academic integrity and social responsibility
10. Apply effective business technology management skills to innovate in digital health targeting new and existing local and global markets.		X	X	X	X		X	X	X	X	X	X	X	X	X

Degree level Learning Outcomes	1. Depth and Breadth of Knowledge						2. Knowledge of Methods	3. Application of Knowledge			4. Communication Skills	5. Awareness of Limits of Knowledge	6. Professional Capacity Autonomy		
	a)	b)	c)	d)	e)	f)		a)	b)	c)			a)	b)	c)
	Developed knowledge of key concepts, methodologies, current advances, theoretical approaches and assumptions in the discipline and in a specialized area of a discipline	Inter- and Intra-disciplinary knowledge and relationships	Research, analysis and assessment of hypotheses relevant to one or more of the major fields in a discipline	Research experience in an area of the discipline	Critical thinking and analytical skills inside and outside the discipline	Learning outside the discipline	Methods of enquiry or creative activity, or both, in their primary area of study. (evaluate and devise arguments, and comment on scholarship)	Critical use of qualitative and quantitative information	Use a range of established techniques	Critical use of scholarly reviews and primary sources	Communicate accurately and reliably, orally and in writing, to a range of audiences	Limits to their own knowledge and ability, ambiguity and limits to knowledge and influence analyses and interpretations	Qualities and transferable skills in the area of personal and interpersonal skills	Manage lifelong learning, personally and professionally	Academic integrity and social responsibility
11. Adhere to professional, ethical and legal codes and standards related to digital health.	X				X		X	X	X	X		X	X	X	X
12. Conduct and evaluate research to contribute to evidence-based practice in digital health contexts.	X		X	X	X		X	X	X	X	X	X		X	X

	1. Depth and Breadth of Knowledge						2. Knowledge of Methods	3. Application of Knowledge			4. Communication Skills	5. Awareness of Limits of Knowledge	6. Professional Capacity Autonomy		
	a)	b)	c)	d)	e)	f)		a)	b)	c)			a)	b)	c)
Degree level Learning Outcomes	Developed knowledge of key concepts, methodologies, current advances, theoretical approaches and assumptions in the discipline and in a specialized area of a discipline	Inter- and Intra-disciplinary knowledge and relationships	Research, analysis and assessment of hypotheses relevant to one or more of the major fields in a discipline	Research experience in an area of the discipline	Critical thinking and analytical skills inside and outside the discipline	Learning outside the discipline	Methods of enquiry or creative activity, or both, in their primary area of study. (evaluate and devise arguments, and comment on scholarship)	Critical use of qualitative and quantitative information	Use a range of established techniques	Critical use of scholarly reviews and primary sources	Communicate accurately and reliably, orally and in writing, to a range of audiences	Limits to their own knowledge and ability, ambiguity and limits to knowledge and influence analyses and interpretations	Qualities and transferable skills in the area of personal and interpersonal skills	Manage lifelong learning, personally and professionally	Academic integrity and social responsibility
13. Identify and apply discipline-specific practices that contribute to the local and global community through social responsibility, economic commitment and environmental stewardship.		X			X			X	X	X		X		X	X

	1. Depth and Breadth of Knowledge						2. Knowledge of Methods	3. Application of Knowledge			4. Communication Skills	5. Awareness of Limits of Knowledge	6. Professional Capacity Autonomy		
	a)	b)	c)	d)	e)	f)		a)	b)	c)			a)	b)	c)
Degree level Learning Outcomes	Developed knowledge of key concepts, methodologies, current advances, theoretical approaches and assumptions in the discipline and in a specialized area of a discipline	Inter- and Intra-disciplinary knowledge and relationships	Research, analysis and assessment of hypotheses relevant to one or more of the major fields in a discipline	Research experience in an area of the discipline	Critical thinking and analytical skills inside and outside the discipline	Learning outside the discipline	Methods of enquiry or creative activity, or both, in their primary area of study. (evaluate and devise arguments, and comment on scholarship)	Critical use of qualitative and quantitative information	Use a range of established techniques	Critical use of scholarly reviews and primary sources	Communicate accurately and reliably, orally and in writing, to a range of audiences	Limits to their own knowledge and ability, ambiguity and limits to knowledge and influence analyses and interpretations	Qualities and transferable skills in the area of personal and interpersonal skills	Manage lifelong learning, personally and professionally	Academic integrity and social responsibility
14. Analyze and evaluate how digital health solutions influence healthcare business practices, quality of care and patient safety.	X	X	X	X	X		X	X	X	X				X	X

	1. Depth and Breadth of Knowledge						2. Knowledge of Methods	3. Application of Knowledge			4. Communication Skills	5. Awareness of Limits of Knowledge	6. Professional Capacity Autonomy		
	a)	b)	c)	d)	e)	f)		a)	b)	c)			a)	b)	c)
Degree level Learning Outcomes	Developed knowledge of key concepts, methodologies, current advances, theoretical approaches and assumptions in the discipline and in a specialized area of a discipline	Inter- and Intra-disciplinary knowledge and relationships	Research, analysis and assessment of hypotheses relevant to one or more of the major fields in a discipline	Research experience in an area of the discipline	Critical thinking and analytical skills inside and outside the discipline	Learning outside the discipline	Methods of enquiry or creative activity, or both, in their primary area of study. (evaluate and devise arguments, and comment on scholarship)	Critical use of qualitative and quantitative information	Use a range of established techniques	Critical use of scholarly reviews and primary sources	Communicate accurately and reliably, orally and in writing, to a range of audiences	Limits to their own knowledge and ability, ambiguity and limits to knowledge and influence analyses and interpretations	Qualities and transferable skills in the area of personal and interpersonal skills	Manage lifelong learning, personally and professionally	Academic integrity and social responsibility
15. Assess how differing value judgments associated with the practice of healthcare, business management and information technology impact digital health decision-making.		X			X		X	X		X	X				

Mapping of Core and Non-Core Courses to Program Learning Outcomes

Course Number	Course Name	1 Analyze, design, develop, implement and maintain business systems and/or components to support strategic business requirements.	2 Manage the process of evaluating, selecting and using business systems.	3 Apply accepted methodologies, theories, concepts and practices to develop and improve business and healthcare systems.	4 Manage data using appropriate methodologies, and standards to improve healthcare and business processes and decision-making.	5 Apply the Project Management Institute's Body of Knowledge to business systems projects.	6 Apply security principles and practices in systems development and the systems environment.	7 Apply principles and skills of business management, leadership and change management in the context of business systems development.	8 Apply quality assurance and quality management principles to business systems development projects.	9 Educate a diversity of clients in the use of business technology to support, promote and improve business and healthcare processes, and healthy-living initiatives.	10 Apply effective business technology management skills to innovate in digital health targeting new and existing local and global markets.	11 Adhere to professional, ethical and legal codes and standards related to digital health.	12 Conduct and evaluate research to contribute to evidence-based practice in digital health contexts.	13 Identify and apply discipline-specific practices that contribute to the local and global community through social responsibility, economic commitment and environmental stewardship.	14 Analyze and evaluate how digital health solutions influence healthcare business practices, quality of care and patient safety.	15 Assess how differing value judgments associated with the practice of healthcare, business management, and information technology impact digital health decision-making.
Semester 01																
MGT4102	Business Fundamentals	X						X		X				X		
CST3100	Introduction to Computer Programming	X		X			X					X				
CST3101	Database Design Fundamentals			X	X				X			X				
MAT1100	Mathematics for Programming	X		X												
ENL1100	Communications and Academic Writing	This course is a non-core course that contributes to a breadth of knowledge outside the main field of study.														

Course Number	Course Name	1 Analyze, design, develop, implement and maintain business systems and/or components to support strategic business requirements.	2 Manage the process of evaluating, selecting and using business systems.	3 Apply accepted methodologies, theories, concepts and practices to develop and improve business and healthcare systems.	4 Manage data using appropriate methodologies, and standards to improve healthcare and business processes and decision-making.	5 Apply the Project Management Institute's Body of Knowledge to business systems projects.	6 Apply security principles and practices in systems development and the systems environment.	7 Apply principles and skills of business management, leadership and change management in the context of business systems development.	8 Apply quality assurance and quality management principles to business systems development projects.	9 Educate a diversity of clients in the use of business technology to support, promote and improve business and healthcare processes, and healthy-living initiatives.	10 Apply effective business technology management skills to innovate in digital health targeting new and existing local and global markets.	11 Adhere to professional, ethical and legal codes and standards related to digital health.	12 Conduct and evaluate research to contribute to evidence-based practice in digital health contexts.	13 Identify and apply discipline-specific practices that contribute to the local and global community through social responsibility, economic commitment and environmental stewardship.	14 Analyze and evaluate how digital health solutions influence healthcare business practices, quality of care and patient safety.	15 Assess how differing value judgments associated with the practice of healthcare, business management, and information technology impact digital health decision-making.
Semester 02																
ACC4101	Financial Accounting	X		X					X			X		X		
CST3102	Programming	X		X			X					X				
CST3103	Data Communications and Networking			X	X		X				X					
BUS0006	Value Creation in Healthcare	X						X		X		X	X	X		
PHI1000	Logic and Critical Thinking	This course is a non-core course that contributes to a breadth of knowledge outside the main field of study.														
Semester 03																
ESC4300	Basics of Supply Chain Management		X	X				X	X		X					

Course Number	Course Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Analyze, design, develop, implement and maintain business systems and/or components to support strategic business requirements.	Manage the process of evaluating, selecting and using business systems.	Apply accepted methodologies, theories, concepts and practices to develop and improve business and healthcare systems.	Manage data using appropriate methodologies, and standards to improve healthcare and business processes and decision-making.	Apply the Project Management Institute's Body of Knowledge to business systems projects.	Apply security principles and practices in systems development and the systems environment.	Apply principles and skills of business management, leadership and change management in the context of business systems development.	Apply quality assurance and quality management principles to business systems development projects.	Educate a diversity of clients in the use of business technology to support, promote and improve business and healthcare processes, and healthy-living initiatives.	Apply effective business technology management skills to innovate in digital health targeting new and existing local and global markets.	Adhere to professional, ethical and legal codes and standards related to digital health.	Conduct and evaluate research to contribute to evidence-based practice in digital health contexts.	Identify and apply discipline-specific practices that contribute to the local and global community through social responsibility, economic commitment and environmental stewardship.	Analyze and evaluate how digital health solutions influence healthcare business practices, quality of care and patient safety.	Assess how differing value judgments associated with the practice of healthcare, business management, and information technology impact digital health decision-making.
CST3104	Introduction to Mobile Application Development	X		X			X									
CST3105	Advanced Database Design and SQL				X		X		X		X	X			X	X
CST3106	Internet Architecture and Web Development	X		X			X					X				
HLT0280	Introduction to the Canadian Healthcare System									X		X		X		X

Course Number	Course Name	1 Analyze, design, develop, implement and maintain business systems and/or components to support strategic business requirements.	2 Manage the process of evaluating, selecting and using business systems.	3 Apply accepted methodologies, theories, concepts and practices to develop and improve business and healthcare systems.	4 Manage data using appropriate methodologies, and standards to improve healthcare and business processes and decision-making.	5 Apply the Project Management Institute's Body of Knowledge to business systems projects.	6 Apply security principles and practices in systems development and the systems environment.	7 Apply principles and skills of business management, leadership and change management in the context of business systems development.	8 Apply quality assurance and quality management principles to business systems development projects.	9 Educate a diversity of clients in the use of business technology to support, promote and improve business and healthcare processes, and healthy-living initiatives.	10 Apply effective business technology management skills to innovate in digital health targeting new and existing local and global markets.	11 Adhere to professional, ethical and legal codes and standards related to digital health.	12 Conduct and evaluate research to contribute to evidence-based practice in digital health contexts.	13 Identify and apply discipline-specific practices that contribute to the local and global community through social responsibility, economic commitment and environmental stewardship.	14 Analyze and evaluate how digital health solutions influence healthcare business practices, quality of care and patient safety.	15 Assess how differing value judgments associated with the practice of healthcare, business management, and information technology impact digital health decision-making.
CST3107	Operating Systems	X					X				X				X	
Semester 04																
BUS0008	Business Analytics and Advanced Business Intelligence			X	X				X	X		X				
ECO4201	Macroeconomics							X		X	X					
CST3109	Business Systems Requirements Analysis		X				X		X			X	X	X		
HLT0281	Healthcare Concepts			X								X		X	X	
HLT0282	Health Records and Data Standards		X	X	X				X			X			X	

Course Number	Course Name	1 Analyze, design, develop, implement and maintain business systems and/or components to support strategic business requirements.	2 Manage the process of evaluating, selecting and using business systems.	3 Apply accepted methodologies, theories, concepts and practices to develop and improve business and healthcare systems.	4 Manage data using appropriate methodologies, and standards to improve healthcare and business processes and decision-making.	5 Apply the Project Management Institute's Body of Knowledge to business systems projects.	6 Apply security principles and practices in systems development and the systems environment.	7 Apply principles and skills of business management, leadership and change management in the context of business systems development.	8 Apply quality assurance and quality management principles to business systems development projects.	9 Educate a diversity of clients in the use of business technology to support, promote and improve business and healthcare processes, and healthy-living initiatives.	10 Apply effective business technology management skills to innovate in digital health targeting new and existing local and global markets.	11 Adhere to professional, ethical and legal codes and standards related to digital health.	12 Conduct and evaluate research to contribute to evidence-based practice in digital health contexts.	13 Identify and apply discipline-specific practices that contribute to the local and global community through social responsibility, economic commitment and environmental stewardship.	14 Analyze and evaluate how digital health solutions influence healthcare business practices, quality of care and patient safety.	15 Assess how differing value judgments associated with the practice of healthcare, business management, and information technology impact digital health decision-making.
PHI2000	Introduction to Research	This course is a non-core course that contributes to a breadth of knowledge outside the main field of study.														
Semester 05																
BUS0007	Strategic Business Intelligence		X					X		X		X				
CST3110	Enterprise Architecture		X	X			X					X				
CST3112	Business Systems Design and Implementation	X	X		X		X		X			X				
CST3111	Project Management for IT		X	X		X		X				X				
QUA2000	Statistics	This course is a non-core course that contributes to a breadth of knowledge outside the main field of study.														
Semester 06																

Course Number	Course Name	1 Analyze, design, develop, implement and maintain business systems and/or components to support strategic business requirements.	2 Manage the process of evaluating, selecting and using business systems.	3 Apply accepted methodologies, theories, concepts and practices to develop and improve business and healthcare systems.	4 Manage data using appropriate methodologies, and standards to improve healthcare and business processes and decision-making.	5 Apply the Project Management Institute's Body of Knowledge to business systems projects.	6 Apply security principles and practices in systems development and the systems environment.	7 Apply principles and skills of business management, leadership and change management in the context of business systems development.	8 Apply quality assurance and quality management principles to business systems development projects.	9 Educate a diversity of clients in the use of business technology to support, promote and improve business and healthcare processes, and healthy-living initiatives.	10 Apply effective business technology management skills to innovate in digital health targeting new and existing local and global markets.	11 Adhere to professional, ethical and legal codes and standards related to digital health.	12 Conduct and evaluate research to contribute to evidence-based practice in digital health contexts.	13 Identify and apply discipline-specific practices that contribute to the local and global community through social responsibility, economic commitment and environmental stewardship.	14 Analyze and evaluate how digital health solutions influence healthcare business practices, quality of care and patient safety.	15 Assess how differing value judgments associated with the practice of healthcare, business management, and information technology impact digital health decision-making.
MGT0107	Business Technology Management		C	X			C	X		X	C					
HLT0283	Human Factors and Workflow Analysis	X	X	X						X		X			X	X
HLT0284	Change Management		X					C		C		X	X		X	X
HLT0285	Health Ethics, Privacy, and the Law			X	X							X		C	X	C
SOC2000	Introduction to Sociology	This course is a non-core course that contributes to a breadth of knowledge outside the main field of study.														
Co-op Work Term																
WKT0013	Co-op Work Term															
Semester 07																

Course Number	Course Name	1 Analyze, design, develop, implement and maintain business systems and/or components to support strategic business requirements.	2 Manage the process of evaluating, selecting and using business systems.	3 Apply accepted methodologies, theories, concepts and practices to develop and improve business and healthcare systems.	4 Manage data using appropriate methodologies, and standards to improve healthcare and business processes and decision-making.	5 Apply the Project Management Institute's Body of Knowledge to business systems projects.	6 Apply security principles and practices in systems development and the systems environment.	7 Apply principles and skills of business management, leadership and change management in the context of business systems development.	8 Apply quality assurance and quality management principles to business systems development projects.	9 Educate a diversity of clients in the use of business technology to support, promote and improve business and healthcare processes, and healthy-living initiatives.	10 Apply effective business technology management skills to innovate in digital health targeting new and existing local and global markets.	11 Adhere to professional, ethical and legal codes and standards related to digital health.	12 Conduct and evaluate research to contribute to evidence-based practice in digital health contexts.	13 Identify and apply discipline-specific practices that contribute to the local and global community through social responsibility, economic commitment and environmental stewardship.	14 Analyze and evaluate how digital health solutions influence healthcare business practices, quality of care and patient safety.	15 Assess how differing value judgments associated with the practice of healthcare, business management, and information technology impact digital health decision-making.
BUS0010	Business Systems Security, Audit and Control						C		C			X				
CST3115	Enterprise Mobile Application Development	X	X		X							X				
HLT0286	Decision Support in Healthcare	X		C								X	C		C	
HLT0287	Project I	C	C	C	X	C			X		C	C		C		
	Elective	Students choose a non-core course that contributes to a breadth of knowledge outside the main field of study.														
	Elective	Students choose a non-core course that contributes to a breadth of knowledge outside the main field of study.														
Semester 08																
MGT6120	Entrepreneurship							X		X		X		X		
HLT0288	Healthcare Quality Improvement	X		X	X				C	X					C	C
HLT0289	Project II	C	C	C	C	C	C	C	C	C	C	C	C			

Course Number	Course Name	1 Analyze, design, develop, implement and maintain business systems and/or components to support strategic business requirements.	2 Manage the process of evaluating, selecting and using business systems.	3 Apply accepted methodologies, theories, concepts and practices to develop and improve business and healthcare systems.	4 Manage data using appropriate methodologies, and standards to improve healthcare and business processes and decision-making.	5 Apply the Project Management Institute's Body of Knowledge to business systems projects.	6 Apply security principles and practices in systems development and the systems environment.	7 Apply principles and skills of business management, leadership and change management in the context of business systems development.	8 Apply quality assurance and quality management principles to business systems development projects.	9 Educate a diversity of clients in the use of business technology to support, promote and improve business and healthcare processes, and healthy-living initiatives.	10 Apply effective business technology management skills to innovate in digital health targeting new and existing local and global markets.	11 Adhere to professional, ethical and legal codes and standards related to digital health.	12 Conduct and evaluate research to contribute to evidence-based practice in digital health contexts.	13 Identify and apply discipline-specific practices that contribute to the local and global community through social responsibility, economic commitment and environmental stewardship.	14 Analyze and evaluate how digital health solutions influence healthcare business practices, quality of care and patient safety.	15 Assess how differing value judgments associated with the practice of healthcare, business management, and information technology impact digital health decision-making.
	Elective	Students choose a non-core course that contributes to a breadth of knowledge outside the main field of study.														
	Elective	Students choose a non-core course that contributes to a breadth of knowledge outside the main field of study.														

Section 4.4: Course Descriptions

This section provides a listing of the course descriptions for all courses that are a part of the proposed Bachelor of Technology (Digital Health) (Honours) program.

These are the course descriptions that would appear in the academic calendar, and other related documentation. For the presentation of these descriptions, the courses have been divided into

- Core courses
- Non-core courses

Course Descriptions for Core Courses

Year and Semester	Course Number/Course Title	Calendar Course Description
YEAR 1 **Semester 1**	MGT4102 - Business Fundamentals	In today's growing global economy, organizations are facing many new, diverse and competing challenges that have significant impact on their organizations. Students discover the essential management concepts of planning, organizing, leading and controlling. Other topics include human resources, strategy, decision making, ethics and social responsibility, as well as organizational culture and change. Students apply various theoretical frameworks utilizing tools including case methodology, terms and discussions.
YEAR 1 **Semester 1**	CST3100 - Introduction to Computer Programming	The underlying technical core of business systems is an effective and efficient implementation of program code. Through technical introduction to the fundamentals of programming with Java, students develop concise, robust and efficient code. Students examine the concepts of object-oriented programming and use pseudo code to provide a descriptive framework for algorithm development. Emphasis is on problem-solving and fundamental logic skills as well as documentation, both in-line and high-level, to underscore the importance of readability and maintainability. A key focus is top-down design, and effective testing and debugging techniques. To establish the necessary background, students use an Integrated Development Environment (IDE) as well as use program development, implementation and execution procedures and strategies, and also machine-level representation of data and common language control constructs.

Year and Semester	Course Number/Course Title	Calendar Course Description
YEAR 1 **Semester 1**	CST3101 – Database Design Fundamentals	Modern business systems rely on fast information storage, processing and retrieval for everyday operations and strategic decision making. Storing data in well-structured and standard format is an important key towards achieving efficiency and speed. Throughout the course, students acquire a theoretical and practical understanding of database systems, types, design and applications. Course components consist of theoretical and hands-on design of databases based on industry standards, such as SQL. Industry case studies focus on data use, data security, cloud-based options, database design, implementation and normalization.
YEAR 1 **Semester 1**	MAT8003 – Mathematics for Programming	The core foundation of all computer science is mathematics. Students examine elementary discrete mathematics for computer science, knowledge that forms the basis of algorithm and data structure efficiency analysis. Emphasis is on mathematical definitions, proofs, and applicable methods. The topics include formal logic notation, Boolean logic, simple logic gates, proof methods, induction, well-ordering, sets, relations, elementary graph theory, integer congruencies, asymptotic notation and growth of functions, permutations and combinations, counting principles, discrete probability, linear algebra and matrix theory.
YEAR 1 **Semester 2**	ACC4101 – Financial Accounting	Generally accepted accounting principles are widely used as benchmarks throughout business. Students explore the role of financial accounting from a user perspective. They also engage with the preparation, use and analysis of financial statements and concepts of accrual accounting, in the context of various forms of business organizations and internal control issues.

Year and Semester	Course Number/Course Title	Calendar Course Description
YEAR 1 **Semester 2**	CST3102 – Programming	The de facto development paradigm for mobile and enterprise systems is object based. This course explores the fundamentals of object-oriented design and programming. Students learn to create and manipulate reusable objects, encapsulate data and logic within a class, inherit one class from another and implement polymorphism and exception handling. Topics may include design patterns, Java APIs, J-Unit testing framework and graphical user interface fundamentals. **Pre-requisite:** CST3100 - Introduction to Computer Programming; MAT8003 – Mathematics for Programming
YEAR 1 **Semester 2**	CST3103 – Data Communications and Networking	Business decision-makers increasingly demand and rely on immediate access to accurate and secure information. Students examine the concepts, components, implementation and operation of computer networks in personal area networks, local area networks, wireless networks, wide area networks, and on the internet. Knowledge of the communication layers is examined using the OSI reference model and in particular the TCP/IP protocol suite and Ethernet. Students evaluate risks, network security, vulnerabilities and mitigation strategies. Guided by sound theoretical knowledge, students also examine materials from the Cisco Network Academy Program CCNA Exploration Networking Fundamentals, CompTIA Network+ Certification as well as analyze industry case studies.
YEAR 1 **Semester 2**	BUS0006 – Value Creation in Healthcare	All organizations create value for stakeholders through the management actions, business models, and ethical decisions made in relation to internal culture and external environment. To gain multiple perspectives on value creation in the field of healthcare, students explore and analyze the stakeholder management process and decision-making framework of organizations. With the help of industry professionals, case studies and collaborative tools, students examine and apply value creation concepts and methodology to contemporary scenarios.

Year and Semester	Course Number/Course Title	Calendar Course Description
YEAR 2 **Semester 3**	ESC4300 – Basics of Supply Chain Management	From a planning point of view, the need to balance demand and supply is paramount in today's business world. Students explore the concepts of managing an integrated supply chain system. Emphasis is placed on recognizing the need for developing customer-supplier relationships throughout the supply chain and true frontend to back end integration. Topics include elements of the supply chain, integrated and collaborative planning, ERP, demand management, logistics, scheduling and capacity management purchasing.
YEAR 2 **Semester 3**	CST3104 – Introduction to Mobile Application Development	Mobile devices, such as smartphones and tablets, are omnipresent and have come to dominate the landscape of mobile computing. Students examine the foundations of programming mobile applications for the Android operating system using an Integrated Development Environment (IDE) and basic mobile programming and security concepts to build applications for the smartphone and tablet. Keys topics include object-oriented database APIs, animation, multi-threading, networking and performance considerations. Particular emphasis is on user interface design for mobile devices and user interactions using multi-touch technologies. **Pre-requisite:** CST3102 - Programming, CST3101 - Database Design Fundamentals, CST3103 - Data Communications and Networking
YEAR 2 **Semester 3**	CST3105 – Advanced Database Design and SQL	Increasingly, businesses face challenges involved with handling volumes of large and complex data. The ability to effectively store, manage, access and communicate with databases requires practical knowledge of advanced database features. Students evaluate and apply methodologies for design, analysis, scalability and evaluation of database systems. Students gain advanced understanding and practical experience in SQL, PLSQL programming, advanced engineering modeling tools, rollup and cube operations, transaction control, and data warehousing, cloud-based database services and security. **Pre-requisite:** CST3101 - Database Design Fundamentals

Year and Semester	Course Number/Course Title	Calendar Course Description
YEAR 2 **Semester 3**	CST3106 – Internet Architecture and Web Development	Internet-based services are a key foundation of e-Commerce systems. Students explore the infrastructure, both in terms of networking and services, of the Internet. Students review the classical client-server architecture, explore cloud-based services as well as the concepts of Service-Oriented-Architecture (SOA) and Software-As-A-Service (SAAS). By applying principles of graphical user interface design for both browser technology and mobile devices, students define structure and content of web pages through the use of markup and scripting languages. Special emphasis is on services that provide secure remote access to enterprise database systems. **Pre-requisite:** CST3102 - Programming, CST3103 - Data Communications and Networking, CST3104 – Introduction to Mobile Application Development
YEAR 2 **Semester 3**	HLT0280 – Introduction to the Canadian Healthcare System	The Canadian healthcare system is a complex mix of jurisdictions, payment methods, delivery systems, care providers, and views of wellness and illness that those who work in healthcare and with health professionals should understand. Students explore federal, provincial/territorial and local government responsibilities for healthcare and public financing. Focus is on how healthcare agencies provide healthcare to individuals, families, groups and communities though prevention, care for the acutely and chronically ill and palliative care. Other topics include the roles of healthcare providers, scopes of practice, how roles overlap and complement each other and issues in providing comprehensive interprofessional, patient-centred care.

Year and Semester	Course Number/Course Title	Calendar Course Description
YEAR 2 **Semester 3**	CST3107 – Operating Systems	Operating systems come in different varieties, such as Windows, Unix, iOS, Android, etc., each with its own unique attributes, but all sharing several features in common. It is important to understand the common characteristics and functionality of operating systems. Students gain an understanding of the concepts and components of operating systems as well as how they interact and function with various hardware components. Course focus includes details of various operating system structures, access (to CPU and input/out devices, etc.), resources, processes and storage management, as well as control mechanisms. Students acquire knowledge of installation, basic security, configuration, administration and modifications through robust theoretical and hands-on assignments.
YEAR 2 **Semester 4**	BUS0008 - Business Analytics and Advanced Business Intelligence	Business Intelligence systems are essential for collecting, storing, evaluating and analyzing information. Students study the principles related to designing, building and implementing a business intelligence (BI) system using a variety of technological tools. Topics include: data warehouse, SQL in relation to BI data manipulations, dimensional modeling, online analytic processing (OLAP), visualization tools dealing with high impact and low entry requirements, data mining, ETL (extract, transform, load) and dashboards. **Prerequisites**: CST3105 - Advanced Database Design and SQL
YEAR 2 **Semester 4**	ECO4201 – Macroeconomics	Students explore the principles of macroeconomics using economic models to analyze the performance of the overall economy. They examine how the level of unemployment, inflation and national income are determined. In addition, students investigate the impact that fiscal and monetary policies have on stabilizing the economy. They also consider Canada's international trade and the foreign exchange rate of the Canadian dollar.

Year and Semester	Course Number/Course Title	Calendar Course Description
YEAR 2 **Semester 4**	CST3109 - Business Systems Requirements Analysis	Translating client requirements into system specifications is critical to successful end products and the starting point is requirements analysis. Students gain an understanding of the development life cycle and the concepts of requirements analysis, and their impact from inception to final product. Course components include best practices, software engineering principles and standards, usability and artifacts for modeling requirements analysis. Students research, analyze, develop and evaluate solutions. Topics may include: agile development, outsourcing, ethics, security and privacy, cloud services and in-house development. **Prerequisites:** CST3102 - Programming, CST3103 - Data Communications and Networking, CST3105 - Advanced Database Design and SQL
YEAR 2 **Semester 4**	HLT0281 – Healthcare Concepts	The Canadian healthcare system is an intricate web of complex processes, professions and institutions, each of which has a language unique to it. Understanding how digital technologies interface with and creatively transform healthcare relies on foundational knowledge of medical and healthcare processes and terminology. Throughout this interactive course students learn the functions, and practice the language of clinical and administrative healthcare environments such as: patient care, patient scheduling, admission, discharge and transfer (ADT), pharmacy and medication management and diagnostic and surgical procedures. Through the use of appropriate terminology, medical abbreviations and acronyms students develop language that supports effective communication with healthcare professionals and stakeholders.

Year and Semester	Course Number/Course Title	Calendar Course Description
YEAR 2 **Semester 4**	HLT0282 – Health Records and Data Standards	Health records are a critical component of every health system. Records enable health professionals to understand a patient's health history and give both professionals and consumers more complete and accurate information to inform decision-making. With the broad adoption of electronic medical record systems the ability to store, maintain and transfer data in a standardized fashion is key to improving healthcare processes, communicating across local and global organizations and maintaining patient safety. Students evaluate different concepts for maintaining quality health records, including the health information lifecycle. Through hands-on, lab-based exercises, students examine standards for abstracting, coding and transferring electronic health data such as ICD 9/10, SNOWMED, LOINC and HL7.
YEAR 3 **Semester 5**	BUS0007 – Strategic Business Intelligence	Business Intelligence (BI) allows organizations to leverage their ability to use available information in new and innovative ways that extend beyond the usual common approaches. As such, BI has proved to be an essential strategic resource for businesses. Students examine different types of analytics that enable managers to enhance their decision-making and increase opportunities for organizational competitive advantage. Special attention is given to BI strategy and management, emerging trends in BI, big data, SPSS and/or SAS, rendering and probability in the cloud, BI reports and OLAP cubes.

Year and Semester	Course Number/Course Title	Calendar Course Description
YEAR 3 **Semester 5**	CST3110 - Enterprise Architecture	In a strategic sense, enterprise system architects are key contributors of any business. Collaborating effectively at all levels within the organization is paramount. The ultimate goal of enterprise architecture is to align enterprise technology investment with business strategic planning. Students compare and contrast frameworks and methodologies used in guiding enterprise-level decisions. Through the use of case studies, students select and apply an appropriate process to support enterprise-level technology decisions used in building enterprise architecture. **Pre-requisite:** BUS0008 – Business Analytics and Advanced Business Intelligence, ACC4101 - Financial Accounting, CST3109 - Business Systems Requirements Analysis
YEAR 3 **Semester 5**	CST3112 - Business Systems Design and Implementation	Design and implementation follow requirements analysis, and often occupy a significant portion of the development process. Guided by software development industry standards and best practices, students gain solid theoretical and practical experience with the design and implementation steps by applying design techniques and creating design artifacts. Students investigate prototyping, testing, debugging and quality assurance aspects of the software engineering process. Real world case studies focus on successes and failures while emphasizing the importance of following industry best practices. **Pre-requisite:** CST3109 - Business Systems Requirements Analysis
YEAR 3 **Semester 5**	CST3111 - Project Management for IT	The role of project management in information technology (IT) revolves around product development and implementation. The content has been closely aligned with the Project Management Institute's (PMIs) Project Management Body of Knowledge (PMBOK®) concepts and methodologies. Topics include management issues related to planning, organization, scheduling, resource allocation and project monitoring and control. Students will also examine IT project management tools for effective project scheduling and management. Through relevant case studies, student projects and presentations, students develop skills and knowledge in relation to technology project management.

Year and Semester	Course Number/Course Title	Calendar Course Description
YEAR 3 **Semester 6**	MGT0107 – Business Technology Management	Government and private sector organization continuously undergo major transformation with respect to technology. Technology is a major enabler of these transformation initiatives. As a result, there is a growing need for professionals that can leverage technology to enable organizations to achieve strategic goals. These professionals possess the ability to bridge the gap between align information technology to the business objectives. Special attention is on discussing planning, decision-making, trends, alignment, optimization, processes and timing.
YEAR 3 **Semester 6**	HLT0283 – Human Factors And Workflow Analysis	Humans have capabilities and limitations that affect their performance. The design of technology and systems can positively or negatively affect job performance and patient safety in healthcare. Students examine theories of design and analysis related to human factors and human-computer interaction, including workflow analysis. These methods are put into practice with a combination of classroom activities and time in the simulation lab where realistic clinical scenarios are created. The simulation lab experience provides students with the opportunity to learn and practice data collection methods used in human factors evaluations, and to identify threats to patient safety when new technologies are introduced.
YEAR 3 **Semester 6**	HLT0284 – Change Management	Healthcare organizations are subject to continuous change, whether it's through the introduction of new or redesigned technologies and processes into clinical practice or continuous quality improvement strategies. Managing that change effectively requires knowledge of change management theories and applications. Students explore the theories and applications of change and examine the psychology of organizational behaviour and change. Students analyze examples of successful change and common modes of failure. Students plan for change by applying knowledge in areas such as: leadership and negotiation skills, conflict management, knowledge translation, and physician and stakeholder engagement.

Year and Semester	Course Number/Course Title	Calendar Course Description
YEAR 3 **Semester 6**	HLT0285 – Health Ethics, Privacy, and The Law	There are a number of ethical and legal issues unique to the practice of healthcare. For example, for healthcare to be delivered effectively individuals must often divulge sensitive personal information, which must be collected and used according to ethical and professional standards, and privacy legislation specific to healthcare. Students engage various ethical and privacy issues in healthcare and the digital health ecosystem. Topics include: value theory, privacy; research ethics; anonymity and re-identification; autonomy and informed consent. Students explore the relationship between ethics, privacy and the law, and the design and use of digital health technologies.
YEAR 3 **Semester 6**	WKT0013 – Co-op Work Term	The co-op placement provides students with experiential opportunities within the field. Students attain entry-level positions that involve a variety of activities allowing application of principles and concepts developed during previous study. Students returning from Co-op bring additional practical considerations to subsequent study. Although centred with public and private institutions located in Eastern Ontario, co-op employment opportunities may be sought throughout Canada and abroad. **Pre-requisite:** Student must successfully complete all semester 1-6 courses.
YEAR 4 **Semester 7**	BUS0010 - Business Systems Security, Audit and Control	As a result of the increasing concern for security of the information, there is a growing demand for qualified auditors to perform security audits of large organization's IT systems and infrastructure. Students examine and employ the principles and methodologies needed to plan and organize security audits and ensure compliance with enterprise security requirements. Curriculum is closely aligned with the industry-recognized Certified Information Systems Auditor (CISA) requirements. Case studies, assignments and in-class learning activities focus on performing high level security audits.

Year and Semester	Course Number/Course Title	Calendar Course Description
YEAR 4 **Semester 7**	CST3115 - Enterprise Mobile Application Development	Enterprise mobile software offers tremendous opportunity for engagement, both by ensuring customers return to your server on a regular basis, and in being central touch-point for employees or partners. Students differentiate between external (customer) and internal (employee) users and their respective design requirements. Topics include multi-platform management tools, network security requirements to support mobile users, mobile Web versus native mobile development, application Programming interface (API) design for accessing enterprise data sources as well as sophisticated graphic user interface (GUI) experiences for external and internal users. Emphasis is on security (information protection, identity, device tracking, etc.) and cover forward-looking topics such as increased capability for data capture (sensors, GPS, cameras). Using Java, students develop both server and client (mobile) system components. **Pre-requisite:** CST3104 - Introduction to Mobile Application Development, CST3106 - Internet Architecture and Web Development
YEAR 4 **Semester 7**	HLT0286 - Decision Support in Healthcare	Decision support in healthcare has evolved from simple data extraction for measuring quality and cost to providing meaningful support for healthcare professionals working in complex environments. Students examine the history of decision support in healthcare with emphasis on potential and currently available clinical decision support. Classroom activities complement and provide background for simulation labs. Students examine how clinical decision support changes clinical workflow and also examine the advantages, as well as unintended consequences, of clinical decision support in healthcare. **Pre-requisite:** HLT0283 - Human Factors and Workflow Analysis

Year and Semester	Course Number/Course Title	Calendar Course Description
YEAR 4 **Semester 7**	HLT0287 – Project I	In order to practice in a professional capacity, students must fully integrate their digital health skills and knowledge. Students integrate the knowledge accumulated in the previous three years of study in the program into a practical design and build of a year-long project of which the first half is in this course. Students collaborate in groups to apply their business, healthcare and IT skills to a real-world project. By applying standard project management principles, students identify and define a problem and produce a digital health solution. Students may have the opportunity to partner with industry on applied research projects. **Pre-Requisite:** WKT0013 - Co-op Work Term
YEAR 4 **Semester 8**	MGT6120 - Entrepreneurship	Entrepreneurship and small business management are introduced from a Canadian perspective. Students develop the skills required to identify and evaluate a business opportunity; they investigate organizational structures of businesses and develop a business plan. A business simulation model provides the opportunity to practice and develop emerging entrepreneurial skills.
YEAR 4 **Semester 8**	HLT0288 – Healthcare Quality Improvement	Quality and patient safety represent priority areas and drivers for improving our healthcare system, leading to better patient care processes and outcomes. Students examine the principles and concepts related to quality and quality improvement in healthcare. Topics include approaches for assessing and evaluating quality of care, contemporary patient safety issues, quality improvement strategies and philosophies, as well as an overview of tools and methods used for quality management and improvement.
YEAR 4 **Semester 8**	HLT0289 – Project II	Possessing practical and real-world experience in project development is a necessity for entry into the field of digital health. Students apply skills and knowledge acquired throughout the program such as conceptual frameworks, methodologies and principles in executing digital health projects. Emphasis is on capably performing tasks during the completion of project work. Students finalize the design work, integrate components and develop implementation and maintenance plans to ensure that the project meets the requirements set in the initial project plan. **Pre-requisite:** HLT0287 - Project I

Course Descriptions for Non-Core Courses

In the table below, the course descriptions for the non-core courses are presented by semester for each academic year. The descriptions for the elective options are presented in a sub-section of their own that follows.

Year and Semester	Course Title	Calendar Course Description
YEAR 1 **Semester 1**	ENL1100 - Communications and Academic Writing	Effective communication is an integral component of success in the workplace and in lifelong learning. Students review communication theory and its connection to expository writing. Frequent writing exercises encourage the development of content that is coherent, well organized and correct. Students consider and use strategies to generate ideas, to collect and organize information, to acknowledge sources, to identify and develop a thesis and to adapt format, style and tone for different purposes and audiences.
YEAR 1 **Semester 2**	PHI1000 – Logic and Critical Thinking	Logic and critical-thinking skills play an important role in both daily life and ongoing academic studies. As foundational skills they support both the development and assessment of ideas, concepts and courses of action that are presented on a daily basis. Approaching the subject from both a practical and theoretical perspective, students hone their skills in analysis, argumentation, reasoning and persuasion. A range of topics and thinkers provide material with which students can exercise and apply their skills.
YEAR 2 **Semester 4**	PHI2000 – Introduction to Research	Possessing a fundamental knowledge of performing academic research is necessary in academia. An overview of the research process and research tools prepares students to undertake research. Emphasis is on evaluation, selection and documentation of secondary sources. Students adapt a hand-on approach in developing research skills. **Prerequisites:** ENL1100 - Communications and Academic Writing, PHI1000 - Logic and Critical Thinking
YEAR 3 **Semester 5**	QUA2000 – Statistics	Students explore fundamental statistical concepts and use statistical software to summarize, analyze and present both descriptive and inferential statistics. Topics include central tendency, variation, probability, central limit theorem, sampling, estimation and hypothesis testing. These theoretical concepts are explained through practical examples from various sectors. Students develop the required background for further study related to research.

Year and Semester	Course Title	Calendar Course Description
YEAR 3 **Semester 6**	SOC2000 – Introduction to Sociology	When working with individuals and groups it is important to understand both the background and influences present. Students develop a familiarity with sociological theories and methodological approaches used to study individual and group behaviours. Students also examine variables that include culture, social class, race, and gender and how these variables may impact work with diverse individuals and groups.
YEAR 4 **Semester 7**	**Elective**	Students may choose from a variety of breadth courses. Courses from a range of disciplines are offered within the humanities, social sciences, sciences, global cultures and mathematics. Elective offerings vary from semester to semester.
YEAR 4 **Semester 7**	**Elective**	Students may choose from a variety of breadth courses. Courses from a range of disciplines are offered within the humanities, social sciences, sciences, global cultures and mathematics. Elective offerings vary from semester to semester.
YEAR 4 **Semester 8**	**Elective**	Students may choose from a variety of breadth courses. Courses from a range of disciplines are offered within the humanities, social sciences, sciences, global cultures and mathematics. Elective offerings vary from semester to semester.
YEAR 4 **Semester 8**	**Elective**	Students may choose from a variety of breadth courses. Courses from a range of disciplines are offered within the humanities, social sciences, sciences, global cultures and mathematics. Elective offerings vary from semester to semester.

Course Descriptions for Elective Non-Core Courses

Algonquin College adopted a Breadth Framework predicated on non-core courses offered at the 1000-, 2000- and 4000-levels intended to meet this requirement, and aligned to the following standards:

- 1000-level introductory humanities courses intended to contribute towards students' attainment of key skills in critical thinking, logic and argumentation, quantitative reasoning, and written and oral communication;
- 2000-level introductory courses in disciplines primarily in the humanities, sciences, social sciences, global cultures and/or mathematics. Students are engaged in the discourse of those disciplines through the application of theories and concepts, critical analysis and modes of reasoning, and;
- 4000-level courses that serve to build on their knowledge in those areas of study and require greater depth by exploring and applying advanced theoretical concepts, developing varied modes of analyses and ways of thinking inherent in those disciplines and applying them in novel and creative ways.

The following are elective courses that would be available to students of the proposed Bachelor of Technology (Digital Health) (Honours).

Year and Semester	Course Title	Calendar Course Description
Elective	**SOC4000 – Criminology**	The interdisciplinary study of social science examining the individual and social aspects of crime is known as criminology. Students work through an introduction to the social science perspective on crime. Presentations, discussions, and assignments allow students to investigate the various theoretical positions related to crime and criminal behaviour. Working forward from the types and definitions of crime, students trace some of the links between government policy and the impacts of these policies on both society and the individual. Pre-requisite: SOC2000 – Introduction to Sociology
Elective	**SOC4001 – Global Perspectives**	Sociology, through its exploration of the organization of society and the connections between people and their surroundings, provides new ways of looking at the world. Using fundamental knowledge in the field of sociology, students analyze globalization and its impact on Canadian society. Students take opposing views to debate the opportunities and challenges that come with globalization. Pre-requisite: SOC2000 – Introduction to Sociology

Year and Semester	Course Title	Calendar Course Description
Elective	**ENL4100 – Creative Writing**	Effectively communicating with others, both professionally and personally, is an art that requires conscious development. Students address the techniques related to interpersonal communication challenges in the diverse workplace. Focus is on communication barriers, verbal and non-verbal communication, listening, team-work and relational dynamics. Through role-play, analysis, and case studies, students engage in simulated and authentic interpersonal communication situations. Pre-requisite: ENL1100 – Communications and Academic Writing
Elective	**ENL4200 – New Worlds and Alternative Realities**	Speculative fiction gathers together all those works of fiction in which new worlds or alternative realities are envisioned. Within this category of prose, students have the opportunity to explore the various sub-genres that present readers with new ways of thinking about some of the issues that face society. Students also develop skills in critical analysis using a variety of approaches and methodologies from literary studies. Pre-requisite: ENL1100 – Communications and Academic Writing
Elective	**ENL4016 – World Literature**	Exposure to broad sources of literature promotes an open-minded perspective on today's global society. Students explore the key texts from 20th and 21st century world literature. Students explore themes, styles and writers from a variety of cultures. Critical analysis of texts supports the development of arguments related to the assigned readings. Pre-requisite: ENL1100 – Communications and Academic Writing
Elective	**PHI4000 – Philosophy and Popular Culture**	Many facets of today's popular culture engage, directly or indirectly, with the concerns of a variety of philosophical traditions. Drawing on a number of examples, students explore both the way popular culture permeates and spreads through society and the way it interprets and presents philosophical questions. Students develop skills and techniques for assessing the soundness and validity of thought experiments. Pre-requisite: PHI1000 – Logic and Critical Thinking

Year and Semester	Course Title	Calendar Course Description
Elective	**PHI4100 – Survival in the Information Age: Risk and the Media**	On an almost daily basis, the media, through its various outlets - television, radio, web sites, RSS, and podcasts - reports on issues that address our well-being. Through discussions, readings, and assignments, students enhance their ability to interpret and question information presented by the media by better understanding the inherent risks. Issues like alternative medicine (i.e. vaccinations) and socio-legal issues (i.e. bullying, hacking, surveillance, and privacy) provide grounds for students to use principles from the social science as a means to think critically about real and perceived risks in daily life. Pre-requisite: PHI1000 – Logic and Critical Thinking
Elective	**CUL4000 – Global Citizenship**	Informed citizens in today's world appreciate the meaning of civic life at the local, national and global level. Students reflect on and develop a personal awareness of the meaning of freedoms, rights and obligations in a diverse global community and consider the political, social and economic drivers that influence patterns of human behaviour and the health of the planet. Based on general principles of global citizenship, students look beyond national borders to assess personal responsibilities related to the health and well-being of the planet and inhabitants. Students critically evaluate information related to environmental and social health, equipped with attitudes and behaviours that foster global environmental and social responsibility.
New Non-Core Courses Proposed		
Elective *(proposed new elective in an earlier application)*	**ECO4001 – Political Economy**	Political economy is the study of the interrelationship between economies and political processes and institutions in society. All economies require state political power to set their rules, enforce economic order, and to correct for market failures that would otherwise undermine the social fabric. Similarly, state power and government policies are shaped in large measure by economic capacities, including being constrained by the need to tend to the economic wellbeing of citizens. In this course, students debate prominent ideas in political economy schools, and practice the application of political economic analysis to high-profile current events in Canada and internationally.

Year and Semester	Course Title	Calendar Course Description
Elective	**ENL4300 – The Brave New Worlds of Dystopian Fiction**	Over the last century, dystopian fiction has become a remarkably popular genre in literature and film, particularly among young adults. Dystopian fiction often features oppressive totalitarian regimes, political dissent, environmental degradation and technological manipulation. In order to understand what a dystopia is, one must first understand what it is not. Through the study of representative works of literature and film, students examine the relationship between dystopic and utopic societies, and discover how dystopian fiction often functions as a creative outlet for authors and filmmakers to express the social, political, cultural, and technological anxieties of contemporary society. Students reflect on issues in the world around them, and develop an appreciation for how these concerns are mirrored in dystopian fiction.
Mandated non-core	**PHI2003 – Big Questions in Philosophy**	Throughout our history, humans have raised big questions about the world and our place in it. A rigorous examination of those questions in the hopes of better understanding them is a core pursuit in academic philosophy. What is the “good life”? Do we have free will? Is there a God? How can we know things about the world? How can you know that you (or other things/people) exist? What is the right thing to do? How should we organize society? Students critically examine these, and other, questions through the lens of historical and contemporary philosophical texts. Students engage in various peer-oriented learning activities throughout the course.
Elective	**PHI4002 – The Philosophy of Drugs**	Drugs are everywhere: professionals prescribe them to us to make us “better”; we take them recreationally; we give them to our children, pets and other loved ones; we buy them on the streets, in grocery stores and grow them in our gardens. What are “drugs”? Why are some drugs legal and others not? How do drugs get to market? What ethical issues are relevant in a global drug industry? Are current intellectual property regimes appropriate if the goal of drug research is to promote benefits to society? Students critically examine these, and other, questions through the lens of historical and contemporary ethical, philosophical and legal theories and arguments. Students engage in various peer-oriented learning activities throughout the course.

Year and Semester	Course Title	Calendar Course Description
Elective	**PHI4003 – The Philosophy of Love and Sex**	Love and sex are central to the human condition, and have been topics of academic inquiry and controversy throughout history. Various practices surrounding love and sex are celebrated in Western culture, such as monogamy and marriage, while other practices, such as polygamy and pedophilia, are condemned. Why is this? Students critically explore these and other issues surrounding love and sex using examples from popular music, movies and literature, framing those issues with the help of historical and contemporary philosophical theories and arguments. Students engage in various peer-oriented learning activities throughout the course.
Elective	**PHI4004 – Technology, Society and the Environment**	Environmental issues have come to occupy a central place in the marketplace, politics, policy, and society at large. Owing largely to the many environmental consequences that have accompanied industrialization, we humans have been forced to rethink the complex relationship between technology, society and the environment. Students investigate philosophical concepts and theories surrounding technology, society and the environment including: the "naturalness" of technology, sustainability and animal rights. Students critically examine course material by focusing on questions such as: What is nature, and what role do/should humans occupy in it? What do we owe non-human organisms? What do we owe future generations? Students engage in various peer-oriented learning activities throughout the course.
Elective *(proposed new elective in an earlier application)*	**PHY4000 – Black Holes, Big Bangs and the Cosmos**	The dynamic and exciting field of Cosmology outlines our current understanding of the Universe from its start, at the so called Big Bang, through the ensuing 13 plus billion years to the present and beyond. Students learn how to discuss our present understanding of the three phases of the Universe as well as its five part make up, with matter making up only 4% of the whole. Students explain our knowledge of the various phases of evolution of the Cosmos and also the latest theories and experiments that are trying to address our uncertainties. Throughout the course, students evaluate and debate many of today's ideas and concepts revolving around cosmology.

N.B. The elective options will increase with the addition of new degrees. Therefore, it is anticipated that by the time the Bachelor of Technology (Digital Health) (Honours) would launch, more breadth elective options would be available to students. Course outlines for seven (7) new proposed non-core courses, including one (1) mandated non-core course and six (6) elective courses are included in Section 4.7.2. The seven (7) new courses are Black Holes, Big Bangs and the Cosmos, Technology, Society and the Environment, The Philosophy of Love and Sex, The Philosophy of Drugs, The Brave New Worlds of Dystopian Fiction, Political Economy and Big Questions in Philosophy. Additional non-core courses available in the degree program have received consent in previous degree applications.

Section 4.5: Course Schedules

Section 4.5.1: Course Schedule 1

Excluded for web version – confidential/proprietary material

Section 4.5.2: Course Schedule 2

Year and Semester	Course Title	Total Core Course Semester Hours	Total Non-Core Course Semester Hours	Course Prerequisites and Co-requisites	Highest Qualification Earned and Discipline of Study
YEAR 1 Semester 1	MGT4102 - Business Fundamentals	45			PhD (Industrial Engineering)
	CST3100 - Introduction to Computer Programming	75			PhD (Computer Science)
	CST3101 - Database Design Fundamentals	60			PhD (Computer Engineering)
	MAT8003 - Mathematics for Programming	45			PhD (Computer Science)
	ENL1100 - Communications and Academic Writing		45		PhD (English)
YEAR 1 Semester 2	ACC4101 - Financial Accounting	45			MAcc (Accountancy and Taxation)
	CST3102 - Programming	75		CST3100 - Introduction to Computer Programming, MAT8003 – Mathematics for Programming	PhD (Computer Science)
	CST3103 - Data Communications and Networking	45			PhD (Computer Engineering)
	BUS0006 - Value Creation in Healthcare	45			MBA
	PHI1000 - Logic and Critical Thinking		60		PhD (Philosophy)

Year and Semester	Course Title	Total Core Course Semester Hours	Total Non-Core Course Semester Hours	Course Prerequisites and Co-requisites	Highest Qualification Earned and Discipline of Study
YEAR 2 Semester 3	ESC4300 - Basics of Supply Chain Management	45			MBA (Logistics and Marketing)
	CST3104 - Introduction to Mobile Application Development	60		CST3102 - Programming, CST3101 - Database Design Fundamentals, CST3103 - Data Communications and Networking	PhD (Computer Science)
	CST3105 - Advanced Database Design and SQL	60		CST3101 - Database Design Fundamentals	PhD (Computer Engineering)
	CST3106 - Internet Architecture and Web Development	45		**PR:** CST3102 - Programming, CST3103 - Data Communications and Networking; **CR:** CST3104-Introduction to Mobile Application Development	PhD (Computer Science)
	HLT0280 - Introduction to the Canadian Healthcare System	45			PhD (Education) PhD (Education)
	CST3107 - Operating Systems	45			PhD (Computer Engineering)
YEAR 2 Semester 4	BUS0008 - Business Analytics and Advanced Business Intelligence	60		CST3105 - Advanced Database Design and SQL	PhD (Business Administration)
	ECO4201 - Macroeconomics	45			PhD (Mathematics)

Year and Semester	Course Title	Total Core Course Semester Hours	Total Non-Core Course Semester Hours	Course Prerequisites and Co-requisites	Highest Qualification Earned and Discipline of Study
	CST3109 - Business Systems Requirements Analysis	45		CST3102 - Programming, CST3103 - Data Communications and Networking, CST3105 - Advanced Database Design and SQL	PhD (Computer Engineering)
	HLT0281 - Healthcare Concepts	45			PhD (Education)
	HLT0282 - Health Records and Data Standards	60			MBA (Health Services Management)
	PHI2000 - Introduction to Research		45	ENL1100 - Communications and Academic Writing, PHI1100 - Logic and Critical Thinking	PhD (Sociology)
YEAR 3 Semester 5	BUS0007 - Strategic Business Intelligence	60			PhD (Business Administration)
	CST3110 - Enterprise Architecture	45		BUS0008 – Business Analytics and Advanced Business Intelligence, ACC4101 - Financial Accounting, CST3109 - Business Systems Requirements Analysis	Executive Master of Electronic Commerce
	CST3112 - Business Systems Design and Implementation	60		CST3109 - Business Systems Requirements Analysis	PhD (Computer Engineering)
	CST3111 - Project Management for IT	45			MSc (eHealth)
	QUA2000 - Statistics		45		PhD (Psychology)

Year and Semester	Course Title	Total Core Course Semester Hours	Total Non-Core Course Semester Hours	Course Prerequisites and Co-requisites	Highest Qualification Earned and Discipline of Study
YEAR 3 Semester 6	MGT0107 - Business Technology Management	45			Executive Master of Electronic Commerce
	HLT0283 - Human Factors and Workflow Analysis	60			PhD (Human Factors)
	HLT0284 - Change Management	45			MSc (eHealth) PhD (Human Factors)
	HLT0285 - Health Ethics, Privacy, and the Law	45			PhD (Philosophy)
	SOC2000 - Introduction to Sociology		60		PhD (Applied Social Psychology-Industrial/Organizational Behaviour)
YEAR 3	WKT0013 - Co-op Work Term	420		Student to have completed all year 1-3 courses.	
YEAR 4 Semester 7	BUS0010 - Business Systems Security, Audit and Control	45			Executive Master of Electronic Commerce
	CST3115 - Enterprise Mobile Application Development	60		CST3104 - Introduction to Mobile Application Development, CST3106 - Internet Architecture and Web Development	PhD (Computer Science)
	HLT0286 - Decision Support in Healthcare	60		HLT0283 - Human Factors and Workflow Analysis	PhD (Human Factors)

Year and Semester	Course Title	Total Core Course Semester Hours	Total Non-Core Course Semester Hours	Course Prerequisites and Co-requisites	Highest Qualification Earned and Discipline of Study
	HLT0287 - Project I	45			MBA (Health Services Management)
	Elective		45		Masters minimum, PhD preferred
	Elective		45		Masters minimum, PhD preferred
YEAR 4 Semester 8	MGT6120 - Entrepreneurship	45			MBA
	HLT0288 - Healthcare Quality Improvement	45			PhD (Business Administration)
	HLT0289 - Project II	45		HLT0287 - Project I	MBA (Health Services Management)
	Elective		45		Masters minimum, PhD preferred
	Elective		45		Masters minimum, PhD preferred
Subtotal Course Hours		**1740**	**435**		
Total Program Hours		**2175**			

Section 4.6: Work-integrated Learning Experience

This section provides details of the work experience requirements for the proposed Bachelor of Technology (Digital Health) (Honours) program. In addition to the explanation of the integration of the work experiences within the program content, information is included regarding the types of placements, the support for finding placements, and placement outcomes.

Integration of Work Experiences

The proposed Bachelor of Technology (Digital Health) (Honours) program includes one (1) mandatory co-op work term that must be completed successfully to qualify for graduation. The work term is scheduled for the summer semester (May – August) when potential employer/supervisors are likely to be able to provide quality work experiences. This work term will be fourteen (14) weeks in length.

The co-op work term takes place after completion of the third year of study. Based on the first three years of studies, students will be able to function with a good level of autonomy and will be able to contribute practically in their chosen placement.

The placement of the co-op work term is part of a deliberate strategy to use the practical work experience as an educational tool in subsequent courses. As a result, it is believed that fourth-year learning will be augmented based on participation in real-world projects and activities. Furthermore, ideas for the fourth-year capstone projects may be derived from these co-op experiences.

In addition to the co-op work placements, opportunities for class-based projects and student work terms may be available through Algonquin College's Office of Applied Research and Innovation (ARI). ARI engages small, medium and large enterprises to offer those companies access to the considerable knowledge and skills of Algonquin's professors and students. Thus ARI helps companies bring real-world project to campus, where professors an d students are given opportunities for further access to work-integrated learning.

Types of Work-integrated Learning Experiences

The diversity and quantity of organizations involved in digital health activities that draw upon the knowledge contained within the discipline of this proposed degree provides for a wide array of placement opportunities. With the proposed program located in Ottawa, there is the potential for placements with the healthcare sector, the public sector, and the private sector.

During their placements, students are likely to be members of project teams engaged in the design, use, integration, analysis or support of a health information system. Although they are unlikely to have a specific job title, students will be engaged in consulting activities, analytical work, technical assessments, modeling and simulation exercises, as well as a variety of meetings related to design review, project management, and other emerging issues.

Support for co-op placements from local employers is high, with a variety of organizations already pledging a willingness to offer co-op placements to students enrolled in the proposed Bachelor of Technology (Digital Health) (Honours) program.

These organizations include:

- Arnprior Regional Health
- Ontario MD
- Health Canada – First Nations and Inuit Health Branch
- Branham Group
- BridgeHead
- Children's Hospital of Eastern Ontario
- Santovex
- Ottawa Valley Family Health Team
- HIS and Clinical Solutions Delivery, The Ottawa Hospital
- West Carleton Family Health Team
- Cognisant MD
- Carleton Place & District Memorial Hospital
- Bruyere Continuing Care
- Newborn Screening Ontario
- The Ottawa Hospital
- University of Ottawa Health Services
- The Ottawa Hospital Research Institute
- Montfort Academic Family Health Team
- Clinical Research Unit (CHEO)
- Connexion Family Health Team
- Perley and Rideau Veteran's Health Centre
- Canada Health Infoway
- J-Squared Technologies Inc.

When the first year of the program delivery begins, the academic department, in collaboration with the Cooperative Education Department, will use established procedures and practices to connect with employers and encourage them to provide placements and to explore the benefits provided through a work term. In order to ensure rich and meaningful work experiences for students, this will be an on-going initiative.

Support for Work-integrated Learning Experiences

Co-op work experiences are supported by Algonquin's Cooperative Education Department (see Section 6.3 Support Services). In more specific terms, staff from the Co-op Department facilitates the relationship between the employer/supervisor and the student, while ensuring that the College meets its responsibilities for the quality of the work experience. The Co-op Department works collaboratively with faculty members from the academic department to ensure the placements are appropriate. The Co-op Department leverages the connections of faculty members with the industry/community. These connections are a key aspect of how faculty members maintain their currency as part of their ongoing professional development. Examples of activities that facilitate community relationships include being active on the program advisory committee, being active in local professional societies, attending and participating in industry conferences, participating in applied research, and organizing plant tours and guest speakers.

In addition to the Co-op Preparation online module offered prior to the start of the first co-op work term, students receive support and guidance from staff in the Co-op Department throughout the application process, including the submission of resumes, and the scheduling of interviews. While students are on placement, there is further support from the Co-op Department through the monitoring of the work experience. In collaboration with faculty from the academic program, site visits to the placement are organized. Finally, staff in the Co-op Department mediate and guide the resolution of any issues that may arise during the work term. Algonquin's Cooperative Education Department details its services on the website: http://www.algonquincollege.com/coop/

Outcomes for Co-op Work Terms

There is one work term in the proposed Bachelor of Technology (Digital Health) (Honours) program. The outcomes for the work term are presented in the table below (See TABLE 4.6.1: Outcomes for Work Experience).

TABLE 4.6.1: Outcomes for Work-integrated Learning Experiences

Work Term	Co-op Work Term
Hours	420
Calendar Description	This co-op placement provides students with experiential opportunities within the field. Students attain entry-level positions that involve a variety of activities allowing application of principles and concepts developed during previous study. Students returning from Co-op bring additional practical considerations to subsequent study. Although centred with public and private institutions located in Eastern Ontario, co-op employment opportunities may be sought throughout Canada and abroad.
Course Outcomes	• Contribute to the practical application of discipline-specific concepts in a workplace environment. • Perform assigned duties in a professional fashion. • Obtain feedback on workplace performance. • Compile a comprehensive report on placement activities. • Conduct oneself in a professional manner based on industry expectations.

Following established practices and procedures for cooperative education at Algonquin, evaluation of student performance during the placement will be based on input from the employer/supervisor and on work completed by the student. The employer/supervisor will complete both a Midterm Progress Report and a Final Employer Evaluation. On both of these documents, students need to meet or exceed established criteria for the placement. In addition, students will write a Final Work Term Report that will be submitted to the academic department for grading by a faculty member. As part of this report, students need to connect their work experience with the learning outcomes that were established for the work term. Once again, students need to meet or exceed established criteria for the report.

The **Cooperative Education Department** facilitates the co-op process including the development of job opportunities and the preparation of students for the work force. The department acts as a liaison between the student, the employer and the academic department and collects the relevant academic assignments. A website facilitates access to student and employer related web-based forms http://www.algonquincollege.com/coop/.

Student Learning Plan Form – Co-op Term

(Blackboard™ based form completed by students during the first few weeks of co-op placement)

The Learning Plan is designed to help you and your manager/supervisor think about what you will be doing during your work placement. It should be completed in conjunction with your direct supervisor/manager. It is a chance to verbalize which skills you want to enhance or improve and to have deliverables and specific goals identified by your employer. When you complete your final work term report, review the Learning Plan and submit it again with the Met or not met section completed. Please select not met for your first report.

Student Name:
Job Title:
Program:
Supervisor Name/Tel:

Student Email:
Work Term:
Name of Organization:

During the course of the work term the student will develop and/or enhance the following employability skills:

1. Communication, thinking and learning
For example: improve public speaking skills by delivering verbal reports/presentations at team meeting

Insert specifics here

Not met Met Exceeded

2. Objectives and Goals:
For example: develop abilities to set goals and priorities

Insert specifics here

Not met Met Exceeded

3. Teamwork:
For example: develop the ability to co-operate with others to achieve established goals and objectives

Insert specifics here

Not met Met Exceeded

4. Technical Skills:
For example: develop expertise with company specific software

Insert specifics here

Not met Met Exceeded

5. Working Habits:
For example: time management, organizational skills, punctuality

Insert specifics here

Not met Met Exceeded

The following is the web-based Employer Evaluation available from the website that the co-op employer completes and submits for the Cooperative Education Department's review.

Employer Evaluation – Co-op Term

Student Name: Program of Study:
Job Title: Name of Employer/Supervisor:
Company Name:

Each area below is assessed as:
☑ Outstanding ☑ Very Good ☑ Good ☑ Average ☑ Needs Improvement

ATTITUDES TOWARD WORK
- Uses time effectively and looks for work to do
- Dresses appropriately for job setting
- Exhibits knowledge of company/department
- Demonstrates continual improvement in completing work

RELATIONS WITH OTHERS
- Cooperates with supervisors; is respectful
- Works well with others and within a team
- Accepts suggestions from others well; is courteous and helpful with public/customers
- Overall communication skills

DEPENDABILITY
- Is on time to work; remains until required hours are completed
- Alerts supervisor if absent or late for work
- Plans ahead to rearrange work schedule

JOB LEARNING/SKILL IMPROVEMENT
- Shows continual improvement and speed in completing work
- Can work independently
- Exhibits adequate knowledge learned in classroom. Learns with ease; understands work/ responsibilities

QUALITY OF WORK
- Uses care with equipment and materials
- Performs quality work
- Able to follow and understand directions
- Performs well under pressure
- Can adapt to working conditions; is flexible

OVERALL PERFORMANCE
- What are some of the student's strengths?
- What areas of work does the student need to improve?
- What recommendations do you have to better prepare this student for the career he/she has chosen?
- Has this report been discussed with the student? Yes / No

Date: _____
Final Report approval by employer
I, the employer, confirm that I have read and approved the work term report for the Co-op student. Yes / No

Conclusion

In keeping with the Board's standards and benchmarks for program content, the proposed Bachelor of Technology (Digital Health) (Honours) program includes one (1) co-op work term that is scheduled in a fourteen (14) week block. The work term is in the summer semester (May – August) between the third and fourth year of study. As indicated above, this work experience:

- is appropriate to the program;
- has articulated learning outcomes; and
- identifies an appropriate method for both instructor and employer/supervisor assessment leading to the assignment of a grade.

Students in the proposed Bachelor of Technology (Digital Health) (Honours), as well as employers in the industry, will benefit from Algonquin's established reputation for experiential learning as exemplified through cooperative education. Moreover, on-going collaboration between the academic department and Algonquin's Cooperative Education Department will ensure that there are rich and meaningful work experiences that contribute to both the breadth and depth of the knowledge and skills developed by the students.

Section 4.7: Course Outlines

***** Excluded for web version – confidential/proprietary material***

Section 4.8: Bridging Course Descriptions

Based on the gap analysis provided in Section 4.10 no bridging courses are planned for this proposed program. A combination of the unique blend of knowledge domains covered throughout the program, and the manner in which the knowledge domains are threaded throughout the program of study, prevent us from easily moving students into upper years of the program.

Section 4.9: Bridging Course Outlines

Not applicable (see Section 4.8).

Section 4.10: Gap Analysis

Computer Engineering Technology – Computing Science Ontario College Advanced Diploma

The outcomes of prior study for this program are drawn from the Ministry of Training, Colleges and Universities published program standards that "outline the essential skills and knowledge that a student must acquire and be able to reliably demonstrate in order to graduate from the program."[4]

Students graduating with a Computer Engineering Technology – Computer Science Ontario College Advanced Diploma will have acquired knowledge and skills in the areas identified in the following chart.

The degree completion arrangements for graduates of the Computer Engineering Technology – Computer Science program require these students to successfully complete several courses throughout the program of study, which combine missing knowledge and skills that are addressed in all four years of the degree program. As described previously (see Section 3.4) there are no smooth bridging options available. This is partly due to the three knowledge domains integrated throughout the four years of the program, resulting in various knowledge pathways that preclude clean bridging options.

For this degree completion arrangement, the necessary academic rigour is in place to ensure that the degree level standard and the degree program outcomes are met.

Degree completion arrangements for graduates of:
Computer Engineering Technology – Computing Science Ontario College Advanced Diploma
( ) denotes semester in which course occurs

Degree Program Outcomes	Outcomes of Prior Study	Gap in Knowledge and Skills	Remediation of Gap
1. Analyze, design, develop, implement and maintain business systems and/or components to support strategic business requirements.	1, 2, 3, 4, 6, 7, 9	Strategic business thinking, business fundamentals, advanced database concepts	Business Fundamentals(1) Financial Accounting (2) Value Creation in Healthcare(2) Macroeconomics (4) Business Analytics and Advanced Business Intelligence (4) Human Factors and Workflow Analysis(6) Decision Support in Healthcare(7) Healthcare Quality Improvement(8)
2. Manage the process of evaluating, selecting and using business	3,4,9	Management, evaluation, broad business perspective, formal RFP	Business Fundamentals(1) Financial Accounting(2) Basics of Supply Chain Management(3) Health Records and Data Standards(4) Strategic Business Intelligence(5)

[4] Ontario Ministry of Training, Colleges and Universities, "What Does a Program Standard Contain?," [ONLINE] (22 February 2006) Available: http://www.tcu.gov.on.ca/eng/general/college/progstan/contain.html

Degree Program Outcomes	Outcomes of Prior Study	Gap in Knowledge and Skills	Remediation of Gap
systems.			Enterprise Architecture(5) Project Management for IT(5) Business Technology Management(6) Human Factors and Workflow Analysis(6) Change Management(6) Business Systems Security, Audit and Control(7) Project I(7) Project II(8)
3. Apply accepted methodologies, theories, concepts and practices to develop and improve business and healthcare systems.	2,3,6,7,9	Business concepts	Financial Accounting(2) Basics of Supply Chain Management(3) Macroeconomics(4) Healthcare Concepts(4) Health Records and Data Standards(4) Business Analytics and Advanced Business Intelligence(4) Strategic Business Intelligence(5) Enterprise Architecture(5) Project Management for IT(5) Business Technology Management(6) Human Factors and Workflow Analysis(6) Health Ethics, Privacy, and the Law(6) Enterprise Mobile Application Development(7) Decision Support in Healthcare(7) Project I(7) Entrepreneurship(8) Healthcare Quality Improvement(8)
4. Manage data using appropriate methodologies, and standards to improve healthcare and business processes and decision-making.	1,2,3,4,7	Strategies, decision-making, business fundamentals, business intelligence	Health Records and Data Standards(4) Business Analytics and Advanced Business Intelligence(4) Health Ethics, Privacy, and the Law(6) Enterprise Mobile Application Development(7) Project I(7) Healthcare Quality Improvement(8) Project II(8)
5. Apply the Project Management Institute's Body of Knowledge to business systems projects.	4,9	PMI BOK	Strategic Business Intelligence(5) Project Management for IT(5) Project I(7) Project II(8)
6. Apply security principles and	3,6,7	Enterprise-level system	Enterprise Architecture(5) Business Technology Management(6)

Degree Program Outcomes	Outcomes of Prior Study	Gap in Knowledge and Skills	Remediation of Gap
practices in systems development and the systems environment.		security	Business Systems Security, Audit and Control(7)
7. Apply principles and skills of business management, leadership and change management in the context of business systems development.	4,9	Fundamental business concepts, some change management	Business Fundamentals(1) Financial Accounting(2) Value Creation in Healthcare(2) Basics of Supply Chain Management(3) Macroeconomics(4) Strategic Business Intelligence(5) Project Management for IT(5) Business Technology Management(6) Change Management(6) Enterprise Mobile Application Development(7) Project I(7) Entrepreneurship(8) Project II(8)
8. Apply quality assurance and quality management principles to business systems development projects.	4,7,9	Quality assurance from a business perspective	Financial Accounting(2) Basics of Supply Chain Management(3) Health Records and Data Standards(4) Business Systems Security, Audit and Control(7) Project I(7) Healthcare Quality Improvement(8) Project II(8)
9. Educate a diversity of clients in the use of business technology to support, promote and improve business and healthcare processes, and healthy-living initiatives.	1,7,9	Business technology management, strategic analysis of business processes	Business Fundamentals(1) Value Creation in Healthcare(2) Introduction to the Canadian Healthcare System(3) Business Analytics and Advanced Business Intelligence(4) Strategic Business Intelligence(5) Human Factors and Workflow Analysis(6) Change Management(6) Business Technology Management(6) Project I(7) Entrepreneurship(8) Healthcare Quality Improvement(8) Project II(8)
10. Apply effective business technology management skills to innovate	9	Management skills, fundamental business concepts,	Basics of Supply Chain Management(3) Business Technology Management(6) Project I(7) Project II(8)

Degree Program Outcomes	Outcomes of Prior Study	Gap in Knowledge and Skills	Remediation of Gap
in digital health targeting new and existing local and global markets.		strategic analysis and decision-making	
11. Adhere to professional, ethical and legal codes and standards related to digital health.	7,8,9,10	Management perspective, accounting principles, strategic planning	Financial Accounting(2) Value Creation in Healthcare(2) Introduction to the Canadian Healthcare System(3) Healthcare Concepts(4) Health Records and Data Standards(4) Business Analytics and Advanced Business Intelligence (4) Strategic Business Intelligence(5) Enterprise Architecture(5) Project Management for IT(5) Human Factors and Workflow Analysis(6) Change Management(6) Health Ethics, Privacy, and the Law(6) Decision Support in Healthcare(7) Business Systems Security, Audit and Control(7) Enterprise Mobile Application Development(7) Project I(7) Project II(8)
12. Conduct and evaluate research to contribute to evidence-based practice in digital health contexts.	N/A	Research	Value Creation in Healthcare(2) Change Management(6) Decision Support in Healthcare(7) Entrepreneurship(8) Project II(8)
13. Identify and apply discipline-specific practices that contribute to the local and global community through social responsibility, economic commitment and environmental stewardship.	10	No Gap	N/A
14. Analyze and evaluate how	N/A	Gap	Advanced Database Design and SQL(3)

Degree Program Outcomes	Outcomes of Prior Study	Gap in Knowledge and Skills	Remediation of Gap
digital health solutions influence healthcare business practices, quality of care and patient safety.			Healthcare Concepts(4) Health Records and Data Standards(4) Human Factors and Workflow Analysis(6) Change Management(6) Health Ethics, Privacy, and the Law(6) Decision Support in Healthcare(7) Healthcare Quality Improvement(8)
15. Assess how differing value judgments associated with the practice of healthcare, business management and information technology impact digital health decision-making.	N/A	Gap	Advanced Database Design and SQL(3) Introduction to the Canadian Healthcare System(3) Human Factors and Workflow Analysis(6) Change Management(6) Health Ethics, Privacy, and the Law(6) Healthcare Quality Improvement(8)

Computer Engineering Technology – Computing Science program learning outcomes

1. Diagnose, solve, troubleshoot, and document technical problems involving computing devices using appropriate methodologies.
2. Integrate multiple software and hardware components using appropriate network architecture.
3. Participate in analyzing, planning, designing, and developing the architecture of computing devices and systems.
4. Plan, install, configure, modify, test, and maintain a variety of computer systems to meet functional requirements.
5. Apply principles of digital and analog circuits to the implementation of embedded computing devices.
6. Analyze, build, test, implement, and maintain applications.
7. Evaluate and document security issues associated with a variety of computing devices and propose alternatives to increase product reliability.
8. Articulate, defend, and conform to workplace expectations found in technology environments.
9. Contribute to the successful completion of the project applying the project management principles in use.
10. Identify and apply discipline-specific factors that enable their contribution to the local and global community through social responsibility, economic commitment and environmental stewardship.

Computer Programmer Ontario College Diploma

The outcomes of prior study for this program are drawn from the Ministry of Training, Colleges and Universities published program standards that "outline the essential skills and knowledge that a student must acquire and be able to reliably demonstrate in order to graduate from the program."[5]

Students graduating with a Computer Programmer Ontario College Diploma will have acquired knowledge and skills in the areas identified in the following chart.

The degree completion arrangements for graduates of the Computer Programmer program require these students to successfully complete several courses throughout the program of study, which combine missing knowledge and skills that are addressed in all four years of the degree program. As described previously (see Section 3.4) there are no smooth bridging options available. This is partly due to the three knowledge domains integrated throughout the four years of the program, resulting in various knowledge pathways that preclude clean bridging options.

For this degree completion arrangement, the necessary academic rigor is in place to ensure that the degree level standard and the degree program outcomes are met.

Degree completion arrangements for graduates of:
Computer Programmer Ontario College Diploma
( ) denotes semester in which course occurs

Degree Program Outcomes	Outcomes of Prior Study	Gap in Knowledge and Skills	Remediation of Gap
1. Analyze, design, develop, implement and maintain business systems and/or components to support strategic business requirements.	1,2,3,5,6	Strategic business thinking, business fundamentals	Business Fundamentals(1) Financial Accounting (2) Value Creation in Healthcare(2) Introduction to the Canadian Healthcare System (3) Healthcare Concepts (4) Macroeconomics (4) Business Analytics and Advanced Business Intelligence (4) Human Factors and Workflow Analysis(6) Change Management (6) Decision Support in Healthcare(7) Healthcare Quality Improvement(8)
2. Manage the process of evaluating, selecting and using business systems.	5,6,9	Management, evaluation, broad business perspective, formal RFP	Business Fundamentals(1) Financial Accounting(2) Basics of Supply Chain Management(3) Health Records and Data Standards(4) Strategic Business Intelligence(5) Enterprise Architecture(5) Project Management for IT(5)

[5] Ontario Ministry of Training, Colleges and Universities, "What Does a Program Standard Contain?," [ONLINE] (22 February 2006) Available: http://www.tcu.gov.on.ca/eng/general/college/progstan/contain.html

Degree Program Outcomes	Outcomes of Prior Study	Gap in Knowledge and Skills	Remediation of Gap
			Business Technology Management(6) Human Factors and Workflow Analysis(6) Health Ethics, Privacy and the Law (6) Change Management(6) Business Systems Security, Audit and Control(7) Project I(7) Healthcare Quality Improvement (8) Project II(8)
3. Apply accepted methodologies, theories, concepts and practices to develop and improve business and healthcare systems.	4,5,6,9	Business concepts	Financial Accounting(2) Basics of Supply Chain Management(3) Macroeconomics(4) Business Analytics and Advanced Business Intelligence(4) Strategic Business Intelligence(5) Enterprise Architecture(5) Project Management for IT(5) Business Technology Management(6) Change Management (6) Enterprise Mobile Application Development(7) Project I(7) Healthcare Quality Improvement (8) Entrepreneurship(8) Project II(8)
4. Manage data using appropriate methodologies, and standards to improve healthcare and business processes and decision-making.	3,4,5,6,9	Strategies, decision-making, business fundamentals, business intelligence	Health Records and Data Standards (4) Business Analytics and Advanced Business Intelligence(4) Health Ethics, Privacy and the Law (6) Enterprise Mobile Application Development(7) Project I(7) Project II(8)
5. Apply the Project Management Institute's Body of Knowledge to business systems projects.	7,8,9	PMI BOK	Strategic Business Intelligence(5) Project Management for IT(5) Project I(7) Project II(8)
6. Apply security principles and practices in systems development and the systems	2,4,6	Enterprise-level system security	Enterprise Architecture(5) Business Technology Management(6) Business Systems Security, Audit and Control(7)

Degree Program Outcomes	Outcomes of Prior Study	Gap in Knowledge and Skills	Remediation of Gap
environment.			
7. Apply principles and skills of business management, leadership and change management in the context of business systems development.	5,6,7,8,9	Fundamental business concepts, some change management	Business Fundamentals(1) Financial Accounting(2) Value Creation in Healthcare(2) Basics of Supply Chain Management(3) Macroeconomics(4) Strategic Business Intelligence(5) Project Management for IT(5) Business Technology Management(6) Risk Management and Strategies(6) Change Management (6) Enterprise Mobile Application Development(7) Project I(7) Healthcare Quality Improvement (8) Entrepreneurship(8) Project II(8)
8. Apply quality assurance and quality management principles to business systems development projects.	6,8,9	Quality assurance from a business perspective	Financial Accounting(2) Basics of Supply Chain Management(3) Business Systems Security, Audit and Control(7) Project I(7) Healthcare Quality Improvement (8) Project II(8)
9. Educate a diversity of clients in the use of business technology to support, promote and improve business and healthcare processes, and healthy-living initiatives.	7,8,9	Business technology management, strategic analysis of business processes	Business Fundamentals(1) Value Creation in Healthcare(2) Business Analytics and Advanced Business Intelligence(4) Strategic Business Intelligence(5) Business Technology Management(6) Enterprise Mobile Application Development(7) Project I(7) Healthcare Quality Improvement (8) Entrepreneurship(8) Project II(8)
10. Apply effective business technology management skills to innovate in digital health targeting new and existing local and global markets.	9,10	Management skills, fundamental business concepts, strategic analysis and decision-making	Basics of Supply Chain Management(3) Business Technology Management(6) Project I(7) Project II(8)
11. Adhere to	6,8,9	Management	Financial Accounting(2)

Degree Program Outcomes	Outcomes of Prior Study	Gap in Knowledge and Skills	Remediation of Gap
professional, ethical and legal codes and standards related to digital health.		perspective, accounting principles, strategic planning	Value Creation in Healthcare(2) Health Records and Data Standards (4) Business Analytics and Advanced Business Intelligence (4) Strategic Business Intelligence(5) Enterprise Architecture (5) Project Management for IT (5) Health Ethics, Privacy and the Law (6) Enterprise Mobile Application Development (7) Business Systems Security, Audit and Control (7) Enterprise Mobile Application Development (7) Project I (7) Project II (8)
12. Conduct and evaluate research to contribute to evidence-based practice in digital health contexts.	n/a	Research	Value Creation in Healthcare(2) Human Factors and Workflow Analysis (6) Decision Support in Healthcare (7) Project I(7) Entrepreneurship(8) Project II(8)
13. Identify and apply discipline-specific practices that contribute to the local and global community through social responsibility, economic commitment and environmental stewardship.	10	No Gap	N/A
14. Analyze and evaluate how digital health solutions influence healthcare business practices, quality of care and patient safety.	n/a	Business strategic decision-making	Healthcare Concepts (4) Health Records and Data Standards (4) Human Factors and Workflow Analysis (6) Health Ethics, Privacy and the Law (6) Change Management (6) Decision Support in Healthcare (7) Healthcare Quality Improvement (8)

Degree Program Outcomes	Outcomes of Prior Study	Gap in Knowledge and Skills	Remediation of Gap
15. Assess how differing value judgments associated with the practice of healthcare, business management and information technology impact digital health decision-making.			Value Creation in Healthcare (2) Introduction to the Canadian Healthcare System (3) Human Factors and Workflow Analysis (6) Change Management (6) Health Ethics, Privacy and the Law (6) Healthcare Quality Improvement (8)

Computer Programmer Ontario College Diploma program learning outcomes

1. Use documented solutions to troubleshoot problems associated with software installation and customization.
2. Develop, test, document, deploy, and maintain secure program code based on specifications.
3. Perform routine maintenance on a database.
4. Apply knowledge of networking concepts to develop, deploy, and maintain program code.
5. Gather and document required information and assist in an analysis of a business.
6. Use relevant methodologies, policies, and standards to develop secure program code.
7. Maintain effective working relationships with clients.
8. Conform to workplace expectations found in information technology (IT) environments.
9. Contribute to the successful completion of the project applying the project management principles in use.
10. Identify and apply discipline-specific practices that contribute to the local and global community through social responsibility, economic commitment and environmental stewardship.

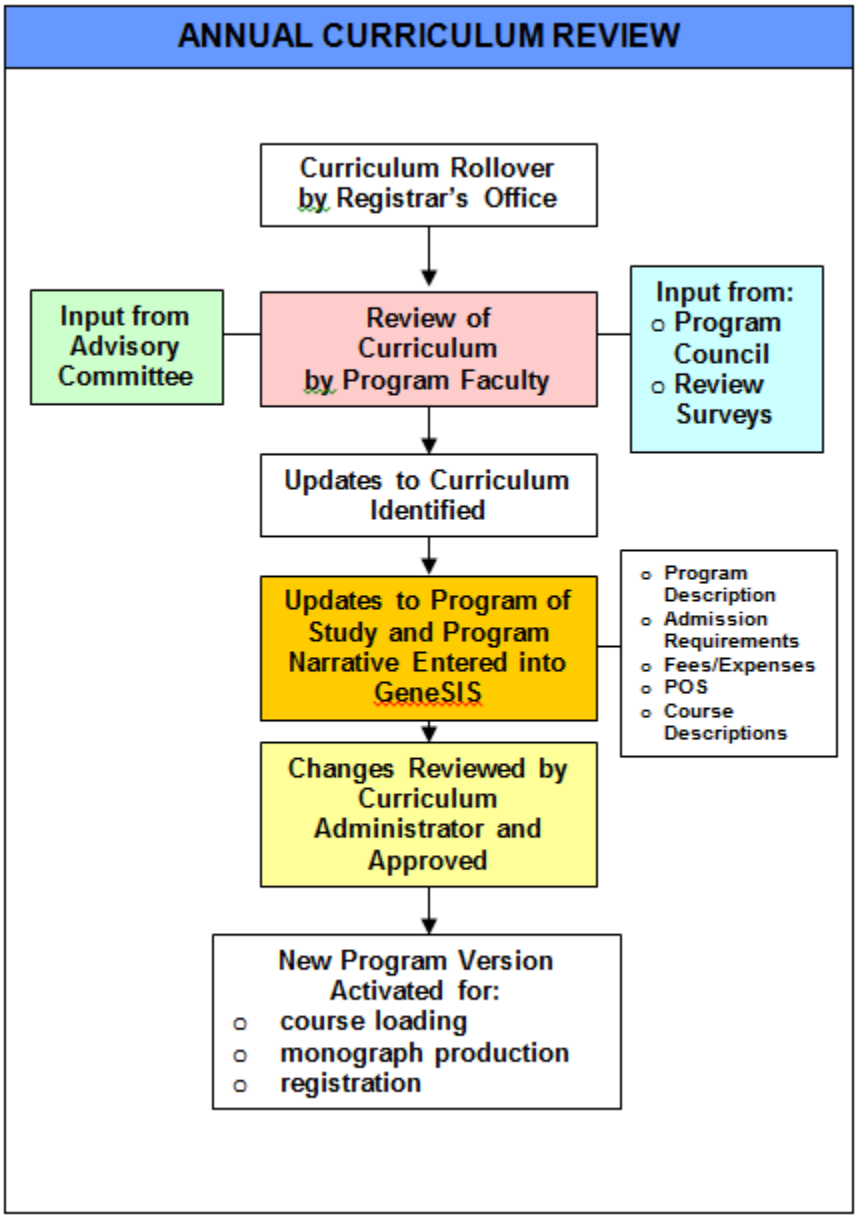
Section 5: Program Delivery

The program methodologies proposed for the delivery of curriculum and other program elements, and the associated quality assurance policies and procedures meet the Board's requirements as described in the following sections.

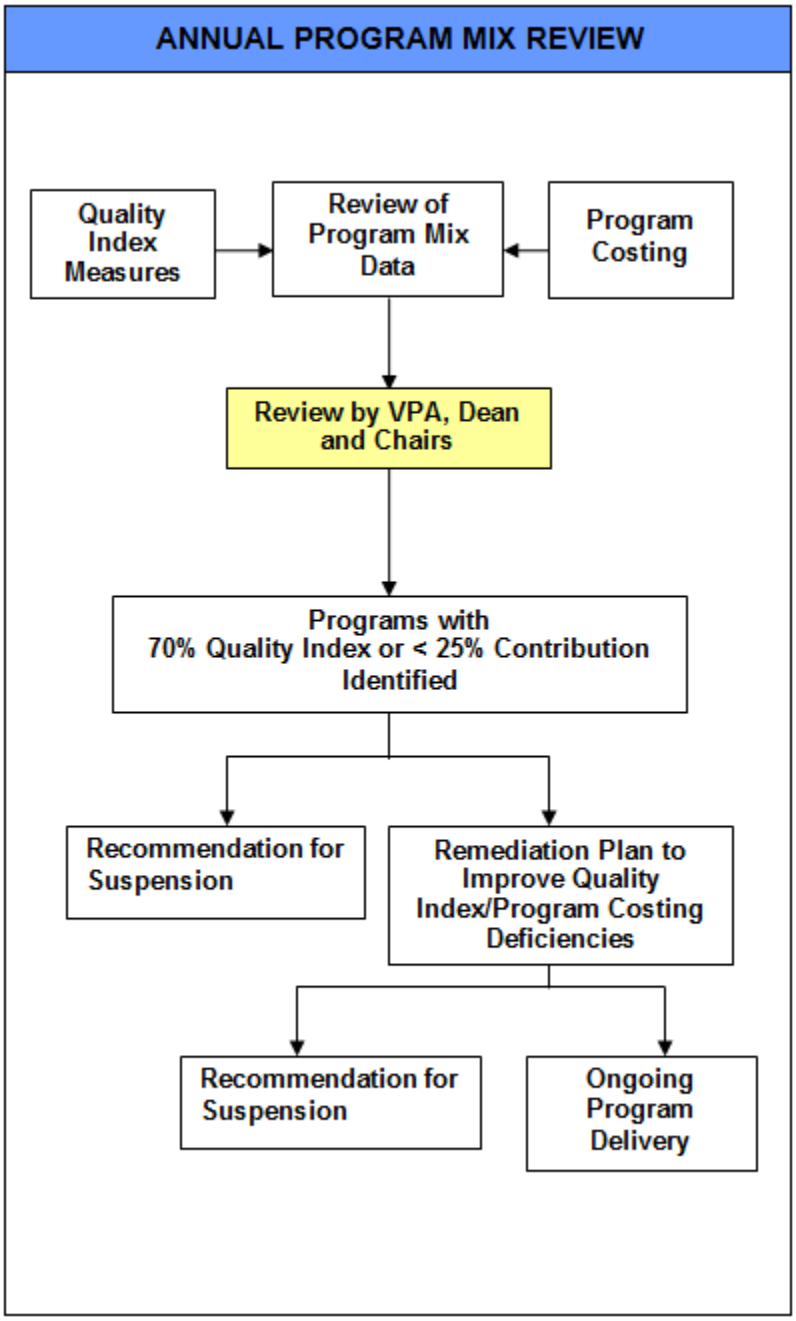
Section 5.1: Quality Assurance of Delivery

Algonquin College has a robust program quality assurance process consisting of three primary components, Annual Curriculum Review, Program Mix Review and Program Quality Review. These processes include evidence-based and participatory inquiry to determine whether courses and the program (whether delivered using traditional, web facilitated, blended, hybrid or online methods) are achieving the intended learning outcomes. Furthermore, the results of the quality assurances practices are used to guide curriculum design and delivery, pedagogy and educational processes as here described.

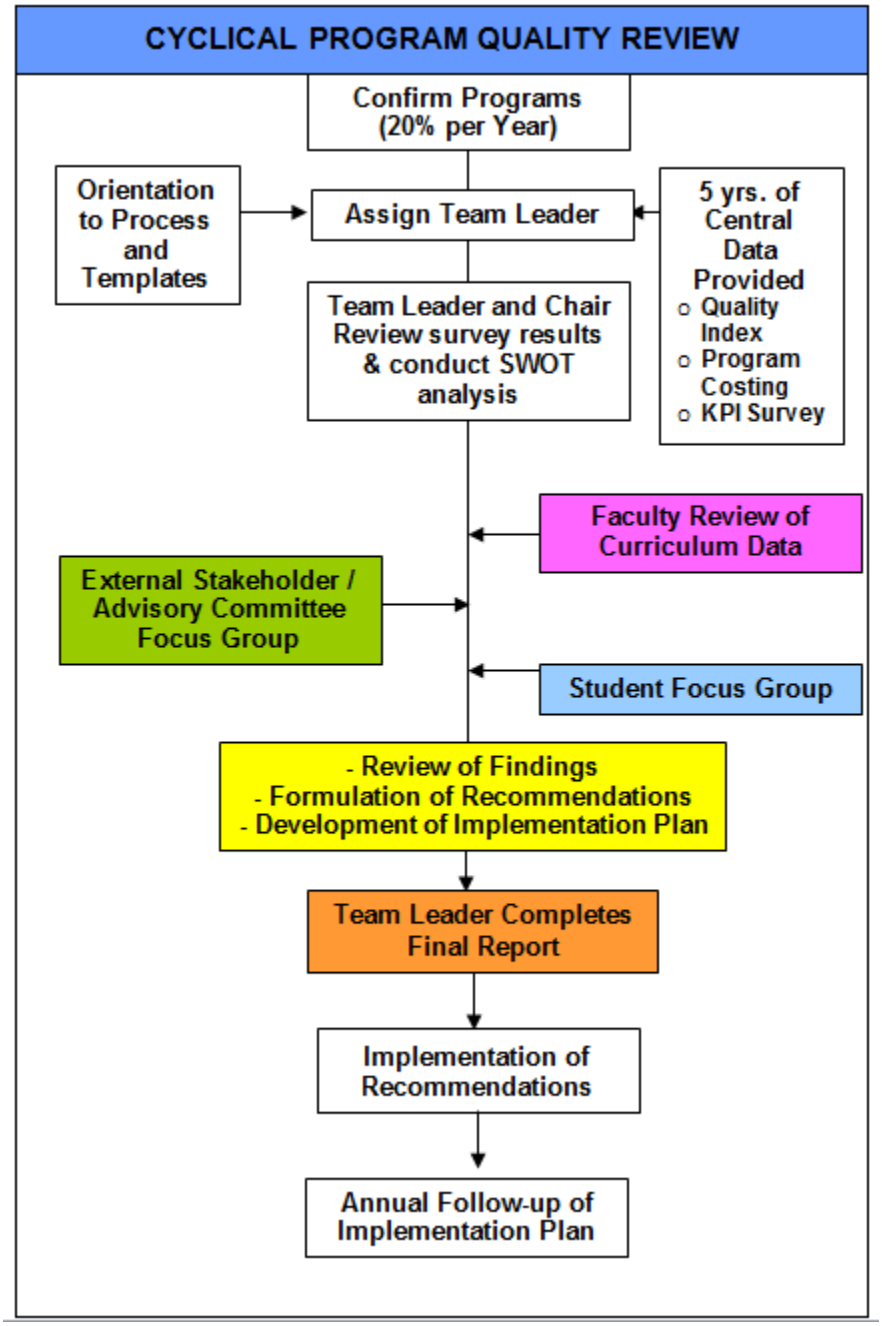
The Annual Curriculum Review process includes reviewing and revising the curriculum, incorporating input from recent Student Course Feedback and KPI surveys, advisory committees and program councils, and formalizing changes for the next academic year.



Program Mix Review is usually undertaken at the end of the fiscal year. The program's fiscal data is reviewed annually along with the results of the KPI and Student Course Feedback surveys. The program is given a score based on both financial and qualitative measures. A Board of Governors' directive is that programs with a financial contribution of less than 25% or a Quality Index Score less than 70% develop remediation plans.



Program Quality Review is a comprehensive process normally occurring on a five year cycle at which time a program augments its Annual Program Review audit with an in depth review of historical survey data for the previous five years. Curriculum is remapped to ensure it remains compliant with the Quality Assurance Framework, degree level standards and program learning outcomes. Course outlines are reviewed to ensure they are complete and that there is congruency between course learning outcomes, learning activities and evaluation methods. Recommendations for improvement are made, and an implementation plan is developed. The implementation plan is tracked on an annual basis until all recommendations have been assessed.



These three quality assurance processes are depicted in a flow chart at http://www.algonquincollege.com/academic-development/our-services/program-quality-assurance/ (*link to the* 'Algonquin College Program Quality Assurance Model').

The electronic policies file (Section 16: Policies) includes policies and procedures pertaining to quality assurance within the following:
Policy AA03: Program Councils
Policy AA25: Student Course Feedback
Policy AA38: Program Quality Assurance

Section 5.2: Student Feedback

Algonquin College believes that student feedback as to the quality and effectiveness of course/program delivery is an important component in the ongoing improvement of the delivery of programs. There are standardized and regular feedback mechanisms in place to gather quantitative and qualitative data to inform plans and actions. Student Course Feedback (Course Assessment) survey results provide quantitative data that is analyzed annually and compared year to year. Aligning with the College's desire to reach all students *anytime, anywhere*, Student Course Feedback surveys moved online in 2009. Instead of a traditional one-time in-class opportunity to provide feedback, surveys are open for a generous time period, with results available to individual course professors and Academic Administrators immediately at the end of the course. Furthermore, the archiving of survey results paves the way for efficient longitudinal analyses of this survey data enabling the College to determine whether improvement initiatives have made a change in the program from the students' perspective or indicating where improvements are necessary. Qualitative information is also obtained from Student Course Feedback surveys and Program Council meetings. All of this information is reviewed on an ongoing basis and responded to, as appropriate.

With the move to the online collection of Student Course Feedback surveys, in 2013, the College initiated a working group with the goal of increasing the student response rates. Recommendations put forth were implemented for the 2014-15 Academic Year that resulted in a 15% percentage point increase in the response rate for Fall 2014, and an increase of nearly 10% for the Winter 2015. Additionally, the working group examined the questions utilized in the survey tool, and put forth numerous recommendations that have resulted in the survey using the 'long form' set of questions for all courses. Previously, the long form was used during the faculty probationary period so that this feedback could be used to assist in the enhancement of course design and teaching development, following which the short form was employed. A copy of the Student Course Feedback Course Evaluation form follows at the end of Section 5.2.

Where student feedback or performance are indicative of the need for support, academic advising and student support specialists are available to assist students. Academic Advising is available to students through the coordinator for the program, or through the services of faculty assigned an advising role. The role of the academic advisor is defined in AA40: Academic Advising http://www2.algonquincollege.com/directives/policy/academic-advising/ as "...a professor or instructor who has been assigned the responsibility of providing academic guidance to students in his/her program at one or more specified levels." (AA40, p.1) Academic advising tools and other resources, such as the Academic Advising Handbook for Resources are available to faculty to assist in supporting students' needs: http://www.algonquincollege.com/acadvising/

Student support specialists are assigned to each Faculty to provide guidance for overall student issues and to provide support to students struggling with academics. http://www.algonquincollege.com/student-success/home/support-services/

Student Coaching, Peer Tutoring and Study Workshops are also available to help students identify solutions to difficulties with their studies through face-to-face coaching and virtual applications. Additionally, a Student Learning Centre is available to provide students with support in English, math, and computer skills. http://www.algonquincollege.com/slc/

The electronic policies file (Section 16: Policies) includes policies and procedures pertaining to student feedback, academic advising and dealing with poor student performance or enhancing student performance within the following:

AA03: Program Councils
AA25: Student Course Feedback
AA40: Academic Advising

Student Course Feedback Long Form Questions – Fall 2015 Implementation

The Student

1. I attend classes (e.g. lectures, theory):
    a. *Always to Never with N/A*
2. I attend labs (e.g. practical component):
    a. *Always to Never with N/A*
3. Outside of scheduled class and hybrid hours, I spend the following number of hours (on average each week) on this course:
    a. *Hours*
4. I expect to earn a final grade in the following range:
    a. *Grade*
5. My first language is:
    a. *Language*

The Curriculum (Delivery) *Responses are 5-Point Likert Scale w/NA*

1. This course integrates educational technologies (e.g. online learning tools, e-classroom audio-visual equipment, etc) in support of my learning.
2. Course learning activities (e.g lectures, discussions, practical work, group work, etc) are varied.
3. The course learning requirements for this course are clearly stated so that I know what to do to be successful in this course.
4. The required course materials (e.g. textbooks, manuals, software, etc) are used in the course.
5. Opportunities exist to link the course material to the real world or workplace setting.
6. The methods used to evaluate my performance are clearly outlined in writing.
7. Course learning activities are linked to the course learning requirements.
8. All of the course learning requirements are covered in the course.
9. The professor's expectations for this course are clearly stated so that I know what to do to be successful in this course.
10. The methods used to evaluate my performance are fair and are linked to the course learning requirements.
11. Overall, please rate the quality of this course
    a) Excellent to Not Satisfactory N/A
12. What did you like most about this course?
    a) Long Answer (free flowing text)
13. How could the course be improved to be of benefit to future students?
    a) Long Answer (free flowing text)

The Professor *Responses are 5-Point Likert Scale w/NA*

1. Covers all elements of the course outline.
2. Demonstrates a good knowledge of the subject area.
3. Relates to students in ways which promote mutual respect, supports student learning and success.
4. Communicates clearly.
5. Helps me understand and apply information.
6. Provides opportunities for me to participate in the course.
7. Provides timely feedback that helps me to improve my performance.
8. Evaluates my performance fairly.
9. Uses class time effectively including starting and ending classes on time.
10. Is prepared and organized.
11. Is available for consultation (e.g. email, office hours, appointments, phone, etc)
12. What did you like most about the professor?
    a) Long Answer (free flowing text)
13. What did you like about the professor?
    a) Long Answer (free flowing text)
14. What, if anything, could the professor do differently to be of benefit to future students?
    a) Long Answer (free flowing text)
15. Overall, please rate the effectiveness of your course professor
    a) Excellent to Not Satisfactory N/A

Section 5.3: Web-facilitated, Hybrid, and Online Delivery

Algonquin College has established an online academic community and has a history of integrating online learning elements in curriculum delivery. The College is well positioned to deliver the components of the Bachelor of Technology (Digital Health) (Honours) program proposed for hybrid or online delivery. In fact, the College was previously reviewed by Dr. Stephen Murgatroyd on behalf of PEQAB, and received a report dated August 2009 that noted the following conclusion that is here excerpted:

> 'Algonquin is an established, publicly funded, respected Community College with a strong history of distance education provision internationally and a strong academic track record. I have no hesitation in recommending that its distance education/e-learning programs be supported by PEQAB – they have the ability to effectively design, develop, deploy and administer programs using distance education and blended learning.'[6]

The full report and Algonquin's response are included as Supplemental Information within the electronic policies file (Section 16: Policies).

Historically, Algonquin College has been on the forefront in incorporating new technologies into the teaching and learning process. The College has been using Blackboard™ as its Learning Management System since 2000 and is presently using V9.1 which has added Wiki and Blog features along with other social media type tools. Every full-time course has a Blackboard™ site that is used for posting course outlines, learning materials, communicating directly with students and as a means to let students know their progress in a course. In addition the College currently delivers approximately 1,100 hybrid courses and 300 online course offerings with each program offering on average 20% of the programs hours online. Procedural information on the use of Blackboard™ is available to students and faculty at Algonquin College and has been included in the Electronic Policies file. The College recently implemented lecture capture technology into every classroom on campus using Camtasia Relay software, and through continued commitment to mobile learning, all classrooms are in the process of being upgraded to provide electronic instructor podiums, new widescreen projectors and electrical connectivity to each desk. Over 1400 wireless access points have been installed on campus allowing for 100% coverage and network access to our 1.6 million sq. ft. of academic space.

Numerous technologies and opportunities are available to achieve interaction amongst faculty and students including: communication via email, posting of announcement to course or homeroom Blackboard™ sites, discussion board with threaded topics, collaboration through Virtual Classroom or Chat, Group Pages, Blog or Wiki, phone (voice mail), and scheduling an appointment with faculty. A Virtual Desktop Infrastructure is now in place which allows students and staff to have access to College licensed software anywhere/anytime on any device, assisting with more flexible course delivery. An Innovation Centre is available to staff to experiment with new teaching tools. It houses some of the latest hardware and software available as well as various books and resources related to the use of digital technologies and innovation in an academic environment.

In January 2011, a Mobile Learning Centre was officially opened at Algonquin that is responsive to the current learning environment needs of students. This new facility creates over 100 new mobile computing spaces for students to bring their laptop, iPad, netbook, smartphone, and

6 Dr. Stephen Murgatroyd, "Algonquin College Offering a Bachelor of Applied Business (Hospitality and Tourism Management), Review of Distance Education Capabilities for Blended Learning" (August 2009), p.7

virtually any other mobile device to work independently or collaborate with peers on class projects. In August 2012 a second Mobile Learning Centre opened in the new Student Commons and work continues on transforming all students study spaces to allow for the use of laptops and other mobile devices. Over the last few years, the College has embraced mobile learning, launching an initiative called Bring Your Own Device (BYOD) that requires students to bring and use a mobile device to enhance their learning experience throughout their program of study. More information on BYOD/Mobile Learning is available at: http://www2.algonquincollege.com/byod/.

The College has approximately 2200 computers accessible within combined general and specialized labs that are equipped on average with 34 computers. Nine 24/7 Open Access Computer Labs are available. Additionally, there are 350 computers in Eclassrooms. All students may connect to the internet anytime and anywhere while on campus through the College's wireless infrastructure and, as mentioned, the College now has a Mobile Learning Centre that is accessible 24/7.

Information Technology Services (ITS) provides an extensive range of services to students and staff to support the use of technology at the College as may be viewed on their website and the screen capture which follows: http://www.algonquincollege.com/its/

There are no consortial or other agreements relating to the delivery of this program that need to be described.

Algonquin College meets the Board requirements for online delivery in that reliable, sufficient and scalable course-management systems to meet current and projected needs are provided, including:

i) a robust and secure technical infrastructure, providing maximum reliability for students and faculty
Algonquin College provides a robust, secure, highly-available technical infrastructure including online systems for student accounts, timetables, grades and course changes. Algonquin also provides a highly available, robust, redundant learning management system (LMS) based on Blackboard Learn™.

ii) emergency backup provisions
Algonquin backs up all critical data every night. To further improve the ability to recover, the College is currently in the process of reviewing options for Disaster Recovery using Cloud-based services. The data center that houses Algonquin‘s systems is physically secured and was designed to handle multiple failures. Should there be a short term power failure, each of the systems will continue to operate through an uninterrupted power supply. If the failure is a longer term one, the data center is powered by a Diesel generator that will automatically start in the event of a failure. Critical telecommunications facilities distributed across the campus also have battery and generator backup power supplies in place.

iii) accessible technical assistance for students and faculty for all hardware, software and delivery systems specified by the college as required for the program
Technical support is provided by ITS and the Educational Technology Support Centre through in person, telephone and email, as well as through extensive online support materials. Both students and faculty are provided one-on-one, email based, and web based assistance with the College‘s LMS. In addition, support is offered for students’ personal mobile computing devices as well as for Algonquin-owned equipment.

iv) 24 hrs per day, 7 days per week access to secure online databanks for web-delivered courses
All of Algonquin online systems are available 7/24 subject only to normal maintenance periods and backup cycles.

v) well-maintained, current and appropriate hardware, software and other technological resources and media
The College annually reviews the requirements for updating and evergreening of all hardware and technology resources. The College has in place an evergreening policy that outlines the processes to be followed. The Colleges Technology Committee reviews all requests for new hardware and hardware upgrades and annually allocated funds to ensure the systems are current and well maintained.

vi) risk assessment and planning that includes:

i**) a disaster recovery plan to ensure consistency of operational capacity**
The College received a full review on its business continuity processes and is in the process of examining options for disaster recovery using cloud-based services

ii) back-up and storage technology protocols
The College performs nightly backups of all critical systems creating multiple redundant copies of this information. A project is underway to utilize offsite secure cloud services to provide offsite recovery capabilities.

iii) a requirement for historical logs and physical documentation of exceptions, breaches, capacity usage, upgrades, workarounds, bolt-ons etc.
Every year, Algonquin's technical infrastructure is audited to ensure sufficient physical and digital security is in place. Logs are maintained of all servers and services and are analyzed regularly to ensure that any breaches or unauthorized use is quickly understood and addressed. In addition, each new system added is audited.

The electronic policies file (Section 16: Policies), includes policies, procedures and supplemental information pertaining to technology, computer and online learning modes of delivery:

Policy IT 01: Acceptable Use of Computer Networks and Accounts
Policy IT 02: Technology Evergreening
Policy IT 04: Voice Communication
Policy IT 05: Information Sensitivity and Security
Policy IT 06: Deployment of Computing Devices
Policy IT 07: Information and Communication Technology Systems Maintenance
Policy AA 13: Evaluation of Student Learning
Policy AA 32: Use of Electronic Devices in Class
Policy AA 35: Confidentiality of Student Records

Extensive professional development opportunities are offered through Algonquin College's Centre for Organizational Learning many of which focus on faculty preparation for existing and new technologies. The full range of professional development opportunities follow.

Professional Development
The College offers a wide range of professional development activities for staff throughout the year. The varied offerings may be viewed at: http://www.algonquincollege.com/pd/.

The Centre for Organizational Learning within Human Resources offers ongoing professional development for faculty. Whenever new technologies are adopted professional development is provided for faculty through the Centre for Organizational Learning and Learning and Teaching Services.

Algonquin offers support and orientation activities for both full- and part-time faculty. Professional development activities aligned with performance appraisals are also provided. Algonquin has established a set of competencies expected of faculty titled the *Professor of the 21st Century*. This document communicates the College's expectations of faculty in their role as teachers and provides a framework for continuous professional development.

To facilitate the ongoing professional development of faculty Algonquin College offers numerous ongoing professional development activities many of which are associated with the competencies of the Professor of the 21st Century as follows:

Faculty Performance Development Program
This program provides for a consistent approach across the College in how faculty performance is evaluated, as well as ensuring that it is collaborative and respectful of all stakeholders. The program includes teaching observations, faculty self-evaluations and setting of professional development plans that are completed on a three-year cycle, with annual reviews to all for timely guidance.

The Performance Institute
The Performance Institute provides performance training (body language and voicing) and many other tips and tricks for new and experienced teachers. It is delivered over one-semester, 3 hours per week. Faculty are released from teaching one course to participate in this.

Teaching Adult Lifelong Learners (T.A.L.L.) Program
This is a certificate program offered to part-time professors who are interested in furthering their professional credentials as an adult educator. The program is delivered in a hybrid format using a combination of workshops and online learning experiences. The different courses in the program are offered at a rate of two per semester (for those wishing to complete it in a shorter period of time).

Kaleidoscope Conference
Algonquin College's annual three-day professional development conference held in May features speakers and workshops of interest to all College employees.

Workshops and Online PD
Numerous workshops are offered throughout the year. Online PD is offered on current topics of interest such as Camtasia Relay, Blackboard™ and Hybrid Course Development.

Faculty can also arrange for one-on-one coaching with Centre for Organizational Learning staff if they are experiencing challenges relative to teaching, classroom management, technology use, among others. Additionally, participation in orientation activities is an expectation of newly hired full and part-time faculty.

Curriculum Services

Curriculum Services was introduced to the College in Fall 2013. This is an extension of the former Curriculum Implementation Services established in Fall 2010, with curriculum consultants dedicated to specific areas of the College. Curriculum Services staff within Academic Development support the development of hybrid and on-line courses, as well as other curriculum related needs, while providing more seamless program and curriculum development, implementation and evaluation services in collaboration with Learning and Teaching Services and the Centre for Organizational Learning. Resources are available to guide faculty in the use of technology as per the screen capture from the following link:
http://www.algonquincollege.com/onlineresources/fsg/

Full-time Faculty Orientation

Beginning in the 2015-16 academic year, new full-time faculty members will be provided with a reduced teaching load in each of the fall and winter terms of their first year in order to participate in a cohort-based professional development program. Throughout their first year, new faculty members participate in five primary orientation activities:

1. New Employee College Orientation

New employees of Algonquin College attend a College orientation and welcome session. Held bi-weekly, these sessions are designed to provide new employees with an overview of the College's mission, vision, policies, and procedures. Information about health and safety, staff ID cards, parking, personnel benefits, and union membership is also provided.

2. Departmental Orientation

New employees meet with their departmental supervisor or a departmental representative on their first day of work for departmental orientation. Topics covered include: course information, time sheets, work hours, class schedules, departmental communications etc. New hires are also introduced to departmental colleagues.

3. Teaching @ Algonquin

These sessions take place typically during August and September of the school year. They provide an introduction to the learning and teaching environment at Algonquin.

4. Focus on Learning (FOL) (Parts I and II)
This program is organized by a committee of professors from Eastern Region colleges and provides the opportunity to explore ways of developing teaching practice within a collaborative and creative environment. All new faculty from these colleges are invited to attend. It involves attending Part I for 5 days in August and Part II for 3 days in the spring of the following year.

5. Mentoring Program
During the orientation process, new professors are paired up with an experienced mentor.

Part-Time Faculty Orientation
New part-time faculty are required to participate in the five module 'Teaching Part-Time at the College' program:
1. Creating Positive Learning Environments (3 hours)
2. Teaching is More Than Talking (3 hours)
3. Getting Started With Blackboard™ (3 hours)
4. The Nuts and Bolts of Evaluation (3 hours)
5. Finding Your Way Around Algonquin College (3 hours)

Professional Development Funds
The College budgets a portion of its professional development funds centrally. This fund is used to run the activities offered through the Centre for Organizational Learning. Additionally, to maintain faculty currency, each School/Faculty also budgets some professional development funds for staff to participate in events related to their field (courses, conferences, meetings) from year to year. Usually, these funds are kept in a central envelope within each School. The funds are disbursed, following receipt of requests from faculty members with the proper justification.

Additionally, the College provides sabbatical opportunities whereby faculty that have been with the College for more than 7 years can make a request to be released from their teaching duties for one year in order to perform other duties which will benefit them in their professional growth.

The College further allows each faculty member 10 working days leave per year for professional development. This professional development can be in relation to in-house teaching methodologies/learning tools, as well as, activities related to the faculty member's field.

Algonquin College's Library also supports the development of both staff and students and offers a full range of services and provides access to over 50 databases
The electronic policies file (Section 16: Policies), includes policies and procedures pertaining to faculty within the following:

Policy AA 31: Learning Resource Centre
Policy HR 02: Professional Development Leave
Policy HR 03: Tuition Assistance-Algonquin College Courses
Policy HR 04: Tuition Assistance-Degree Completion
Policy HR 10: New Employee Orientation

Section 5.3.1: Curriculum Vitae of Online Learning Professional and Technical Staff

***** Excluded for web version – confidential/proprietary material***

Section 6: Capacity to Deliver

The proposed program is appropriate to the College's mission, goals and strengths.
Algonquin College's strategic plan, ***Charting our Future: Strategic Plan 2012-2017,*** articulates its mission, goals and strength. The new strategic plan and Strategic Mandate Agreement may be reviewed at the following link:
http://www.algonquincollege.com/reports/

Algonquin College's Vision, Mission and Core Values

Algonquin College's organizational philosophy is defined by our vision, mission and core values. These critical elements describe who we are, what we want to achieve, and what will guide our decision-making on a daily basis. The vision sets out the ideal state that we want to achieve and the mission identifies our purpose, while the core values articulate our most fundamental beliefs and the behaviours expected of employees and students. Combined, the vision, mission and values, set the context for the development and evaluation of the present Strategic Plan for 2012-2017 and for the long-term development of the College. Extensive public consultation and engagement of the College community has informed this plan's direction. The College's current strategic plan retains the core values espoused in the previous 2008-2013 plan, however, contains a revision to the Mission and Vision as follows:

VISION STATEMENT
To be a global leader in digitally-connected applied education and training.

MISSION STATEMENT
To transform hopes and dreams into skills and knowledge, leading to lifelong career success.

CORE VALUES
Caring
We have a sincere and compassionate interest in the well-being of the individual.
Learning
We believe in the pursuit of knowledge, personal growth and development.
Integrity
We believe in trust, honesty and fairness in all relationships and transactions.
Respect
We value the dignity and uniqueness of the individual.
We value the equity and diversity in our community.
The College is presently engaged in developing the next Strategic Plan for 2017-2022 and is once again embarking on extensive stakeholder consultation to inform its new direction. The phases of planning and processes underway are detailed at the following link:
http://www.algonquincollege.com/strategicplan/

Section 6.1: Learning and Physical Resources

The Algonquin College Library offers a variety of services to support faculty teaching and student learning by providing access to Library professionals and para-professionals as well as print and electronic resources.

Algonquin's main campus is well situated in the National Capital Region. This gives our students the advantage of being close to many specialized libraries. The Algonquin Library has local agreements with many area libraries which permit direct student borrowing or Inter-library loan service. The libraries covered under these agreements include Carleton University and University of Ottawa libraries.

In addition to individual Library agreements, the Algonquin College Library is a partner in the National Capital **Sm@rtLibrary** which includes numerous member institutions. This partnership facilitates students' access to resources available at partner institutions. Current partners include:

- University of Ottawa
- Carleton University
- Ottawa Public Library
- Canadian Museum of Civilization
- Canadian War Museum
- Canadian Mortgage and Housing Corporation
- La Cité collégiale
- National Gallery
- Bibliothèque municipal de Gatineau
- Université du Québec en Outaouais
- Canada Science and Technology Museums Corporation
- Dominican College University

Print/in-house resources relevant to Bachelor of Public of Technology (Digital Health):
The Algonquin Library collection totals about 65,000 volumes in-house. As this program covers topics in Health, Computing and Business, it is difficult to estimate the number of books in our present collection that would support the new program. There are potentially thousands of books that may be relevant. The most current titles would generally be in electronic format (ebook). Specialized titles from the digital health field would need to be purchased, as this is a new area to cover and be kept up to date.

Included in the above are audio-visual items that may be relevant for the program. Students may benefit greatly from the lynda.com tutorials and video resources from the Films on Demand educational video database. The Library also provides resources for support subject areas such as Mathematics, Communications (Language/Writing/Presentations), Critical Thinking, Basic Computing, among others.

Electronic/Online Resources

Databases

The Algonquin Library provides access to over 50 databases. Many of these databases would include journal titles of relevance to a Digital Health program. Database titles of specific interest would be:

- Medline(Ebsco)
- Business Source Complete
- Safari Tech Books Online
- Academic Search Complete
- ScienceDirect
- Lynda.com
- CINAHL

Journals

Online journal titles are available through our various electronic databases and include the following:

- Electronic Healthcare
- International Journal of Electronic Healthcare
- Digital Health (Sage)
- Journal of AHIMA
- Artificial Intelligence in Medicine
- Journal of Healthcare Information Management

Journals and articles on relevant topics can be found in various databases–medical crises in medical databases, computer technology issues in computer or technical databases. The Library offers a "Onesearch" service which allows searching of most library databases simultaneously. This service will greatly benefit students as they search for topics that are multi-disciplinary.

Audio Visual – Streamed Video

The Algonquin Library provides access to a large collection of online (streamed) video from Films on Demand. Other online video collections are available through the Library, including National Film Board (NFB) and PBS LearningMedia.

Electronic Books

The Library's e-Book collection contains over 30,000 titles and 29,000 public documents. Other areas of interest covered in the various e-book collections include Mathematics, Basic Computing, English Communications, among others.

General Information

Algonquin's main campus is well situated in the National Capital Region. This gives our students the advantage of being close to many specialized libraries. The Algonquin Library has local agreements with many area libraries which permit direct student borrowing or Inter-library loan service. The libraries covered under these agreements include Carleton University and Ottawa University libraries.

In addition to individual library agreements, the Algonquin College Library is a partner in the National Capital **Sm@rtLibrary** which includes numerous member institutions. This partnership facilitates students' access to resources available at partner institutions. Current partners include:

- University of Ottawa

- Carleton University
- Ottawa Public Library
- La Cité collégiale
- Canadian Museum of Civilization
- Canadian War Museum
- Canadian Mortgage and Housing Corporation
- National Gallery
- Bibliothèque municipal de Gatineau
- Université du Québec en Outaouais
- Canada Science and Technology Museums Corporation
- Dominican University College

Specialized Equipment

The Bachelor of Technology (Digital Health) (Honours) program will require the integration of state-of-the-art hospital information system (HIS) software to support hands-on learning in a digital health environment. HIS software will allow students to develop solutions using an environment similar to those used by local healthcare organizations. As such, it will also support student projects in partnership with those organizations and any others interested in linking their systems with the HIS. The HIS will be accessible to students remotely, and in the various health sciences labs.

The Bachelor of Technology (Digital Health) (Honours) program will also use Algonquin College's existing state-of-the-art health sciences and advanced technology labs, described below.

Laboratory Space

In addition to the available classroom and student spaces at the Woodroffe campus, the proposed program will use existing laboratory space in Algonquin College's various health sciences and simulation labs, and advanced technology labs.

Algonquin College's health sciences labs include hospital, community, and clinic-based simulation spaces. To provide some examples of the spaces, the hospital-based Simulation Centre consists of an operating room, a three (3) bed intensive care unit and nine (9) bed ward space. While in the lab, students interact with computerized mannequins, the latest hospital equipment such as ventilators, intravenous pumps, and other hospital equipment. The labs are equipped with a number of cameras, microphones and large-screen monitors to allow for recording scenario-based simulations, followed by full student debriefing sessions or research activities. In addition, Algonquin has dental and other health sciences labs that add to the number of labs available to students and professors when designing learning activities, and incorporating health technology into hands-on educational experiences.

Section 6.2: Resource Renewal and Upgrading

Library Resources
The College plans and invests in Library acquisitions on an annual basis. Library resource needs are identified by the librarians as well as faculty members. Faculty members review existing acquisitions, typically in the May/June timeframe. New resources (text, video, journal, electronic) that will be of benefits are prioritized and purchasing recommendations submitted to the Library for consideration as per yearly funding allocations. Policy AA31 further details the Library's (formerly the Learning Resource Centre) mandate.

Computers and Computer Access
The College establishes an instructional computing and technology renewal and upgrading plan on an annual basis. A process for renewal of computers and their deployment to staff has been established as detailed in Policy IT02- Technology Evergreening and Policy IT06-Deployment of Computing Devices. The College has approximately 2050 computers accessible at the Woodroffe campus within combined general and specialized labs that are equipped on average with 34 computers.

New equipment and renewal requirements are identified and prioritized on an annual basis in conjunction with capital equipment planning. The College Space and Infrastructure Committee (CSIC) develops plans to address strategic directions, needs and areas for improvement. On an annual basis, Schools are requested by the CSIC to bring forward requests for renovations and/or space requirements to improve the learning environment. These requests are prioritized by a sub-committee of CSIC.

Allocation of funds for environmental and learning resources is an annual process as per the budget approved by Algonquin College's Board of Governors. Capital funds are distributed amongst the Faculties/Schools in the College and the allocation varies from year to year, based on funds available.

Classrooms
The College upgrades and enhances facilities on an ongoing basis taking into account enrolments, faculty support needs, and the growing use of web-based technologies for learning and teaching. There are currently 147 classrooms at the Woodroffe campus that are upgraded according to the needs identified through the annual Learning Environment Quality identification, prioritization, and funding process. Lecture rooms vary in size and seat from 20-140 students. All classrooms at Algonquin College have e-learning capabilities that can be used for course delivery and web access. E-classrooms are equipped with wireless Internet access, video equipment, a speaker system, a high-resolution projector, a computer with wired access to high speed internet, and a white or black board. Of the E-classrooms, 130 have been enhanced to mobile classrooms supporting the use of laptops and other mobile devices with full access to power, an enhanced data projector and a Smart Podium interactive pen display. E-classrooms are equipped with video equipment, a speaker system, a high-resolution projector, a computer with access to high speed internet, and a white or black board.

Policy AA 31: Learning Resource Centre
Policy IT 02: Technology Evergreening
Policy IT 06: Deployment of Computing Devices
Procedure: College Technology Committee Terms of Reference
Procedure: College Space and Infrastructure Committee Mandate

Section 6.3: Support Services

Support Service	Brief Description of Service
Welcome Centre	The Robert C. Gillett Student Commons provides a variety of services dedicated to student success. The Welcome Centre in Student Support Services, located on the third floor of the Student Commons (E341), is designed to serve as a vital first point of access to a number of support services for potential applicants, current students and graduates from one centralized location, in the hopes of establishing a familiar and ongoing resource during an individual's affiliation with Algonquin College. The Welcome Centre features five stations including one accessible station to assist students and clients in their pursuit of service from the Centre for Students with Disabilities, Counselling Services, and the Employment Support Centre (formerly known as Student Employment Services).
The AC Hub	The AC Hub is devised as a one-stop access point for student engagement and a source for information, events and workshops. Students will cultivate partnerships, friendships and networking connections within the AC Hub and their communities. Our goal is to enhance the academic experience beyond the scope of the classroom, providing students the opportunity to become actively involved in campus life and the surrounding community. The AC Hub hosts College-wide Orientation, provides signature events (including the annual Volunteer Appreciation Gala), and also provides volunteer opportunities on campus and in the community recognized by a Co-Curricular Record to acknowledge students' contributions. Additionally, the AC Hub delivers hands-on workshops, exposes students to industries through keynote speakers and AC Hub Talks, provides a support structure for students through a Peer Mentoring program, offers services at the AC Hub Satellite (second floor, C building) and three AC Hub Mobile desks across the sprawling Woodroffe campus to help keep students informed, and provides both physical and virtual outreach to regional campuses.

Support Service	Brief Description of Service
Academic Advising	Algonquin College's Policy on Academic Advising, AA40, defines an advisor as "…a professor or instructor who has been assigned the responsibility of providing academic guidance to students in his/her program." In this role, the faculty member provides the student with an opportunity to • plan, discuss, and review academic progress • address challenges that may impede successful performance • identify education, life and career goals • assist the student in creating a plan to realize those goals • refer the student to all College resources the College
Student Success Specialists	Student Success Specialists are support staff who provide a friendly first point of contact for students of a designated Academic area (e.g. Faculty of Technology and Trades), or group (e.g., Aboriginal, WSIB). They work closely with Academic and Student Services staff to: • promote and implement student success initiatives (e.g., connecting with students at risk) • ensure students' questions are answered promptly or directed to the appropriate forum • participate in activities that help students in the transition to the College (e.g., orientation) • provide information about admissions, records, programs of study and bursaries • link students to appropriate resources and services
Counselling: Career and Personal	Counselling Services (Woodroffe Location) is staffed by 8 full-time professional counsellors. This department provides confidential support services to students facing the academic, career, and personal challenges of college. Services include: • Short term and Supportive counselling for common mental health issues experienced by students, such anxiety, depression, and stress regulation • Crisis intervention and suicide risk assessment • Proactive outreach initiatives issues such as team building, effective group work, communication skills, and stress management • Program-choice planning and career direction assessment • Tragic Event Response Team • Parent Resource Network • Employee training initiatives such as "SafeTALK" suicide intervention, "Positive Space" sexual orientation awareness, and a range of mental health awareness workshops.

Support Service	Brief Description of Service
Financial Aid	The Financial Aid Office is staffed with 1 manager, 1 front office supervisor, 10 full-time employees and 4 part-time employees who administer various government financial assistance programs to eligible full and part-time students**.** Services include, but are not limited to**:** • Administration of the Ontario Student Assistance Program (OSAP) • Determination of an individual student's eligibility for the various types of funding • Administration of the student bursary programs for students • Interpretation of the rules and regulations of the Ontario Ministry of Training, Colleges and Universities
Employment Support Centre	The Employment Support Centre offers professional cost-free services to students, graduates, and employers. The department is comprised of three full-time employees including two Employment Officers and one Employment Outreach Officer. The Employment Support Centre promotes college programs to the community and offers a comprehensive electronic job posting service ensuring employers and qualified students/graduates are connected. Services include, but are not limited to: • Electronic job posting system (MyCareerZone) • One-on-one job coaching appointments • Résumé and cover letter review drop-in service • Job search techniques • Interview preparation • Labour market information • Career Fairs and other on-campus recruitment activities
Peer Tutoring	Peer Tutoring provides the one-on-one opportunity for students experiencing difficulties in a particular course to be matched with a senior student (nominal fee applies) for academic assistance.
Services for Students with Disabilities	The Centre for Students with Disabilities provides disability-related counselling and advising, including specialized academic and personal counselling that is developed specifically for students with disabilities and not duplicated by regular counselling and advising services available to all students. The Centre is staffed with 1 manager and 12 full-time employees including 6 Disability Counsellors, 1 Learning Strategist, 1 Intake and Assessment Advisor, 2 Assistive Technologists, 1 Test Room Facilitator, 1 Office Administrator and numerous additional part-time staff. We also employ two part time counsellors and two part-time learning strategists. Services include, but are not limited to: • Counselling and support so that students with disabilities can work within an accessible college environment • Assistive reading technologies • A large Test Centre for the provision of test and exam accommodations • Transcription services (ie: Braille, large print, alternative/digital

Support Service	Brief Description of Service
	formats such as accessible e-text) • Assistance to find specialized and peer tutors • Interpreters and electronic note taking for students with hearing loss • Peer notetaking services • Access to, and training for, assistive devices • Access to a large Assistive Technology Lab • A Transition Centre for students with Autism Spectrum Disorder • Consultation with faculty for students with disability-related needs • Liaison with and referral to other Student Support Services and agencies • Liaison with campus and community agencies on the students' behalf
Other Services:	
Cooperative Education Department	The Cooperative Education Department facilitates the co-op process including the development of job opportunities and the preparation of the students for the work force. The department acts as a liaison between the student, the employer and the participating academic departments and collects the relevant academic assignments. The academic coordinators evaluate the student's co-op work term report. The staffing complement is 5 full-time employees. Services include, but are not limited to: • Job posting process, distribution of applications to employers • Arranging interviews on or off campus, process job offers • Site visits with the employer and student during the work placement • Consultation with co-op professionals to mitigate issues encountered during the job search or while on placement
Health Services	Health Services provides professional, confidential medical services for students. Physicians are available by appointment and walk-in. Registered Nurses provide assessment and treatment of minor illnesses or injury. Health Services is staffed with both full and part-time physicians, nurses and support staff. There are 6 combined full and part-time physicians, one registered dietitian, one psychiatrist and 7 nurses on staff. Services include, but are not limited to: • Allergy injections • Birth control information and prescriptions • Blood tests • Emergency treatment for accidents/illnesses • Mental health support • Health counseling (nutrition, stress, exercise, smoking, drugs, alcohol) • Treatment for acute illness (headaches, colds, etc.) • Vaccinations

Support Service	Brief Description of Service
Mamidosewin Centre for Aboriginal Students	The Mamidosewin Centre provides a variety of cultural programs and services to Aboriginal students. In addition to welcoming social events and activities, services offered include, but are not limited to: • Information on Aboriginal bursaries, scholarships and other funding • Workshops and individual support with study skills, time management, tutors etc.) • Career, academic or personal counselling with an Aboriginal counsellor • Aboriginal Education to Employment program and job listings • Referrals to Aboriginal services (housing, counselling, employment etc.)
College Ombudsperson	The Ombudsman provides confidential, independent, and impartial assistance and intervention to address any college-related concerns of students. The Ombudsman has effective access to both College and Students' Association officials and can assist students with concerns related to any aspect of student life at the College – from policies, procedures to rights and responsibilities. Assistance is provided to ensure fair, just, and equitable treatment and may be provided in the following areas: • Coaching students in making appropriate choices based on unique/personal circumstances • Promoting a proactive perspective for managing and resolving conflicts and/or concerns that may occur • Facilitating communication between the student and other members of the College community • Resolving student concerns and issues with other students, faculty, or staff.
Residence Life	Residence Life supports the holistic development of students through individual, interpersonal, intellectual and community education and empowers students to live, learn, and lead in an inclusive and safe community. The Manager-Residence Life and the Residence Life Coordinator supervise the Two Senior Resident Advisor, the Residence Programmer and 20 Resident Advisors. Services include, but are not limited to: • Educational Programming and Building Wide Events • Residence Orientation • Algonquin Residence Council • Student Outreach and Support • Community Management and Policy education
Registrar's Office	The Registrar's Office maintains student records and provides relevant support from admission to graduation. Services include, but are not limited to: • Admissions, fees, registrations, withdrawals • Applications for course exemptions • Academic records and transcripts • Scheduling (timetables)

Support Service	Brief Description of Service
Safety and Security Services	Safety, Security & Emergency Management ensures the College provides sustainable safe and secure learning, working and social environments for all of its occupants through the implementation of coordinated risk mitigation strategies and integrated programming. Services include, but are not limited to: • Full service prevention and patrol programs. • Communications, dispatch and reporting centre (24 hrs/day) • Walk Safe Services • Incident Response, Emergency Response and Investigations • Risk management risk assessment & consultation services • Workshops and presentations on a variety of safety issues

Section 6.4: Faculty

Enrolment Projections and Staffing Implications

	Cumulative Semester Enrolment Full-time	Contact Hours	Cumulative Full-time Faculty Equivalents (F.T.E.)	Cumulative Part-time Faculty Equivalents (F.T.E.)	Contact Hours taught by Full-time Faculty	Contact Hours taught by Part-time Faculty	Ratio of Full-time Students: Full-time Faculty
Year 1 2017-18	48	540	1	1.26	360	455	1:59
Year 2 2018-19	104	540+600=1140	2	2.43	720	875	1:63
Year 3 2019-20	170	1140+510=1650	3	3.51	1080	1265	1:67
Year 4 2020-21	235	1650+525=2175	4	4.68	1440	1685	1:70

The table above depicts both the enrolment and staffing projections for the program. The figures are based on a plan to hire a full-time faculty member in each of the second, third and fourth years following the launch of the program, assuming stable enrolment. Note that full-time faculty members who may teach breadth courses are also captured in the table above.

Faculty Selection

Faculty selection and orientation are detailed within Policy HR07: Full-time Hiring Process and Policy HR10: New Employee Orientation. All future new full-time hires in the Faculty of Health, Public Safety and Community Studies designate a graduate degree as the preferred credential. If hiring a full-time professor to teach primarily in a degree program, a terminal credential will be the requirement. Faculty identified for the Bachelor of Technology (Digital Health) (Honours) program meet the Board requirement of no fewer than 50% of the faculty proposed to teach hold the terminal academic credential in the field or in a closely related field of study. There are 15 faculty identified to teach core courses in the program, 9 of which hold PhD's and 6 who hold Master's level credentials. Of the 34 core courses within the course schedule, 23 (68%) have a PhD identified eligible to teach. Although Master's qualified faculty have also been identified for certain of these courses, the number of PhDs is such that the program would be able to ensure that 50% of the faculty assigned to a cohort would hold the terminal credential.

Review of Faculty Performance

The Academic Chair is expected to conduct regular reviews of faculty performance, which includes a review of student feedback on teaching and supervision (see Policy AA25: Student Course Feedback). Formal performance appraisals of full-time faculty are to be conducted no less than once every three years and as often as yearly. However, Student Course Feedback surveys are reviewed following each semester and any areas for improvement are addressed with faculty on an ongoing basis. Performance appraisals of faculty are conducted to ensure that student needs

are being adequately met as well as to discuss the ongoing needs and professional development of faculty.

New professors are subject to a one-year probationary period during which time the Chair will evaluate them at regular intervals (every 4 months). The Chair completes a final, more detailed, evaluation immediately prior to the end of the probationary period to formally acknowledge and confirm the faculty member's suitability.

The College has initiated a Faculty Performance Development Program that provides for a consistent approach across the College in how faculty performance is evaluated, as well as ensuring that it is collaborative and respectful of all stakeholders. The program includes teaching observations, faculty self-evaluations and setting of professional development plans that are completed on a three-year cycle, with annual reviews to all for timely guidance.

Faculty Currency and Professional Development

As previously detailed in Section 5.3, the College offers a wide range of professional development activities for staff throughout the year. Policy H04: Tuition Assistance – Degree Completion was instated to assist staff who wish to pursue further studies. The purpose of Policy H04 is:

'To provide professors and other College employees with support in acquiring degrees at the bachelor's, master's and doctoral level at postsecondary institutions to better serve the needs of the students, the strategic directions of the College, and to assist employees in achieving their professional development goals.'

Other varied professional development opportunities offered by the Centre for Organizational Learning with Human Resources may be viewed at: http://www.algonquincollege.com/pd/. Program faculty have received support to pursue furthering their academic credentials.

Faculty Innovation

Algonquin supports experimentation with new teaching methods and is an advocate for innovation. Innovation was specifically referenced in the College's 2008-2013 Strategic Plan and defined as, *"…the successful implementation of creative ideas which includes initiatives related to staff, programs, technology and business processes."* As such an Academic Innovation Fund was established in 2009 to formally support experimentation with new teaching methodologies. Innovation is ongoing, and budget permitting, it is expected that calls for proposals will continue to be announced.

An Innovation Centre is available to staff to experiment with new teaching tools that houses some of the latest hardware and software available as well as various books and resources related to innovation. Three workstations are available to all staff for innovating and experimenting.

Whenever new technologies are adopted professional development is provided through the Centre for Organizational Learning. Typically prior to adopting system wide technologies, the College will pilot/experiment, using off-site hosting services when necessary, and rollout the professional development support in tandem. This process was used with Adobe Connect adoption and prior to adopting Blackboard™ 9.1 and Elluminate. A Virtual Desktop Infrastructure is now in place which allows students and staff to have access to any College licensed software anywhere/anytime on any device assisting with more flexible course delivery.

The College additionally offers an annual Algonquin College Innovation Fund (ACIF) that allow faculty and staff to propose and receive up to a maximum of $10,000 for projects that will lead to productivity improvements, enhanced teaching and learning, more engaged employees and greater student success.

Faculty Teaching and Supervision Loads

Faculty teaching and supervision loads are assigned in accordance with the Academic Employees Collective Agreement's Standard Workload Formula (SWF) defined in Article 11 – Workload. The pertinent workload excerpt is in included in Section 16: Policies.

The electronic policies file (Section 16: Policies) includes policies and procedures pertaining to faculty within the following:
Policy AA 23: Faculty Consultation with Students
Policy AA 25: Student Course Feedback
Policy AA 40: Academic Advising
Policy HR 02: Professional Development Leave
Policy HR 03: Tuition Assistance - Algonquin College Courses
Policy HR 04: Tuition Assistance - Degree Completion
Policy HR 07: Full-time Hiring Process
Policy HR 10: New Employee Orientation
Procedure: Credential Evidence and Release of Information
Procedure: Ontario Colleges of Applied Arts and Technology Academic Employees Collective Agreement (Effective From: September 1, 2014 - September 30, 2017) Excerpt Article 11 Workload

Section 6.5: Curriculum Vitae Release

The college has on file and available for inspection, from all faculty and staff whose CVs are included in this submission, signatures that attest to the truthfulness and completeness of the information contained in their CV and agreeing to the inclusion of their curriculum vitae in any documents/web sites associated with the submission, review, and final status of the program application.

Section 6.6: Curriculum Vitae of Faculty Assigned to the Degree Program

***** Excluded for web version – confidential/proprietary material***

Section 6.6.2: Curriculum Vitae of Faculty Assigned to New Non-core Courses

***** Excluded for web version – confidential/proprietary material***

Section 7: Credential Recognition

The program has been designed to maximize the graduates' potential for employment and promotion in the field and for further study as evidenced by the following communications from employers, professional associations and academic institutions.

Included in this section are letters of support from:

- Arnprior Regional Health
- Ontario MD
- Health Canada – First Nations and Inuit Health Branch
- Branham Group
- BridgeHead
- Children's Hospital of Eastern Ontario
- Santovex
- Ottawa Valley Family Health Team
- HIS and Clinical Solutions Delivery, The Ottawa Hospital
- West Carleton Family Health Team
- Cognisant MD
- Carleton Place & District Memorial Hospital
- Bruyere Continuing Care
- Newborn Screening Ontario
- The Ottawa Hospital
- University of Ottawa Health Services
- The Ottawa Hospital Research Institute
- Montfort Academic Family Health Team
- Clinical Research Unit (CHEO)
- Connexion Family Health Team
- Perley and Rideau Veteran's Health Centre
- Canada Health Infoway
- J-Squared Technologies Inc.

ARNPRIOR REGIONAL HEALTH

ARNPRIOR & DISTRICT MEMORIAL HOSPITAL
PRIMARY HEALTH CARE CENTRE
THE GROVE NURSING HOME
ASSISTED LIVING SERVICES

September 21, 2015

Margaret Cusson, Chair
Academic Development
Algonquin College
1385 Woodroffe Ave/C226H
Ottawa, ON K2G 1V8

Re: Bachelor of Technology (Digital Health)

Please accept this letter as confirmation that Arnprior Regional Health is pleased to offer this letter in support of the proposed Bachelor of Technology (Digital Health) and may be able to provide:

- Placements for students for the required co-op work experience component of the program,
- Hiring potential for graduates should the opportunities be available.

Sincerely,

Gail Atwill
CFO, VP Finance & Support Services
613-623-3166 x 223

350 John Street North, Arnprior, Ontario K7S 2P6 Phone: (613) 623-3166 Main Fax: (613) 623-4844
ArnpriorRegionalHealth.ca

OntarioMD
Empowered Practices. Enhanced Care.

November 6, 2015

Margaret Cusson, Chair
Academic Development
Algonquin College
1385 Woodroffe Ave/C226H
Ottawa, ON K2G 1V8

Re: Bachelor of Technology (Digital Health)

Please accept this letter as confirmation that OntarioMD is pleased to offer this letter in support of the proposed Bachelor of Technology (Digital Health) and may be able to provide:

- Placements for students for the required co-op work experience component of the program,
- Hiring potential for graduates should the opportunities be available

We anticipate that this new program will also focus on the eHealth landscape in Ontario and the challenges regarding interoperability and data standardization in primary care settings.

We wish you the best of luck in this new program.

Sincerely,

Sarah Hutchison, CEO

150 Bloor Street West, Suite 900, Toronto, Ontario M5S 3C1 • 416-623-1248 • 1-866-339-1233 • OntarioMD.ca

Health Canada Santé Canada

November 6, 2015

Ms. Margaret Cusson, Chair
Academic Development
Algonquin College
1385 Woodroffe Avenue, C226H
Ottawa, ON K2G 1V8

Re: Bachelor of Technology (Digital Health/eHealth)

Dear Ms. Cusson:

Please accept this letter as confirmation that the Capacity, Infrastructure, Accountability Division, First Nations and Inuit Health Branch, is pleased to offer this letter in support of the proposed Bachelor of Technology (Digital Health) and may be able to provide:

- Placements for students for the required co-op work experience component of the program; and
- Hiring potential for graduates should the opportunities be available.

Programs such as this are instrumental in providing the skill set required for future development and implementation of National Digital Health/eHealth activities.

Sincerely,

Catherine Jones
Executive Director
Capacity, Infrastructure, Accountability Division
First Nations and Inuit Health Branch
Health Canada

Branham
BRANHAM GROUP INC.

November 5, 2015

Margaret Cusson, Chair
Academic Development
Algonquin College
1385 Woodroffe Ave/C226H
Ottawa, ON K2G 1V8

Re: Bachelor of Technology (Digital Health)

Please accept this letter as confirmation that Branham Group Inc. is pleased to offer this letter in support of the proposed Bachelor of Technology (Digital Health) and may be able to provide:

- Placements for students for the required co-op work experience component of the program,
- Hiring potential for graduates should the opportunities be available.

Healthcare is the single largest vertical industry in terms of public and private spend in Canada and in most countries around the world. Digital Health is and will only increase its importance to gradual change in patient outcomes by making information flows better.

This Bachelor program is very key component

Sincerely,

Wayne Gudbranson
CEO

45 O'Connor Street, Suite 1150 - Ottawa, ON - Canada K1P 1A4
Tel. (613) 745-2282 Fax. (613) 745-4990
www.branhamgroup.com
www.branham300.com

BridgeHead

Nov 5, 2015

Margaret Cusson, Chair
Academic Development
Algonquin College
1385 Woodroffe Ave/C226H
Ottawa, ON K2G 1V8

Re: Bachelor of Technology (Digital Health)

Please accept this letter as confirmation that Bridgehead Software is pleased to offer this letter in support of the proposed Bachelor of Technology (Digital Health) and may be able to provide:

- Placements for students for the required co-op work experience component of the program,
- Hiring potential for graduates should the opportunities be available.

Sincerely,

Todd MacCallum
Regional Director, Canada

November 5, 2015

Margaret Cusson, Chair
Academic Development
Algonquin College
1385 Woodroffe Ave/C226H
Ottawa, ON K2G 1V8

Re: Bachelor of Technology (Digital Health)

Please accept this letter as confirmation that The Children's Hospital of Eastern Ontario is pleased to offer this letter in support of the proposed Bachelor of Technology (Digital Health) and may be able to provide:

- Placements for students for the required co-op work experience component of the program,
- Hiring potential for graduates should the opportunities be available.
- Placements for students supporting research for the required co-op work experience component of the program

Sincerely,

Lorraine Hart, EORLA Integrated Quality Manager
Mari Teitelbaum, CHEO Vice President of Technology and Chief Information Officer

Santovex Consulting

November 4th, 2015

Margaret Cusson, Chair
Academic Development
Algonquin College
1385 Woodroffe Ave/C226H
Ottawa, ON K2G 1V8

Re: Bachelor of Technology (Digital Health)

Please accept this letter as confirmation that Santovex Consulting is pleased to offer this letter in support of the proposed Bachelor of Technology (Digital Health) and may be able to provide:

- Placements for students for the required co-op work experience component of the program,
- Hiring potential for graduates should the opportunities be available.

Sincerely,

Anubha Sant
Principal
Santovex Consulting

Ottawa Valley
FAMILY HEALTH TEAM

95 Spring Street
Almonte, ON K0A 1A0
Tel: 613-256-9370
Fax: 613-256-0949
www.ovfht.ca

November 4, 2015

Margaret Cusson, Chair
Academic Development
Algonquin College
1385 Woodroffe Ave/C226H
Ottawa, ON K2G 1V8

Re: Bachelor of Technology (Digital Health)

Please accept this letter as confirmation that the Ottawa Valley Family Health Team is pleased to offer this letter in support of the proposed Bachelor of Technology (Digital Health) and may be able to provide:

- Placements for students for the required co-op work experience component of the program,
- Hiring potential for graduates should the opportunities be available.

Sincerely,

Peter Hamer
Executive Director

November 5, 2015

Margaret Cusson, Chair
Academic Development
Algonquin College
1385 Woodroffe Ave/C226H
Ottawa, ON K2G 1V8

Re: Bachelor of Technology (Digital Health)

Please accept this letter as confirmation that The Ottawa Hospital is pleased to offer this letter in support of the proposed Bachelor of Technology (Digital Health). We were engaged as an organization in the development of the program as part of the advisory committee. We may be able to provide:

- Placements for students for the required co-op work experience component of the program.
- Hiring potential for graduates should the opportunities be available.

There is a need for trained professionals in the area of digital health in Canada and educating these professionals in a program such as the one proposed will not only guarantee a more skilled graduate in this area, it will also save healthcare organizations training costs once they are hired.

We support this initiative and wish the Algonquin college every success with the program.

Sincerely,

Michelle Leafloor, MHA
Director, HIS and Clinical Solutions Delivery
The Ottawa Hospital
501 Smyth Road
Ottawa, Ontario

West Carleton
Family Health Team

November 5, 2015

Margaret Cusson, Chair
Academic Development
Algonquin College
1385 Woodroffe Ave/C226.
Ottawa, ON K2G 1V8

Re: Bachelor of Technology (Digital Health)

Please accept this letter as confirmation that West Carleton Family Health Team is pleased to offer this letter in support of the proposed Bachelor of Technology (Digital Health) and may be able to provide:

- Placements for students for the required co-op work experience component of the program,
- Hiring potential for graduates should the opportunities be available.

Sincerely,

Dave Sellers, Director of Operations

WEST CARLETON
family health centre
keeping our community healthy

• Dr. Rachael Adams • Dr. Barry Bruce • Dr. Sara Ciechanska • Dr. Amanda Connell • Dr. Jeannette Dionne
• Dr. Karen Ferguson • Dr. Mark Fraser • Dr. Michelle Lawlor • Dr. Kathy McBride • Dr. Lisa Rosencrantz
• Dr. Rob Slecher • Dr. Kristen Tonon • Dr. Eugene Vigneron
119 Langstaff Drive, P.O. Box 218, Carp, ON K0A 1L0
Tel: 613.839.3271 • Fax: 613.839.3273 • www.wcfht.ca

November 2, 2015

Margaret Cusson, Chair
Academic Development
Algonquin College
1385 Woodroffe Ave/C226H
Ottawa, ON K2G 1V8

Re: Bachelor of Technology (Digital Health)

Please accept this letter as confirmation that CognisantMD is pleased to offer this letter in support of the proposed Bachelor of Technology (Digital Health) and may be able to provide:

- Placements for students for the required co-op work experience component of the program,
- Hiring potential for graduates should the opportunities be available.

Sincerely,

Jeff Kavanagh
President

www.CognisantMD.com
Phone 888-864-8655
Email info@cognisantmd.com
Address
3335 Yonge Street Suite 304
Toronto ON, M4N 2M1

CARLETON PLACE & DISTRICT MEMORIAL HOSPITAL

SIXTY YEARS OF CARING ... AND WE'RE JUST GETTING STARTED

September 25, 2015

Margaret Cusson, Chair
Academic Development
Algonquin College
1385 Woodroffe Ave/C226H
Ottawa, ON K2G 1V8

Re: Bachelor of Technology (Digital Health)

Please accept this letter as confirmation that Carleton Place & District Memorial Hospital is pleased to offer this letter in support of the proposed Bachelor of Technology (Digital Health) and may be able to provide:

- Placements for students for the required co-op work experience component of the program,
- Hiring potential for graduates should the opportunities be available.

Sincerely,

Toni Surko, CEO

211 Lake Avenue, East
Carleton Place, ON K7C 1J4
Phone:(613) 257-2200
Fax: (613) 257-3026
Website: www.carletonplacehospital.ca

www.bruyere.org

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43, rue Bruyère St.
Ottawa ON K1N 5C8
Tél./Tel.: 613-562-6262
Téléc./Fax: 613-562-6367

Hôpital Saint-Vincent Hospital
60, rue Cambridge St. N.
Ottawa ON K1R 7A5
Tél./Tel.: 613-562-6262
Téléc./Fax: 613-782-2785

Residence Elisabeth-Bruyère Residence
75, rue Bruyère St.
Ottawa ON K1N 5C8
Tél./Tel.: 613-562-6262
Téléc./Fax: 613-562-6016

Résidence Saint-Louis Residence
879, ch. Hiawatha Park Rd.
Ottawa ON K1C 2Z6
Tél./Tel.: 613-562-6262
Téléc./Fax: 613-683-5001

Village Bruyère Village
879, ch. Hiawatha Park Rd.
Ottawa ON K1C 2Z6
Tél./Tel.: 613-562-6262
Téléc./Fax: 613-683-5001

Centre de médecine familiale Bruyere
Bruyère Family Medicine Centre
75, rue Bruyère St.
Ottawa ON K1N 5C8
Tél./Tel.: 613-241-3344
Téléc./Fax: 613-241-1971

Centre de médecine familiale Primrose
Primrose Family Medicine Centre
35, rue Primrose St.
Ottawa ON K1R 0A1
Tél./Tel.: 613-230-7768
Téléc./Fax: 613-230-7778

Institut de recherche Bruyère
Bruyère Research Institute
43, rue Bruyère St.
Ottawa ON K1N 5C8
Tél./Tel.: 613-562-6045
Téléc./Fax: 613-562-4266

Fondation Bruyère Foundation
43, rue Bruyère St.
Ottawa ON K1N 5C8
Tél./Tel.: 613-562-6319
Téléc./Fax: 613-562-6023

September 22, 2015

Margaret Cusson, Chair
Academic Development
Algonquin College
1385 Woodroffe Ave/C226H
Ottawa, Ontario
K2G 1V8

Dear Ms. Cusson,

Re: Bachelor of Technology (Digital Health)

Please accept this letter as confirmation that Bruyère Continuing Care is pleased to offer support for the proposed Bachelor of Technology (Digital Health) and may be able to provide:

- Placements for students for the required co-op work experience component of the program,
- Hiring potential for graduates should the opportunities be available.

We feel that this is a program that our industry needs, and will develop the graduates with the skills required to work in this area.

Sincerely,

Phil Kretzmar

Phil Kretzmar
Director, Information Systems

Affilié à / Affiliated with

uOttawa

170 ANS YEARS 1845 2015
de soins compatissants
of compassionate care

NEWBORN SCREENING ONTARIO
DÉPISTAGE NÉONATAL ONTARIO

CHEO
NSO is located at the Children's Hospital of Eastern Ontario

November 6, 2015

Margaret Cusson, Chair
Academic Development
Algonquin College
1385 Woodroffe Ave/C226H
Ottawa, ON K2G 1V8

Re: Bachelor of Technology (Digital Health)

Please accept this letter as confirmation that Newborn Screening Ontario is pleased to offer this letter in support of the proposed Bachelor of Technology (Digital Health) and may be able to provide:

- Placements for students for the required co-op work experience component of the program
- Hiring potential for graduates should the opportunities be available.

Sincerely,

Jennifer Milburn
Operations Director, Newborn Screening Ontario
613-737-7600 ext. 2905

JM/ss

415 Smyth Road, Ottawa Ontario K1H 8M8 Phone: 613-738-3222 · 1-877-NBS-8330 · Fax: 613-738-0853
www.newbornscreening.on.ca · newbornscreening@cheo.on.ca @NBS_Ontario

The Ottawa Hospital | L'Hôpital d'Ottawa

September 28, 2015

Margaret Cusson, Chair
Academic Development
Algonquin College
1385 Woodroffe Ave/C226H
Ottawa, ON K2G 1V8

Re: Bachelor of Technology (Digital Health)

Please accept this letter as confirmation that The Ottawa Hospital is pleased to offer this letter in support of the proposed Bachelor of Technology (Digital Health) and may be able to provide:

- Placements for students for the required co-op work experience component of the program,
- Hiring potential for graduates should the opportunities be available.

Sincerely,

Renée Légaré
Executive Vice-President
Human Resources

c.c.: S. Shamji, Executive Vice-President and Chief Information Officer
V. Naik, Vice-President, Education

☐ *Civic Campus Civic*
1053 av. Carling Avenue
Ottawa, Ontario K1Y 4E9

☐ *General Campus Général*
501 chemin Smyth Road
Ottawa, Ontario K1H 8L6

☐ *Riverside Campus Riverside*
1967 prom. Riverside Drive
Ottawa, Ontario K1H 7W9

uOttawa
Université d'Ottawa | University of Ottawa
Service de santé | Health Services
100 Marie-Curie (300) Ottawa ON K1N 6N5

October 28, 2015

Margaret Cusson, Chair
Academic Development
Algonquin College
1385 Woodroffe Ave/C226H
Ottawa, ON K2G 1V8

Re: Bachelor of Technology (Digital Health)

Please accept this letter as confirmation that University of Ottawa Health Services is pleased to offer this letter in support of the proposed Bachelor of Technology (Digital Health) and may be able to provide:

- Placements for students for the required co-op work experience component of the program,
- Hiring potential for graduates should the opportunities be available.

Sincerely,

Christopher Fisher, Executive Director

Ottawa Hospital Research Institute
Institut de recherche de l'Hôpital d'Ottawa

November 9, 2015

Margaret Cusson, Chair
Academic Development
Algonquin College
1385 Woodroffe Ave/C226H
Ottawa, ON K2G 1V8

Re: Bachelor of Technology (Digital Health)

Please accept this letter as confirmation that OHRI mHealth is pleased to offer this letter in support of the proposed Bachelor of Technology (Digital Health) and may be able to provide:

- Placements for students for the required co-op work experience component of the program,
- Hiring potential for graduates should the opportunities be available.

We believe that the proposed program will equip graduates with valuable, multidisciplinary skills. Specifically, the blend of computer programming, business fundamentals, health policy, research methods and statistics will prepare students for employment in the field of digital health innovation.

Sincerely,

Kumanan Wilson, MD, MSc, FRCPC
Professor of Medicine, University of Ottawa
Senior Scientist, Ottawa Hospital Research Institute
Research Chair in Public Health Policy, The Ottawa Hospital, Department of Medicine, OHRI

MONTFORT
Équipe de santé familiale académique
Academic Family Health Team

November 12, 2015

Margaret Cusson, Chair
Academic Development
Algonquin College
1385 Woodroffe Ave/C226H
Ottawa, ON K2G 1V8

Re: Bachelor of Technology (Digital Health)

Please accept this letter as confirmation that The Montfort Academic Family Health Team is pleased to offer this letter in support of the proposed Bachelor of Technology (Digital Health) and may be able to provide:

- Placements for bilingual students for the required co-op work experience component of the program,
- Hiring potential for bilingual graduates should the opportunities be available.

Sincerely,

André Veilleux
Executive Director

745 ch Montréal Rd., pièce/suite 101B, Ottawa, Ontario, K1K 0T1 (613) 749-4429 (613) 749-7942

RESEARCH INSTITUTE
INSTITUT DE RECHERCHE

uOttawa

November 11, 2015

Margaret Cusson, Chair
Academic Development
Algonquin College
1385 Woodroffe Ave/C226H
Ottawa, ON K2G 1V8

Re: Bachelor of Technology (Digital Health)

Please accept this letter as confirmation that Clinical Research Unit is pleased to offer this letter in support of the proposed Bachelor of Technology (Digital Health) and may be able to provide:

- Placements for students for the required co-op work experience component of the program,
- Hiring potential for graduates should the opportunities be available.

As a provider of research informatics infrastructure to CHEO's active community of clinical researchers, we require staff who are competent in aspects of digital health. We welcome the addition of this important training program to the community.

Sincerely,

Lisa Nesbitt, RRT, MHA, CHE
Director of Operations, Clinical Research Unit

Discoveries today for healthier kids tomorrow | *Des découvertes aujourd'hui pour des enfants en meilleure santé demain*

Children's Hospital of Eastern Ontario Research Institute Inc.
401 Smyth Road, Ottawa, ON K1H 8L1
Tel: (613) 737-7600 · www.cheori.org

Institut de recherche du Centre hospitalier pour enfants de l'est de l'Ontario Inc.
401, chemin Smyth, Ottawa (ON) K1H 8L1
Tél : (613) 737-7600 · www.cheori.org

November 17, 2015

Margaret Cusson, Chair
Academic Development
Algonquin College
1385 Woodroffe Ave/C226H
Ottawa, ON K2G 1V8

Re: Bachelor of Technology (Digital Health)

Dear Ms. Cusson:

Please accept this letter as confirmation that Connexion Family Health Team is pleased to offer this letter in support of the proposed Bachelor of Technology (Digital Health) and may be able to provide:

- Placements for students for the required co-op work experience component of the program,
- Hiring potential for graduates should the opportunities be available.

Sincerely,

P. Toffanello

P. Toffanello – Executive Director
Connexion Family Health Team
5303 Canotek Road,
Ottawa, ON K1J9M1

Connexion Family Health Team | 8-5303 Canotek Rd. Ottawa, ON K1J 9M1 | PHONE: (613) 656-3841 FAX: (613) 745-0866

Perley Rideau

The Perley and Rideau Veterans' Health Centre

www.perleyrideau.ca 1750 Russell Road, Ottawa, Ontario K1G 5Z6 Tel: (613) 526-7171 Fax: (613) 526-7172

November 13, 2015

Margaret Cusson, Chair
Academic Development
Algonquin College
1385 Woodroffe Ave/C226H
Ottawa, ON K2G 1V8

Re: Bachelor of Technology (Digital Health)

Dear Ms. Cusson:

Please accept this letter as confirmation that The Perley and Rideau Veterans' Health Centre is pleased to offer this letter in support of the proposed Bachelor of Technology (Digital Health) and may be able to provide:

- Placements for students for the required co-op work experience component of the program,
- Hiring potential for graduates should the opportunities be available.

Sincerely,

Akos Hoffer,
Chief Executive Officer

Together... we improve the well-being of the people we serve

Canada Health Infoway / Inforoute Santé du Canada

December 3, 2015

Ms. Sandra McCormick
Chair, Wellness Research & Innovation, Algonquin College
1385 Woodroffe Avenue (J117C)
Ottawa, Ontario K2G 1V8

Dear Ms. McCormick:

It is our pleasure to write a letter in support of the proposal to develop a new Bachelor of Technology (Digital Health) program at Algonquin College.

Since it was established in 2001, Canada Health Infoway has been working to improve the health of Canadians through innovative digital health solutions. Together with our jurisdictional partners, we have invested in digital health technologies across the country and have seen first-hand the transformative change in improved access, quality and productivity gains that have resulted from these investments.

Through our experience and research, we also know that there is a need to ensure that our academic facilities are graduating individuals with the skill sets to work in the field of health informatics. According to the June 2014 *Health Informatics and Health Information Management: Human Resources Outlook, 2014-2019*, jointly commissioned by Infoway, COACH: Canada's Health Informatics Association, and others - the combination of growth demand and replacement demand for skills will generate hiring requirements ranging from approximately 6,200 to 12,200 persons over the next five years. More than 70% of these hiring requirements will be in information technology and health information management.

In conclusion, Canada Health Infoway supports the efforts of Algonquin College to develop a Bachelor of Technology (Digital Health) program. New programs that build the needed capacity to drive the digital health agenda in Canada are needed and welcome.

Yours truly,

Shelagh Maloney
Vice President, Communications, Canada Health Infoway

150 King Street West, Suite 1300, Toronto, Ontario M5H 1J9 T 416.979.4606 Toll free 1.888.733.6462 F 416.593.5911
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www.infoway-inforoute.ca

SQUARED
TECHNOLOGIES INC.

December 1, 2015

Margaret Cusson, Chair
Academic Development
Algonquin College
1385 Woodroffe Ave/C226H
Ottawa, ON K2G 1V8

Re: Bachelor of Technology (Digital Health)

Please accept this letter as confirmation that J-Squared Technologies, Inc. is pleased to offer this letter in support of the proposed Bachelor of Technology (Digital Health) and may be able to provide:

- Placements for students for the required co-op work experience component of the program,
- Hiring potential for graduates should the opportunities be available.

Sincerely,

Tom Kelley

The following universities have indicated that they will consider Bachelor of Technology (Digital Health) (Honours) program graduates for admission into their existing graduate level programs:

- **McMaster University:** will consider graduates of Algonquin College's proposed Bachelor of Technology (Digital Health) (Honours) degree for admission to the Master of Science in eHealth graduate program. (Letter included in this section.)
- **University of Waterloo:** will consider graduates of Algonquin College's proposed Bachelor of Technology (Digital Health) (Honours) degree for admission to the Master of Health Informatics graduate program. (Letter included in this section.)
- **University of Ottawa (Telfer School of Business)**: will consider graduates of Algonquin College's proposed Bachelor of Technology (Digital Health) (Honours) degree for admission to the Master of Science in Health Systems graduate program. (Letter included in this section.)

McMaster University

M.Sc. eHealth Graduate Program

1280 Main Street West
Hamilton, Ontario
Canada L8S 0A3

Phone: 905.525.9140 Ext. 26139
http://www.erg.mcmaster.ca

December 1, 2015

Margaret Cusson, Chair
Academic Development
Algonquin College
1385 Woodroffe Ave/C226H
Ottawa, ON K2G 1V8

Dear Ms. Cusson,

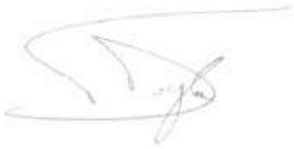
Re: Algonquin College's Bachelor of Technology (Digital Health)

I am pleased to have been asked to write a letter of support for the Bachelor of Technology (Digital Health) at Algonquin College (Ottawa). The program structure is similar to our own McMaster University M.Sc eHealth and as described is series of courses in programming/IT, business and business intelligence, and healthcare studies (e.g. decision support, workflow analysis, quality improvement); including a mandatory co-op following the third year of the program.

The McMaster M.Sc eHealth Program is a competitive entry graduate program that considers students with 4-year Bachelor Degrees related to eHealth. The organization, structure and content of the Bachelor of Technology (Digital Health) at Algonquin College (Ottawa) appear to be an excellent fit with our curriculum and focus. As such, I expect students graduating from Bachelor of Technology (Digital Health) at Algonquin College (Ottawa) would be very well suited to our program.

Please do not hesitate to contact me if I can provide further information.

Sincerely,



Thomas E. Doyle, B.E.Sc, B.Sc, M.E.Sc, Ph.D, P.Eng
Director of eHealth Graduate Program and Associate Professor
Dept. of Electrical and Computer Engineering
School of Biomedical Engineering
McMaster University
Hamilton, Ontario, Canada

Phone: (905) 525-9140 ext. 26139

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TELFER
VOTRE LIEN AVEC CE QUI COMPTE — CONNECTS YOU TO WHAT MATTERS

December 4, 2015

Margaret Cusson
Chair, Academic Development
Algonquin College
1385 Woodroffe Avenue
Ottawa, Ontario K1G 1V8

Dear Ms. Cusson,
I am pleased to write a letter of support for the Bachelor of Technology (Digital Health) program at Algonquin College. The program curriculum is well suited for developing digital health professional as it contains courses on traditional digital health concepts such as decision support and quality improvement but also addresses emerging needs such as business analytics and business intelligence.

The admission requirements for the Master of Science in Health Systems program at the Telfer School of Management requires a 4-year undergraduate degree as well as a certain level of coursework in quantitative and qualitative research methods, micro and macroeconomics, calculus, probability and statistics, linear algebra, and information technology. The course work in the Bachelor of Technology (Digital Health) program meets the admission requirements for the MSc in Health Systems program and therefore I would expect Bachelor of Technology (Digital Health) graduates to be a good fit for our program.

I wish you every success with your new program.

Regards,

Craig Kuziemsky, PhD
Associate Professor and Director, MSc in Health Systems Program
Telfer School of Management
University of Ottawa
Phone: (613) 562-5800 ext 4792
E-mail: kuziemsky@telfer.uottawa.ca

Section 8: Regulation and Accreditation

As indicated in Section 4.2 we are in the process of applying for accreditation from the Canadian Information Processing Society (CIPS). The following is the result of the informal "desk audit" conducted as the second stage of the accreditation process.

The Business Technology Management Accreditation Council (BTMAC) offers an informal review to programs that have not yet produced graduates and do not qualify for a formal accreditation visit. The purpose of the informal evaluation is to provide comment and advice to the institution with respect to the program. The review will focus solely on the alignment of the program to the BTM Learning Outcomes. To be successful, a program needs to demonstrate that it produces learning outcomes that are largely aligned with the BTM Learning Outcomes and Competency Standards.

A report is prepared by a competent team having suitable qualifications and is presented to the BTMAC for consideration. Programs that are successful in the review will be allowed to use the term *BTM Recognized* on communications for a maximum of four (4) years. No undertaking is given by the BTMAC as to the eventual accreditation of the program.

The questionnaire provides essential qualitative and quantitative input for the evaluation team as part of the overall review process. It also serves as a tool for self-assessment.

The program recognition process consists of the following steps:

1. Request by the institution for evaluation of its program(s);
2. Completion and submission of a questionnaire and supplementary material;
3. Submission of a draft report by the review team to the dean and/or program director approximately 6 weeks after the submission. The institution may respond to team's finding and/or note errors of fact or findings and respond with 14 days.
4. Final decision by the Business Management and Technology Accreditation Council regarding recognition status.

Algonquin College has initiated the BTM informal review process.

Section 9: Nomenclature

The Bachelor of Technology (Digital Health) (Honours) program title meets the Board nomenclature requirements. This title follows one of the approved approaches to nomenclature for Bachelor degrees in applied areas, available for designating college degrees, the Bachelor of Faculty (Subject).

The degree title conveys accurate information about the degree level since *Bachelor* is reflected in the title, which is congruent with degree level learning. As required, the quality standards are as dictated by the *Ontario Qualifications Framework (OQF)*, specifically section *11. Baccalaureate/Bachelor's Degree Honours*. As such, the program is a four-year degree in an applied area of study and meets the degree level standards of the Baccalaureate/Bachelor's Degree Honours designation. Inclusion of *Honours* in the degree nomenclature facilitates public understanding that it brings the degree title into alignment with other comparable provincial four-year baccalaureate programs. Additionally, it clarifies the academic rigour, conceptual sophistication, specialized knowledge and intellectual autonomy associated with the credential earned. Finally, it provides unambiguity with respect to the depth and nature of the degree to postsecondary institutions receiving applications from graduates of this program wishing to pursue graduate studies.

The inclusion of the term "Technology" is critical to the understanding of the discipline addressed by the degree. This degree focuses on three core knowledge domains, including more traditional software development knowledge, and topics in healthcare studies (with a focus on health technologies) and business technology management. Thus, in all three knowledge domains a focus on technology is maintained. The addition of the Digital Health subject indicator clarifies that the degree focuses specifically on the three core knowledge domains as they relate to Digital Health Technologies and the integration of technology into healthcare contexts. This title facilitates the public's understanding, and assists students, employers, and other postsecondary institutions in recognizing the level, nature and discipline of study. The title is supported by the Bachelor of Technology (Digital Health) (Honours) ad-hoc Program Advisory Committee.

Section 10: Program Evaluation

Algonquin College has a formal, institutionally approved policy and procedure for the periodic review of programs that embodies the characteristics required of the Board. As previously explained in Section 5.1 Quality Assurance of Delivery, Algonquin has an effective Program Quality Assurance process detailed in Policy AA38: Program Quality Assurance. The program evaluation process consists of three primary components, Annual Curriculum Review, Program Mix Review and Program Quality Review (PQR).

The three prong quality review process includes two annual reviews, each with a different focus, and one in depth review every five years. The current PQR process was originally designed for postsecondary programs leading to Ontario College Credentials. The quality criteria parallel those used by the Provincial Program Quality Assurance Process Audit (PQAPA) and map to the expectations of the Program Evaluation Standard as stated in the PEQAB Handbook for Ontario Colleges. The PQAPA external audit of the College review processes ensures that the College has a process in place that assures continuous quality improvement. Note that, based on feedback obtained from a PEQAB Quality Assessment Panel, the mapping to the Program Evaluation Standard has been made more explicit within the Bachelor's Degree PQR report template, and quality criteria elements may be extended to include all PEQAB Benchmarks.

The Program Quality Review process at the College has been extended for degree programs. In addition to conducting a PQR (self-study), a Program Evaluation Committee is established that adheres to the Board's requirements. The Program Evaluation Committee is expected to evaluate a program based on the PQR report and a site visit during which members of the Committee meet with faculty members, students, graduates, employers and administrators to gather information. A Program Evaluation Committee report is completed that provides an assessment of the program quality and leads to recommendations for change intended to strengthen the quality of the program and support ongoing continuous improvement. The report is addressed to senior administration and shared with the College's Academic Council, Board of Governors, faculty members and students in the program, and includes a plan of action to respond to the report's recommendations. The Program Quality Assurance Administrator works with the Program Chair in following up on the status of implementation of recommendations. A cyclical program review schedule is established that conforms to Board requirements in that the PQR is conducted prior to a request for Ministerial Consent Renewal. The PQR template for Bachelor's Degrees and associated documentation to facilitate the process may be viewed at the following link: http://www3.algonquincollege.com/academic-development/program-quality-review-bachelors-degrees/
Algonquin College's overall Quality Assurance Model and Processes may be viewed on the Program Quality Assurance Website: http://www3.algonquincollege.com/academic-development/our-services/program-quality-assurance/

The electronic policies file (Section 16: Policies) includes the policy on Quality Assurance within the following:
Policy AA 38: Program Quality Assurance

Section 11: Academic Freedom and Integrity

Algonquin College policies detail procedures relative to academic freedom, ownership of intellectual products of its employees and students, compliance with copyright law, academic honesty/integrity, and research involving humans and/or animals, as well as the management of research funds.

The electronic policies file (Section 16: Policies) includes policies and procedures pertaining to academic freedom and integrity within the following:

Policy AA 18: Academic Dishonesty and Discipline
Policy AA 20: Plagiarism
Policy AA 34: Copyright
Policy AA 35: Confidentiality of Student Records
Policy AA 42: Learning Management System
Policy IT 05: Information Sensitivity and Security
Policy RE 01: Research Administration
Policy RE 02: Integrity in Research and Scholarly Activities
Policy RE 03: Research Involving Human Subjects
Policy RE 04: Use of Animals in Teaching, Research and Other Activities
Policy RE 05: Intellectual Property
Policy RE 06: Use of Biohazardous and Radioactive Materials in Research and Education
Policy RE 07: Academic Freedom Rights and Responsibilities

Section 12: Student Protection

In accordance with Algonquin's core values of caring, learning, integrity and respect, ensuring ethical business practices and the protection of students' interests are integral to the College's operation. Algonquin endeavors to ensure transparency, thoroughness, and clarity of its publications in terms of informing prospective and current students' as to their responsibilities and rights. Numerous policies and practices provide evidence of compliance with the Board's requirements for student protection.

Applicant and student requirements and obligations are published in hard copy and/or web based formats as follows:

Program Monographs

- Full-time programs: http://www.algonquincollege.com/future/fulltime.html
- Part-time programs: http://xweb.algonquincollege.com/woodroffe/viewAll.aspx?tab=3

Monographs detail fees and expenses as well as information regarding the technological requirements and success factors required of a program. For example, for mandatory Bring Your Own Device (BYOD), formerly laptop/mobile programs, publications direct students to the BYOD website to obtain the technical specifications for programs and details of service provisions at:
http://www7.algonquincollege.com/byod/
Other primary College publications include the Viewbook.

Viewbook

Students can access a Viewbook to gain additional details, including videos and stories from current students and alumni, to guide the selection of their programs.
http://www.algonquincollege.com/html/viewland/

Prospective and current students can view all College policies online at http://www2.algonquincollege.com/directives/. Excerpts of these policies are published in the Student Handbook available from the Student Affairs website at http://www.algonquincollege.com/studentsupportservices/student-handbook/

The electronic policies file (Section 16: Policies), includes policies and procedures pertaining to student protection within the following:
Policy AA 09: Transfer of Academic Credit (Internal)
Policy AA 10: Transfer of Academic Credit (External)
Policy AA 11: Registration
Policy AA 18: Academic Dishonesty and Discipline
Policy AA 19: Academic Appeal
Policy AA 37: Review of Final Grade
Policy AA 39: Program Progression and Graduation Requirements
Policy AD 02: Freedom of Information and Protection of Privacy Act
Policy HR 22: Respectful Workplace
Policy SA 02: Ombudsman
Policy SA 03: Student Complaints
Policy SA 06: Fees
Policy SA 07: Student Conduct

Section 13: Economic Need

The benchmark for economic need is demonstrated through the evidence contained within this section that includes:

- A commissioned Labour Market Analyses conducted for Algonquin College by AXION (2012);
- A summary of an independent, industry-led Labour Market Analysis conducted by industry organizations (2014)
- OCAS data on related degree programs (September 2015)
- Algonquin College Applicant Demand Survey results (March 2015)
- Current Employment Opportunities Listings (September 2015)

The information provided demonstrates the need for and viability of this program.

Labour Market Analyses

Mobilizing for e-Health

December 20, 2012

LABOUR MARKET ANALYSIS FOR TWO NEW E-HEALTH PROGRAMS

Ottawa, Ontario
T. 613-369-4333
www.axioninc.biz

PROJECT MANAGER: AXION

PROJECT ADVISOR:

Dr. Barbara Foulds, Acting Dean, Health, Public Safety and Community Studies
Andrew Pridham, Chair, Information and Communications Technology
Jo-Ann Aubut, Acting Dean, Academic Development

This labour market study is a project of Algonquin College.

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EXECUTIVE SUMMARY

Algonquin College is considering the introduction of a Bachelor of E-Health degree program aimed at the general student population, and a one-year Ontario Graduate Certificate in E-Health aimed at health or informatics professionals. The two e-health programs are multidisciplinary in nature and are proposed to combine knowledge and skills from the health sciences, informatics, and business disciplines.

Axion conducted a labour market analysis of the e-health sector to determine the nature and scope of employment opportunities in this sector and to identify the number and type of similar programs offered in Ontario. Most of this research was conducted by way of web search supplemented by interviews of a small number of high-level stakeholders.

The research indicated that there is no e-health profession. E-health tends to be grouped into two main disciplines – health informatics (HI) and health information management (HIM). Together they include at least 27 occupational categories.

Two national associations have created the first employment profile of the combined HI and HIM occupational categories because of the unavailability of official government statistical data. Their data shows a significant increase in the demand for these types of professionals over the next few years, and an even greater demand for skills upgrading. These statistics are generally consistent with those produced by the US Department of Labor which estimates a 49% job growth in health information and health informatics. Demographic trends, changes in the healthcare sector, and technology improvements are all contributing to the high demand for professionals in e-health.

One of the unique features about e-health professionals is that they have a wide choice of employment opportunities. Employment can be found in both the private sector and the public sector and includes healthcare, government, retail, telecommunications, informatics, consulting, and manufacturing, amongst others.

The term e-health is very new and e-health post-secondary programs are even newer. There are an increasing number and variety of college and university multi-disciplinary programs in e-health, but few are located in Eastern Ontario. There may be an emerging trend to combine HI programs and HIM programs into one program.

Industry associations indicate that knowledge of the healthcare system is essential. While technical knowledge of informatics is usually important to gain entry into the profession, business analysis skills and communication skills are critical to career success. Accordingly, most industry associations recommend that e-health programs should focus increasingly on the non-technical side.

Axion feels that Algonquin College should consider setting up one or both e-health programs. Given the variety of jobs available to e-health professionals, it would be prudent for Algonquin College to establish an advisory board to assist it in aligning its e-health programs to the market reality of Eastern Ontario.

The new programs could have either an HI or HIM orientation. Through one of our interviews, we understand that Conestoga College, one of the better postsecondary institutions in this industry, is

about to develop a combined HI and HIM undergraduate program. Two other postsecondary institutions in western Canada are apparently interested in developing a combined program. We believe it would be advantageous for Algonquin College to determine whether this is an emerging trend or whether there are other reasons for offering a combined HI and HIM.

1. INTRODUCTION

1.1. BACKGROUND

Algonquin College is considering the introduction of a Bachelor of E-Health degree program aimed at the general student population, and a one-year Ontario Graduate Certificate program in E-Health aimed at health or informatics professionals.

The two e-health programs are multidisciplinary in nature and are proposed to combine knowledge and skills from the health sciences, informatics, and business disciplines.

The majority of the undergraduate degree program would focus on informatics training. This would be supplemented by knowledge and skills in the area of business, the health system, records management and key health vocabulary.

The graduate certificate in E-health would be a mix of business, informatics, records management and health data analysis.

In order to make an informed decision on the introduction of these programs, Algonquin College has retained Axion to collect objective, reliable, and valid data on related industry trends and labour market conditions.

Using existing data, reports, and publically available research material, Axion will attempt to provide information on the following:

- The extent of the labour market
- The size of the target market
- The competition
- Population and client demographic data
- Analysis of related trends
- Educational needs in this field
- Employment prospects
- Indications of interest for this field of study

1.2. METHODOLOGY

This study has many components, but the key elements are: the analysis of secondary source documents available through the internet and telephone interviews of a number of high-level stakeholders.

1.3 DEFINITIONS AND CONTEXT

E-health

The term e-health is a relatively new term in the health system vocabulary. In addition, it can take many forms - ehealth, e-health, E-health. One source suggests that it only dates back to the late 1990's.[7]

There are numerous definitions of the term e-health. "Usage of the term varies: some would argue it is interchangeable with health informatics with a broad definition covering electronic/digital processes in health while others use it in the narrower sense of healthcare practice using the Internet."[8]

The literature shows that hybrid terms for e health are not uncommon. For example, the terms mobile health and m health are now regularly seen on the internet. Several large international conferences on mhealth exist today.[9] Many of the conference attendees and exhibitors appear to be the same as those involved in e-health.

Informatics is an important component of e-health and this term is also subject to interpretation. Indeed, within the informatics community in Canada, there are numerous definitions of the term health informatics. In a 2009 report by the Information and Communications Technology Council, the authors identified no less than three different definitions of e-health and two separate definitions of the term health information management.

What is relatively clear is that the breadth of e-health products and services is very broad and the knowledge and skills required for their delivery is also quite broad. Typically it is used to refer to a blend of information technology, health science, and business. We suggest that it also includes engineering as many e-health products are developed by engineers. A review of jobs in the USA found a small number of advertised work opportunities for e-health engineers.

What is Health Informatics?

The most commons definitions of the health informatics (HI) profession seen in Canadian literature come from: the Canadian Organization for Advancement of Computers in Health (COACH), the Waterloo Institute for Health Informatics Research, and the University of Minnesota. In reviewing the three definitions, the reader will note that the term health informatics is much larger and diverse than might be expected.

> *COACH (Canadian Organization for Advancement of Computers in Health):* Health informatics (HI) is the intersection of clinical; IM/IT and management practices to achieve better health … Health Informatics Professionals develop and deploy information and systems solutions, drawing on expert knowledge from fields such as computer science, information management, cognitive science, communications, epidemiology, management sciences and health sciences.
>
> *Waterloo Institute for Health Informatics Research:* HI is the discipline that explores how information management, and information and communication technologies (ICT) can support and advance health and the health system. HI is intrinsically, intersecting

[7] eHealth, http://en.wikipedia.org/wiki/EHealth
[8] eHealth, http://en.wikipedia.org/wiki/EHealth
[9] mHealth Alliance, http://www.mhealthalliance.org/

areas such as medicine, computer science, engineering, and the physical and social sciences.

University of Minnesota: Health informatics is an interdisciplinary field of scholarship and activity that applies computer, information, and cognitive sciences to enhance the delivery of healthcare, support biomedical research, and foster education of health professionals and the public. It is at the crossroads where data, information, and knowledge meet be the focused on a gene, cell, organ, individual or group.[10]

What is Health Information Management?

The term health information management (HIM) profession is a vague and largely unknown profession to most persons, unless they are in the industry. Even within the healthcare industry, it is often misunderstood.

The health information management profession has three main domains of practice, data quality, privacy of health information, and electronic health information management. In our opinion, the last domain is difficult to understand as it is essentially a repeat of the name of the profession modified by the word electronic.

Let us examine the role of the HIM so that it can be clearly distinguished from the Health Informatics professional.

Some of the work of HIM professionals includes the "interpretation of the record and translation into standardized codes for diseases/diagnoses and procedures using the International Classification of Diseases"[11]. This data is submitted to the Canadian Institute for Health Information (CIHI) for use in case costing, population health analysis, research and policy.

Another key role of the HIM professional is to ensure that quality and privacy standards and control exist and are followed to ensure that information is accurate, complete, and timely. HIM professionals are also responsible for developing and implementing policies and practices pertaining to the access, use, retention and destruction of health data in accordance with applicable legislation.[12]

2. SECTOR-BASED DATA

[10] eHealth in Canada – Current Trends and Future Challenges, April 2009, Information and Communications Technology Council, http://www.ictc-ctic.ca/wp-content/uploads/2012/06/ICTC_eHealthSitAnalysis_EN_04-09.pdf, p. 5
[11] eHealth in Canada – Current Trends and Future Challenges, April 2009, Information and Communications Technology Council, http://www.ictc-ctic.ca/wp-content/uploads/2012/06/ICTC_eHealthSitAnalysis_EN_04-09.pdf, p. 3
[12] eHealth in Canada – Current Trends and Future Challenges, April 2009, Information and Communications Technology Council http://www.ictc-ctic.ca/wp-content/uploads/2012/06/ICTC_eHealthSitAnalysis_EN_04-09.pdf, p. 3-4

The National Occupational Classification (NOC) 2011 provides a standardized language for describing the work performed by Canadians in the labour market. It is used for many applications including defining and collecting statistics, managing information databases, analyzing labour market trends and extracting practical career planning information. More importantly, the NOC gives statisticians, labour market analysts, career counsellors, employers and individual job seekers a consistent way to collect data and describe and understand the nature of work. The NOC is developed in collaboration with Statistics Canada.

The NOC tool classifies occupations with a four-digit code according to skill type and skill level. The digits of the NOC code reflect important information about the occupation it represents (e.g., 3113 Dentists - "31" indicates that this is a health occupation and it requires university level education).

The classification system also supports a variety of career information sources published by the Government of Canada and others. For example, Job Futures, the widely-used source of information about occupational outlooks, and the national JobBank®, an electronic listing of jobs, work or business opportunities provided by Canadian employers are both organized according to NOC definitions. By providing a standard way of organizing labour market information, the NOC helps all Canadians to be better informed about the world of work.[13]

There is no evidence of an "e-health profession". There are few job titles referring to an e-health professional, perhaps with the exception of very senior government employees, and their numbers are very low. The health information management (HIM) profession and the health informatics (HI) profession are the two main professions associated with e-health, and there is a high demand for both professional in government and in the private sector. HI and HIM can work in the government sector for municipalities, agencies, and hospitals, and can work for the private sector in the delivery of services and products. Health informatics professionals can be involved in systems maintenance and news system development, but seldom at the same time.

Unfortunately there are no NOC occupational codes for the HI and/or HIM e-health multidisciplinary professions available at this time because these professions involve too many types of occupations. Most associations agree that there is very limited information on trends in human resources requirements in Canada, and call on government to provide assistance to help industry obtain vital data on employment, job vacancies and capital expenditures related for the industry. In the face of the lack of information available, the leading associations have recommended that "efforts should be made to develop with HRSDC and Statistics Canada appropriate occupational codes for HI & HIM occupations so that these codes will be in place for the 2011 census."[14] It is not known whether these changes have been introduced in the 2011 census.

2.1 OCCUPATIONAL PROFILE OF TARGET SECTOR

Given the lack of NOC data, we have sought employment statistics from the leading industry associations representing the HI and HIM professions.

[13] Human Resources and Skills Development Canada, National Classification (NOC 2011) http://www.hrsdc.gc.ca/eng/workplaceskills/noc/index.shtml
[14] eHealth in Canada – Current Trends and Future Challenges, April 2009, Information and Communications Technology Council, http://www.ictc-ctic.ca/wp-content/uploads/2012/06/ICTC_eHealthSitAnalysis_EN_04-09.pdf, p. 54

The Canadian Health Information Management Association (CHIMA), and COACH: Canada's Health Informatics Association, are generally regarded as the two leading organizations exclusively representing the e-health sector in Canada. In 2009, the two associations had a combined membership of 4,000 members (12.3%) of 32,450 HI and HIM professionals in Canada.[15] Both of these associations are legally entitled to award professional credentials, however, neither HI nor HIM professionals require a license to practice.

The Health Informatics and Health Information Management - Human Resources Report of November 2009 examined the health of the informatics and health information management profession by way of a survey. The data was generated on the basis of a Canada wide survey of 330 employers in all provinces except Ontario. The survey included 35 responses from the public sector and 45 responses from the private sector. The surveys targeted employers and did not examine the perspective of current employees.

The Ontario Hospital Association (OHA) carried out a similar but not identical labour force survey of all its e-health professionals in the summer of 2009. The survey results are based on 77 responses from 153 Ontario hospitals. This only represents the hospital perspective of the e-health industry in Ontario. It is important to note that the universe of 153 hospitals only includes general hospitals and does not include other hospitals such as psychiatric hospitals and specialized hospitals.

Statistics in the Health Informatics and Health Information Management Human Resources Report November 2009 jointly published by the Canada Health Infoway, the Canadian Health Information Management Association, COACH – Canada's Health Informatics Association, the Information and Communications Technology Council, and the Information Technology Association of Canada - Health are a blend of the information of its own survey and those of the Ontario Hospital Association's survey.

In our opinion, the data for the numbers needs to be interpreted very cautiously because it is not fully representative of the industry. Unfortunately, we need to consider this data, because that is all that is available.

According to the literature review, the gender profile of HI and HIM professionals is different. HI professionals are typically male, while an overwhelming number of HIM professionals are female. Unfortunately there is no published data on the demographic profile of HI and HIM professionals, and on their primary motives for entering the professions.

COACH and CHIMA have developed an occupational taxonomy for both HI and HIM professions. The occupational taxonomy is organized around 7 broad occupational categories with a total of 27 occupational groups.

There is considerable variance in the employment figures for 2009 between the different occupational categories and occupational groups. Let us first examine occupational group employment[16].

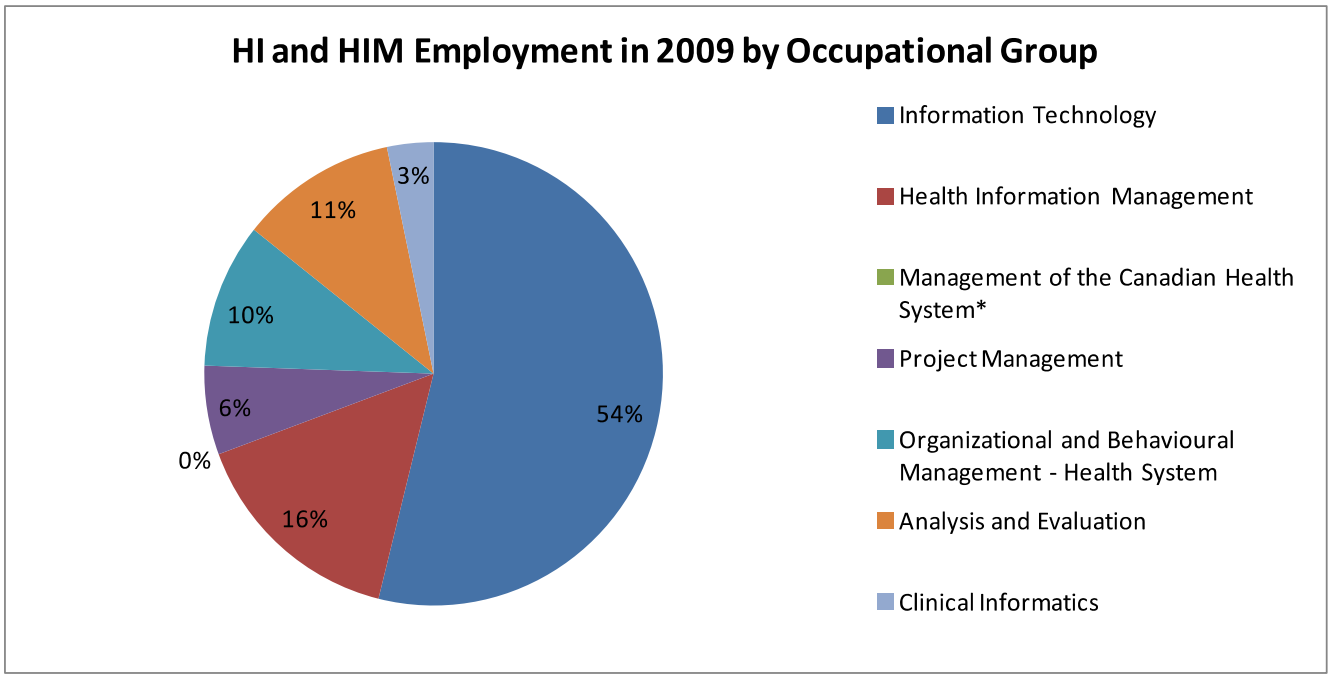
[15] National Study Reveals Metrics on HI and HIM Labour and skills shortages, http://itac.ca/uploads/pdf/HI_HIM_HR_Report_NewsRelease_FINAL_E.pdf, p. 1
[16] Prism Economics and Analysis, Health Informatics and Health Information Management-Human Resources Report, http://www.coachorg.com/en/publications/resources/ICTC_HealthInfo_report_E_web.pdf, p. 47-48 (data aggregation by Axion)

Table 1. Number of employees per occupational group in 2009

Occupational Groups	Number of employees
Information Technology	17,520
Health Information Management	5,040
Analysis and Evaluation	3,530
Organizational and Behavioural Management	3,300
Project Management	2,030
Clinical Informatics	1,060
Management of the Canadian Health System	N/A

As shown in Chart 1, over 75% of the employment is found in three of the seven occupation groups. The breakdown of three largest groups is: 54% of employees for the information technology, 16% for the health information management group and 11% for the analysis and evaluation group.

Chart 1. HI and HIM Employment in 2009 by Occupational Group



Based on a moderate growth scenario, the report data indicates that estimated new employment in 2009 will increase by 14.3% by 2014. Under the same scenario, it is estimated that another 11.8% of the 2009 workforce will have to be replaced. Assuming moderate growth this means that the hiring requirement as a percent of estimated 2009 employment for HI and HIM is 26.1%.[17] In absolute terms, employment is clustered around information technology jobs.

The employment data in the report did not specify if there is unemployment or underemployment in any of the occupational groups or occupational categories.

[17] eHealth in Canada – Current Trends and Future Challenges, April 2009, Information and Communications Technology Council, http://www.ictc-ctic.ca/wp-content/uploads/2012/06/ICTC_eHealthSitAnalysis_EN_04-09.pdf, p. 50

Table 2. Five-Year Employment Change by HI and HIM Occupational Groups[18]

Occupational Groups	Employment (# of persons)		
	2009	2014	Change (%)
Information Technology	17,520	20,090	14.7%
Health Information Management	5,040	5,520	9.5%
Management of the Canadian Health System*	*	*	*
Project Management	2,030	2,460	21.2%
Organizational and Behavioural Management - Health System	3,300	3,810	15.5%
Analysis and Evaluation	3,590	4,140	15.3%
Clinical Informatics	1,060	1,180	11.3%
Total (excluding certain occupational groups)	32,540	37,200	14.3%

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

The latest analysis of the vacancy rate in 2001 using 1999 data identifies the occupational groups having the highest vacancy rates. The top five vacancy rates were found to be in health information management – standards 23%, health information management – decision support 14.4%, information technology – quality/testing 12.5%, health information management privacy, 11.6%, and management of the Canadian Health System – Business Analysis.[19] The data seems to indicate that in relative terms, high vacancy rates are not in the technical domains.

Table 3. Vacancy for HI and HI Employees (using 1999 data)

Occupational Group	% Vacancy
Health Information Management - Standards	23.0%
Health Information Management - Decision Support	14.4%
Information Technology - Quality Assurance/Testing	12.5%
Health Information Management -Privacy	11.6%
Management of Canadian Health System - Business Analysis	11.4%

Research data shows that the total need for skills broadening will increase from 8,800 in 2009 to 21,800 persons in 2014. This represents an increase of 145.5%. The data suggests that the need

[18] eHealth in Canada – Current Trends and Future Challenges, April 2009, Information and Communications Technology Council, http://www.ictc-ctic.ca/wp-content/uploads/2012/06/ICTC_eHealthSitAnalysis_EN_04-09.pdf, p. 50

[19] eHealth in Canada – Current Trends and Future Challenges, April 2009, Information and Communications Technology Council, http://www.ictc-ctic.ca/wp-content/uploads/2012/06/ICTC_eHealthSitAnalysis_EN_04-09.pdf, p. 42

for retraining will be relatively more important than the programs aimed at new graduates. It remains to be seen if the need for skills broadening will translate into demand for programs from various institutions.

Table 4. Skills broadening between 2009 and 2014

Occupational Groups	Skills Broadening (# of persons)		
	2009	2014	Change (%)
Information Technology	5,200	11,250	116.3%
Health Information Management	1,000	3,320	232.0%
Management of the Canadian Health System*	*	*	*
Project Management	510	1,470	188.2%
Organizational and Behavioural Management - Health System	970	2,540	161.9%
Analysis and Evaluation	900	2,480	175.6%
Clinical Informatics	300	740	146.7%
Total (excluding certain occupational groups)	8,880	21,800	145.5%
Total (excluding certain occupational groups)			
* Survey estimates were considered unreliable or insufficient to support estimates.			

A closer examination of 2009 employment in the 27 different occupational categories in 2009 reveals that the six largest occupational categories are: Application Implementation/Support at 9,780 jobs; Analysis and Evaluation at 3,590 jobs; Help Desk at 2,450 jobs; Network, Storage and Other Infrastructure Support at 1,940 jobs; Health Records Management at 1,920 jobs; and Project Management at 1,590 jobs.

Table 5. Occupational categories with the largest number of employees

Occupational Category	Employment 2009
Application Implementation / Support	9 780
Analysis and Evaluation	3 590
Help Desk	2 450
Network, Storage and Other Infrastructure Support	1 940
Health Records Management	1 920
Project Management	1 590

The industry has a wide breadth of potential employers. They can be found in retail (Wal-Mart/Dossia), internet search engine companies (Google) hospitals (CHEO), telecommunications (Rogers), safety products (Johnson & Johnson) government (Ministry of Health of Ontario), health agencies (LHINs), insurance companies (WSIB), accounting firms (Deloitte), electrical manufacturing companies (GE), pharmaceutical companies (Abbot Pharmaceuticals), consulting firms (PWC), multi

safety product firms (3M), research institutes (Mohawk Applied Research Centre), computer companies (IBM), management consulting company (Accenture), specialized health software companies (EPIC), digital imaging (Agfa), and computer hardware manufacturers (HP).

2.2 EMPLOYMENT PROSPECTS

Growth of Industry

Governments and educational institutions often quote very impressive statistics pertaining to employment opportunities in e-health. In a multi-institutional web site in the USA, the following statistics are cited:

- The US Department of Labor estimates a 49% job growth in health information and health informatics
- Healthcare informatics was named one of the top careers in U.S. News & World Report
- Approximately 70,000 health informatics specialists are needed in the next decade, according to Don Detemer, the CEO of the American Medical Informatics Association (AMIA), the main professional body relation to Health Informatics in the U.S. (2011)
- Health informatics is the #1 emerging industry job opportunity on CareeerBuilder.com
- Electronic medical records tops ECRI's Top 7 Health Plan IT Trends to Watch.[20]

Health Informatics Occupations (HI)

There are a variety of positions open to new college and university graduates in the area of health informatics. The table 6 identifies the various jobs available to each.[21]

[20] AllHealthCareDegrees, http://www.allhealthcaredegrees.com/informatics_ba.htm, p.1
[21] eHealth in Canada – Current Trends and Future Challenges, April 2009, Information and Communications Technology Council, http://www.ictc-ctic.ca/wp-content/uploads/2012/06/ICTC_eHealthSitAnalysis_EN_04-09.pdf, p. 20

Table 6. Health Informatics occupations for new graduates

College Level	Undergraduate Level	Master's Level
Assistant Technical Writer	Application Developer	Chief Information Officer (CIO)
Business Analyst Assistant	Database Developer/Administrator	Chief Medical Information/Chief Nursing Information Officer
Database Developer Assistant	Junior Business/Systems Analyst	Chief Technology Officer
IT Help Desk Support	Research Assistant	Medical Informatics Manager
User Training Assistant	Systems Implementation Specialist	Senior Analyst
	Technical Writer	Senior Researcher
		Systems Developer

Health Information Management Occupations (HIM)[22]

There are a variety of positions open to new college and university graduates in the area of health information management as well. The table identifies the various jobs available to each.[23] The job list suggests that there are many more occupations available to new undergraduates or graduates than college graduates, and that many of these occupations appear to be closely related or the same as those found in the list of HI occupations – i.e. systems analyst.

HIM professionals are employed in: hospitals; in the community health and extended care sectors; government; health and education institutions; the private sector including insurance and pharmaceutical companies; technology vendors; and consulting firms.

The range of positions appears to be larger as a whole in the HIM profession than in the HI profession.

Table 7. Health Information Management Occupations for New Graduates

College Level	Undergraduate or Graduate Level
Data/Information Manager Records Technician Specialist	HIM Department Director
Clinical Coding Specialist	HIM Systems Manager
Clinical Research Associate	Data Quality Manager

[22] eHealth in Canada – Current Trends and Future Challenges, April 2009, Information and Communications Technology Council, http://www.ictc-ctic.ca/wp-content/uploads/2012/06/ICTC_eHealthSitAnalysis_EN_04-09.pdf. p. 20-21

[23] eHealth in Canada – Current Trends and Future Challenges, April 2009, Information and Communications Technology Council, http://www.ictc-ctic.ca/wp-content/uploads/2012/06/ICTC_eHealthSitAnalysis_EN_04-09.pdf, p. 20

College Level	Undergraduate or Graduate Level
Health Data Analyst	Compliance Manager
Optical Imaging Coordinator	Risk Management Specialist
Patient Information Coordinator	Information Security Officer or Privacy Officer
Physician Practice Manager	HIM College/University Instructor
Release of Information Specialist	HIM Consultant
	Clinical Analyst
	Clinical Applications Coordinator
	Senior Project Manager
	Clinical Vocabulary/Terminology Asset Manager
	Enterprise Applications Specialist
	Integration Architect
	Process Improvement Engineer
	Senior Documentation Coordinator for Adverse Events
	Solutions Analyst
	Systems Analyst

Unfortunately, there is little data yet that captures employment statistics about emerging jobs in HI and HIM.

The Ministry of Training, Colleges and Universities of Ontario publishes a yearly summary of the employment experience of College Graduates six months after graduation by program type. The information is voluntarily provided by individual colleges and students.

Despite the existence of several HI and HIM programs in Ontario postsecondary institutions, the Employment Profile 2011 covering the 2009-2010 period shows no specific HI program or HIM program listed in the list of programs. It does show, however, a Health Informatics Management program with 7 graduates [24] which is identified as a Bachelor of Applied Health Sciences program offered at Conestoga College.

Clearly the data is neither reflective of the number of college programs offering HI and HIM programs in the whole province in 2009-2010, nor of the number of students registered in these programs.

[24] Employment Profile – A Summary of the Employment Experience of 2009-2010 College Graduates Six Months After Graduation, http://www.tcu.gov.on.ca/pepg/audiences/colleges/serials/eprofile09-10/profile10.pdf, p. 166

2.3 TRENDS AND DEMOGRAPHICS

2.3.1 TRENDS

There are many factors which impact the future of the e-health industry. Many of these trends are due to general socio-economic, demographic, attitudinal, technological change. In this section we will examine these trends and their impact on the e-health industry. A separate section will examine key e-health trends, and key e-health trends pertaining to postsecondary institution programs.

General Trends

Government

Federal and provincial governments in Canada, just as in most industrialized countries, are very concerned with their capacity to sustain health care funding due the costs associated with treating large numbers of aging boomers, together with the escalation of the number and cost of medical tests and treatments. In response to this situation, they have introduced innovative initiatives at the micro and macro levels.

At the micro level, for example, provincial initiatives have been undertaken to allow registered practical nurses to carry out many functions normally performed by physicians, to permit pharmacists to dispense over the counter drugs, and most recently, to let pharmacists administer flu shots. Other changes will likely follow.

At the macro level, governments have been making significant investments to automate many health records, and introduce other automated systems. This phenomenon has been underway for many years in many countries such as Sweden and Norway. Other countries such as the United States of America are just beginning to make these nation-wide investments.

Patient waiting systems produced by HI professionals have recently been introduced, amongst other things, to better manage patient waiting times.

The reality is that every province today is engaged in e-health activities and has established measurable objectives and outcomes.[25]

Regionalizing the Health Care System

Ontario health care institutions have traditionally worked in silos. This made coordination and collaboration difficult. Efforts to generate economies of scale through the use of information technology were difficult due to differences in priorities and available resources by the various institutions, and due to the lack of standardization, amongst many other reasons.

[25] eHealth in Canada – Current Trends and Future Challenges, April 2009, Information and Communications Technology Council, http://www.ictc-ctic.ca/wp-content/uploads/2012/06/ICTC_eHealthSitAnalysis_EN_04-09.pdf, ,p. 15

In 2006, the Ontario Government created 11 Local Health Integration Networks (LHINs) with the mandate to plan, fund and integrate health care services for more efficient care in their regions. One of the reasons they were developed was to facilitate e-health capacity.[26]

Other organizational models, such as family health teams have been introduced in Ontario to address the fact that health consumers often have a number of related issues that affect their health condition, and that a team of experienced professionals is better suited to remedy the situation in an economical, efficient and effective manner than by having recourse to multiple specialists over a long period of time. This shift from episodic care with an acute orientation to care management [27] means that health information needs to be better organized and more quickly available to assure effective care.

[26] eHealth in Canada – Current Trends and Future Challenges, April 2009, Information and Communications Technology Council, http://www.ictc-ctic.ca/wp-content/uploads/2012/06/ICTC_eHealthSitAnalysis_EN_04-09.pdf, ;p. 16
[27] National League for Nursing http://www.nln.org/nlnjournal/infotrends.htm, p. 3

Health Workers

There is a shortage of trained health workers of all types. The average age of health workers is increasing significantly and there are fears that there will be inadequate replacements. Older health workers may not be up to date in using the latest technologies and may have difficulty in adapting to the rapid pace of technological change.

Many younger health professionals of today's generation are increasingly reluctant to work night shifts. Alternative careers in health informatics and health information management can be an opportunity to retain skilled personnel instead of losing them to other industries.

The rate of discovery of new medical information on diseases and clinical interventions makes it very difficult for clinicians to keep up to date.[28] It is increasingly difficult for health professionals to memorize the large body of knowledge without ready access to information tools. These tools increasingly consider more than one discipline. New organizations such as the National Collaborating Centre for Public Health have been tasked with collecting and organizing information so that practitioners can access the latest information 24/7.

More isolated communities are increasingly finding it difficult to attract and retain health professionals in their communities. Advanced technologies have the potential to significantly reduce the need to travel for health care.

Patient Needs

A key trend in the entire health sector is the "movement of patient care out of the hospitals and into the patient's home, and into ambulatory and community care settings. These settings are less structured than hospitals and will require new processes to integrate the capture of information along the continuum of care. "[29]

Individual patient information has generally been captured from a single health professional's perspective. Health professionals are increasingly looking at patients and their dependents more holistically. There is recognition that health solutions based on the results of treating an individual need to be more inclusive of family members and dependents. For example, keeping a senior in his/her home is often seen to be superior to their institutionalization; however, there may likely be cost and short and long term health impacts on other family members that should be considered as well.

An abundance of health-related literature is easily available through the internet. Approximately 75% of Canadians use the internet for health reasons in Canada. [30]

Patients/Consumers Needs for Transparency, Accountability, and Managing Expectations

[28] eHealth in Canada – Current Trends and Future Challenges, April 2009, Information and Communications Technology Council, http://www.ictc-ctic.ca/wp-content/uploads/2012/06/ICTC_eHealthSitAnalysis_EN_04-09.pdf, p. 5
[29] eHealth in Canada – Current Trends and Future Challenges, April 2009, Information and Communications Technology Council, http://www.ictc-ctic.ca/wp-content/uploads/2012/06/ICTC_eHealthSitAnalysis_EN_04-09.pdf , p. 21
[30] Healthfinder.gov, http://healthfinder.gov/HealthTools/#checkups

The advent of computers is continuing to radically transform all industry sectors, and its introduction has precipitated many changes in consumers' needs. For example, consumers expect that mechanics will provide them with a clear and detailed record of the 90 point checkup of their vehicles in order to give it a clean bill of health. Today's health consumer increasingly feels entitled to similar treatment when receiving health care - though the process of receiving healthcare is still considerably behind compared to how mechanics treat our vehicles.

Consumerism

Consumers feel more empowered and responsible for their health care decisions – they search online for preventative solutions to ailments. Patient are more engaged in exploring the cause of their ailments, they use a variety of on-line sources to verify their health providers [31] recommendations and/or seek out alternative or complementary solutions

Consumerism is an important development because health informatics has traditionally focused on the needs of the health professional. Some leading thinkers are suggesting that a new form of health informatics will inevitably develop to better address the needs of the consumers and integrates these with the needs of the health profession. Guther Eysenbach suggested that:

> Consumer health informatics is the branch of medical informatics that analysis consumers' needs for information; studies and implements methods of making information accessible to consumers; and models and integrates consumer preferences into medical information system.[32]

E-health Industry Trends

Rapid Change

The e-health industry is rapidly changing and it is difficult for its professionals to keep abreast of these changes due to a shortage of human resources.

Physician Office/Clinic

Large number of health professionals working outside of hospitals have had limited access to e-health tools. In future years, many of them will begin to take advantage of now proven practice management software and electronic medical record clinical software. Unfortunately, it is well proven that Canada still lags well behind other industrialized countries in its implementation of these electronic tools.[33]

Use of consultants

[31] eHealth in Canada – Current Trends and Future Challenges, April 2009, Information and Communications Technology Council,http://www.ictc-ctic.ca/wp-content/uploads/2012/06/ICTC_eHealthSitAnalysis_EN_04-09.pdf, p. 18
[32] eHealth in Canada – Current Trends and Future Challenges, April 2009, Information and Communications Technology Council,http://www.ictc-ctic.ca/wp-content/uploads/2012/06/ICTC_eHealthSitAnalysis_EN_04-09.pdf, p. 18
[33] eHealth in Canada – Current Trends and Future Challenges, April 2009, Information and Communications Technology Council,http://www.ictc-ctic.ca/wp-content/uploads/2012/06/ICTC_eHealthSitAnalysis_EN_04-09.pdf, p. 15

The implementation of new e-health systems requires persons to work intensely for limited periods of time. This means that many organizations rely on outside consultants to carry out the work.[34]

Knowledge Skills and Barriers in E-Health and Information Technology

The literature often indicates that "one of the biggest issues facing health care organizations is the ability to attract and retain EHealth and IT professionals."[35]

Another key issue often found in the literature with respect to those working as HIM and HI professionals is the difficulty "to attract individuals who have the right balance of information technology, information management, and clinical information competencies."[36] Other literature also suggests that the lack of people skills and general business skills is a serious impediment to successful employment in the e-health area.

In the IT industry it is generally accepted that workers must have outstanding technical skills, but "communication skills is cited as a non-negotiable by everyone with expertise in the industry."[37]

A CIO of a large organization in the USA states in an article in Computer World state that "it's a horrible thing to say, but there's just not enough time [in college] to learn all the skills that people need to be successful. We are expecting more and more, and universities are supplying more, but we're asking for still more".[38]

A survey looking at the E-Health industry found that it is:

> easier to train individuals that have a health care system background needed to develop into eHealth professionals than to train IT professionals the skills need in the area of clinical information management . It was also noted that it is difficult to find the "right" resource due to the fact that there is a limited resource pool and that they are all currently employed. [39]

In February 2012, Computer World reported on a survey of IT managers, which found that there are six key skills they wish their newest hires had picked up in college.[40] Those skills are as follows:

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[34] eHealth in Canada – Current Trends and Future Challenges, April 2009, Information and Communications Technology Council,http://www.ictc-ctic.ca/wp-content/uploads/2012/06/ICTC_eHealthSitAnalysis_EN_04-09.pdf, p 22
[35] eHealth in Canada – Current Trends and Future Challenges, April 2009, Information and Communications Technology Council, http://www.ictc-ctic.ca/wp-content/uploads/2012/06/ICTC_eHealthSitAnalysis_EN_04-09.pdf, p 22
[36] eHealth in Canada – Current Trends and Future Challenges, April 2009, Information and Communications Technology Council, http://www.ictc-ctic.ca/wp-content/uploads/2012/06/ICTC_eHealthSitAnalysis_EN_04-09.pdf, p. 23
[37]Chicago Tribune, Chicago Jobs, http://www.chicagotribune.com/classified/jobs/chi-tech-career-guide-20120130,0,209288.story,
[38] Computer World, 6 key skills new IT grads are lacking, http://www.computerworld.com/s/article/9224133/6_Key_Skills_IT_Grads_Lack,
[39] eHealth in Canada – Current Trends and Future Challenges, April 2009, Information and Communications Technology Council, http://www.ictc-ctic.ca/wp-content/uploads/2012/06/ICTC_eHealthSitAnalysis_EN_04-09.pdf, p. 22
[40] Computer World, 6 key skills new IT grads are lacking http://www.computerworld.com/s/article/9224133/6_Key_Skills_IT_Grads_Lack

- Knowledge of business basics
- Experience with integration
- Emerging technologies expertise
- The tech basics
- Familiarity with legacy systems (Cobol …)
- The ability to work on a team[41]

Profession(s) in Transition

Today there is some concern about the quantity and quality of emerging professionals in the e-health field. Some of the leading Canadian organization suggests that the health information and health information management professions need to develop a standardized approach to curricula that is tied to standards of practice and competencies.

[41] Computer World, 6 key skills new IT grads are lacking
http://www.computerworld.com/s/article/9224133/6_Key_Skills_IT_Grads_Lack

New Entrants in the E-health Industry in Ottawa

Abbot Point of Care, a subsidiary of Abbot Laboratories (pharmaceutical company) is a relatively new and large manufacturing company in Ottawa. The company is a recognized leader in the design of medical diagnostic chips used in a variety of mobile testing products. In a recent Ottawa Citizen article, it was reported that the company produces more than four million chips a month, and that "almost half of its 850 production staff have university or business college degrees. [42]

The article also states that "market researchers believe demand for point-of-care diagnostics is growing by 10 percent to 15% annually"[43] and that "point-of-care technology is moving out of hospitals into senior residences and nursing homes"[44]

Growth of Educational Programs

Many Ontario and other post-secondary Canadian and American institutions offer HI and HIM programs. In Ontario, most of these have been created within the last 10 years and are located in southern Ontario. The first Ontario multidisciplinary programs in HI and HIM were graduate and doctorate programs.

In recent years, there has been a boom in the number of undergraduate and college programs in HI and HIM in Ontario and in Canada and the United States. In recent years colleges have begun to offer a mix of undergraduate program, diploma programs and certificate programs. Universities have also introduced short certificate programs.

Increased Use of Technology

In general, technology adoption in health care in Ontario has been relatively slow. However, industry observers in Ontario feel that the "pace of change is at tipping point and the next decades will see a significant increase in the utilisation of technology for improved efficient and clinical outcomes.[45]

The significant advances of the internet, mobile devices, miniaturization, increased power and affordability of computers will lead to increased use of technology throughout the health system. For many professionals, this will mean increased demand for knowledge and skills in e-health and increased re-training.

The use of portable devices has become a best practice in some hospitals as well as in Emergency Medical Services (EMS) in this field.[46]

E-Health Interoperability

E-health interoperability is a word that is the subject of many e-health conferences these days. Interoperability refers to the sharing of information across organizational lines. It is a complex

[42] The Ottawa Citizen, Silicon Success, Saturday, November 17, 2012 p F1
[43] The Ottawa Citizen, Silicon Success, Saturday, November 17, 2012 p F2
[44] The Ottawa Citizen, Silicon Success, Saturday, November 17, 2012 p F2
[45] eHealth in Canada – Current Trends and Future Challenges, April 2009, Information and Communications Technology Council, http://www.ictc-ctic.ca/wp-content/uploads/2012/06/ICTC_eHealthSitAnalysis_EN_04-09.pdf , p. 21
[46] eHealth in Canada – Current Trends and Future Challenges, April 2009, Information and Communications Technology Council, http://www.ictc-ctic.ca/wp-content/uploads/2012/06/ICTC_eHealthSitAnalysis_EN_04-09.pdf, p.14

process which requires standardization of: data; hardware and software; operational protocols; and security amongst other thing.

Governments have invested considerably to enable standardized electronic health information to be shared among different organizational entities within and across provinces. Under the leadership of the Canada Health Infoway several provinces have, or are about to have completed, the development of the necessary systems architecture to enable the sharing of electronic records. The sharing of electronic does not cover all health care in Canada.

Management of Change

Over the last 15 years it has become evident that the introduction of e-health requires significant investments in change management. The shift from a paper world to an electronic documentation world is huge. [47]

Trying to harmonize standards or user needs across regional and provincial boundaries is much more complicated and time consuming than most people think. The literature clearly states that there will be increased "need for personnel to identify transition requirements and process to effectively manage change".[48]

Difficulties

The subject of E-health in Ontario has been the focus of acrimonious debate. In September 2008, the Government of Ontario created an independent corporation, eHealth Ontario to develop an Electronic Health Record (HER) system for all of Ontario. Two years later, the Auditor General of Ontario, Jim McCarter produced a devastating report on the management and progress of the project. Newspaper headlines at the time read Ehealth scandal a $1B waste![49] The scandal led to the resignation of the Health Minister prior to the auditor's report being made public. The legacy of this scandal is still being raised in the day to day political life in Ontario.

Canada Health Infoway was born in 2001 to assist in the coordination of electronic health records across Canada. It argued that spending $10-bilion on a national system would have generated $6-billion in annual savings.[50]

It is clear that the federal government and its provincial counterparts have made significant investments in ehealth. But a number of journalists are stating that there is little to show for the massive spending in ehealth in Canada.[51] In an article published in the fall of 2011, a reporter wrote that:

[47] eHealth in Canada – Current Trends and Future Challenges, April 2009, Information and Communications Technology Council, http://www.ictc-ctic.ca/wp-content/uploads/2012/06/ICTC_eHealthSitAnalysis_EN_04-09.pdf, p.16
[48] eHealth in Canada – Current Trends and Future Challenges, April 2009, Information and Communications Technology Council, http://www.ictc-ctic.ca/wp-content/uploads/2012/06/ICTC_eHealthSitAnalysis_EN_04-09.pdf, p.17
[49] CBC News, EHealth scandal, a $1B waste: auditor http://www.cbc.ca/news/canada/toronto/story/2009/10/07/ehealth-auditor.html
[50] Financial Post, FP Comment The Chopping Block: 1. Canada Health Infoway, http://opinion.financialpost.com/2011/09/28/the-chopping-block-1-canada-health-infoway/ , p.1
[51] Financial Post, FP Comment The Chopping Block: 1. Canada Health Infoway, http://opinion.financialpost.com/2011/09/28/the-chopping-block-1-canada-health-infoway/ , p.1

> Last week, the National Health Service in the United Kingdom announced a dismantling of its national ehealth project. After spending £6.4-billion ($10.3-billion), the NHS scrapped what had been the world's largest single civilian computer system. The decision came after a review by a House of Commons public health committee found that while the effort was worthy, the money had been wasted. The department has been unable to demonstrate what benefits have been delivered.[52]

The same reporter cited an article recently published by the Canadian Medical Association Journal (CMAJ) which "cited doubts about Health Infoway's claims that electronic prescribing by doctors would produce major cost benefits."[53]

A journal article published in 2006 stated that "developing information systems (IS) is a difficult task and the process often leads to a failure instead of a success"[54]

A scientific study of 9,000 IS projects in 352 US companies, for example showed that "more than half of the IS development projects failed in one way or another."[55] The article indicated that certain success factors such as collaboration and co-operation, and setting goals and courses were critical to the success of many systems.[56]

Cambrian College in Sudbury has offered a two-year Health Information Management program since 2005. It made the headlines in the summer of 2009, when André Marin, Ontario's Ombudsman claimed that the "northern Ontario college misled students into believing it would prepare them for careers in managing health information and the 'province abdicated' its responsibility to ensure those students were getting the education they paid for."[57] The Ombudsman added

> It's a worthless degree because student can't get a job in the field without CHIMA requirements … Although health information is an unregulated health-care field, most workplaces demand certification from the association.[58]

Neither CHIMA nor COACH currently licenses its members.

What do the Trends Suggest?

There is rapid transformation of the general health care sector and the e-health industry and these changes are significant and are likely irreversible in the long run.

[52] Financial Post, FP Comment The Chopping Block: 1. Canada Health Infoway, http://opinion.financialpost.com/2011/09/28/the-chopping-block-1-canada-health-infoway/ , p.1
[53] Financial Post, FP Comment The Chopping Block: 1. Canada Health Infoway, http://opinion.financialpost.com/2011/09/28/the-chopping-block-1-canada-health-infoway/ , p.2
[54] Factors Influencing Success and Failure of Health Informatics Systems* A Pilot Delphi Study, http://www.woogeweb.de/Publikationen/z34.pdf, p.125
[55] Factors Influencing Success and Failure of Health Informatics Systems* A Pilot Delphi Study, http://www.woogeweb.de/Publikationen/z34.pdf, p.125
[56] Factors Influencing Success and Failure of Health Informatics Systems* A Pilot Delphi Study, http://www.woogeweb.de/Publikationen/z34.pdf, p.133
[57] CTV News, Ont. Government warned to keep eye on colleges http://toronto.ctvnews.ca/ont-government-warned-to-keep-eye-on-colleges-1.428609, p.1
[58] CTV News, Ont. Government warned to keep eye on colleges http://toronto.ctvnews.ca/ont-government-warned-to-keep-eye-on-colleges-1.428609, p. 1

The associations representing HI and HIM professionals appear to be very active and appear to be very connected to many large organizations in a large variety of industry sectors. The trends suggest a very positive employment outlook for HI and HIM professionals in many different industries.

2.4 EDUCATION NEEDS

Many professions have introduced professional designations. This is a way to demonstrate competence, but is also a way to protect a labour market niche.

It is impossible to determine how many students of hybrid programs are working in HI or HIM fields, and it is impossible to determine how many students are in HI and HIM positions but who have not graduated from a specific HI and HIM program.

Both CHMA and COACH have the legal authority to award professional credentials. These credentials are given upon successful completion of exam.

Literature review suggests that the CHIMA designation is essential for entry into a HIM job, but the COACH designation is seldom a condition of employment.

3. INTERVIEW RESULTS

RESULTS AND ANALYSIS

Methodology and approach

A small number of confidential telephone interviews were held with key stakeholders in the Ottawa area. Senior representatives of the two major associations involved in health informatics and health information management were interviewed to obtain a broader perspective on industry trends with specific emphasis on the employment outlook for new graduates.

The respondents provided candid answers to the questions and were very forthcoming in their answers. In general, the lead time in obtaining interviews was from 1.5 weeks to 2 weeks. This is considerably longer than has been experienced in other industry sectors.

We found that obtaining information on two programs at once made the discussion more difficult as respondents sometimes mixed up the two programs or found it difficult to switch from one to another.

The telephone interviews were based on a set of 7 questions, but were adjusted to suit the respondent's time availability and their ability to answer the questions. The interviews averaged about 40 minutes. All respondents were assured that their comments would remain confidential.

The results of the interviews are summarized into the following four groups: general; knowledge skills and abilities; health informatics; health information management; potential Algonquin College clients and trends

General

- There is a huge market for both health informatics and health information management graduates. Some organizations, especially in the western provinces are developing very aggressive strategies to attract qualified staff for health information management, and to a lesser extent, health informatics professionals.
- The starting pay is quite good in the various jobs.
- The range of jobs for emerging professionals is very diverse and there is significant opportunity for rapid advancement.
- The trend towards increased use of technology is unstoppable – even if government was to stop financing its large projects – this is not a one-time crisis response.
- Consulting careers are a booming market, but these are not starting jobs.
- Persons with only 3 to 4 years experience are regularly recruited to become consultants– this is dramatically less time than in most industries.
- Manufacturers need persons who have clinical experience.
- It is not anticipated that there will be a big demand for government workers in the short and medium term, but nonetheless job market entry will not usually begin in the private sector, but rather in hospitals, cancer care centres, LHINs, CCAC's, associations…)
- It is almost impossible to aspire to mid-level careers in health information management or health informatics without having spent time in the health care sector.
- Both the private sector and the public sector in Ottawa have a high demand for HI and HIM professionals.
- Larger organizations seem to prefer undergraduate based training.
- Existing health professionals interested in a HI or HIM career should focus on business analysis, change management (before and after), and training rather than on informatics because there is a great need for these skills, and these skills are ideally suited to their existing knowledge and interests.
- The need in government will be at very low end of the career scale and at the very high end, but not much in between.
- Some respondents are concerned that if there is a big take up on a one or two year program, there may be less demand for a four year program.

Knowledge skills and abilities

- It is absolutely essential for any one aspiring to work in health informatics to understand the health care system.
- Health informatics professionals often start at help desk positions.
- Students need to establish relationships with potential employers.
- Business analysis, project management, documentation skills and change management skills were often cited as skills to emphasize in training.
- Training and change management is often a neglected area.

Health Informatics

- Business analysis – documenting workflows, cost benefit analysis is critical to the success of someone in health informatics.
- The field is too complex to be a generalist business analyst – it is imperative to have an understanding of health and clinical terminology.
- There is huge potential in web application development.
- Computer element should not be more than 20 to 25% because that training is outdated in two to three years.
- There are few programs in health informatics.
- There is considerable competition for one year programs.
- Many colleges find it hard to attract students in health informatics directly out of high school.
- Some colleges such as Conestoga have added a CHIMA accreditation component to their program to make it more attractive to potential students.
- Mobile and personalized care ehealth tools are a booming sector and this will continue for a long time because it saves so much time, leads to more accurate results, and is more cost efficient.
- A professional designation is available for Health Informatics professionals; however, it is seldom mentioned as an essential requirement.

Health Information Management

- A good starting job is in coding classification.
- There is a broader range of potential employers for HIM professionals i.e. WSIB, insurance companies, research institutes, quality assurance testing companies, and health informatics manufacturers and consultants.
- Despite being in existence for a long time, the health information management profession, which first began as a records management association, has undergone significant change in its scope. At this time, HIM professionals are also concerned with patient's rights, freedom of information, quality and risk assessment, document retention and destruction.
- The designation is essential to obtain employment.

Potential Algonquin College Clients -Trends and Considerations

- Despite the excellent work outlook, some colleges and universities are having some difficulties in attracting students.
- A number of colleges and universities are admitting foreign professionals to ensure that they maintain adequate numbers of students.
- Health information management and health informatics professionals have been very different personality profiles. Most of the health information management professionals are women, whereas most health informatics professionals are male.

4. COMPETITION

4.1 INDUSTRY ASSOCIATIONS, LICENSING AND ACCREDITING BODIES

Industry Associations

There are many associations involved in the e-health field, and they continue to grow in numbers. Many of the association members are very large private corporations such as Wal-Mart, Microsoft, GE, Rogers, Telus, Bayer, Deloitte, Apple, IBM, AGFA, Phillips covering a broad range of industries in the product and service sector. Government representatives also belong to many of these same associations.

The Health Information Management Association (CHIMA), and COACH: Canada's Health Informatics Association, are generally regarded as the two leading organizations exclusively representing the e-health sector in Canada. Both of these associations are legally entitled to award professional credentials.

CHIMA is the larger of the two leading e-health associations. CHIMA regroups approximately 3,700 certified Health Information Management (HIM) professionals from across Canada in addition to 1,300 affiliate, students and retired members.

Both organizations, therefore, have a combined membership of 5,000 members. CHIMA has been in existence for many years. It was first established in the 1920's under the banner of the Association of Record Librarians of North America. CHIMA states that it's "members manage the security, privacy and accuracy of patient records".[59]

The Ottawa-based Canadian Institute for Health Information (CIHI) has been collecting data from individual health care facilities for use in case costing, population health analysis, research and policy for many years. This data is often prepared and analyzed by HIM professionals.

COACH is a relatively new association which focuses exclusively on the field of health informatics. This 1,500 member association was formed in 1975 by several health professionals and vendors in the medical industry, who recognized that significant sharing of ideas and efforts must take place in order to enable Canadian health institutions to effectively use information technology and systems. The focus of the association has apparently expanded to include not only the technology and the systems, but also the effective use of health information for decision-making.[60]

Several other associations have a keen interest in the e-health field such as the Health Division of the Information Technology Association of Canada (ITAC-Health) and the Information and Communication Technology Council. Both have a membership that is broader than the e-health sector. Unlike CHIMA and COACH, neither association offers specially designed credentials related to e-health.

New and interesting association partnerships are also being created. In April 2010, Canada's Medical Technology Companies (MEDEC) and ITAC - Health announced a collaborative agreement focusing on patient management software.

CHIMA recently announced that is has partnered with the Canadian Nursing Informatics Association to host the International Federation of Health Information Management Associations' (IFHIMA) Conference in May 2013 in Montreal.

[59] Facebook page CHIMA, https://www.facebook.com/OfficialCHIMA
[60] COACH, Diverse community, http://www.coachorg.com/en/aboutcoach/diversecommunity.asp?_mid_=4275

COACH has been very active in the last year in developing a "common core or shared set of skills, knowledge, attitudes, and capabilities necessary … to effectively perform as a Health Informatics professional, regardless of the practice context or the route by which each has … originally entered the field of HI."[61]

A review of the different associations on the internet shows that they hold many major conferences which appear to be very well attended, and are financially supported by many large private and government sponsors such as IBM, 3M, and Canada's Information Highway. It suggests that that the industry is a large and healthy industry.

We noted that HI and HIM associations hold job fairs to attract new employees. These job fairs are sponsored by large private organizations.

A review of the major e-health associations suggests that the industry has many players, it is economically very important, and that it is vibrant and healthy.

Licensing and Accreditation

Most professionals working in the health informatics field and the health information management field are not licensed unless they have a licensed by virtue of another occupation (i.e. nursing). Both associations have well developed documentation to assist in curriculum development and are willing and eager to assist Algonquin College in program development leading to accreditation.

4.2 POSTSECONDARY TRAINING IN ONTARIO

There has been a steady increase in the number of HI/HIM programs offered, from certificate programs through to post graduate studies.[62] Over the last 10 to 15 years, many universities in Canada and the USA have begun to offer applied multidisciplinary master's level programs in health, medical informatics, or bio-medical informatics. More recently, university and colleges have both begun to offer multidisciplinary undergraduate, certificate and diploma programs related to health informatics and health information management. In addition, a number of health associations, such as the Canadian Healthcare Association and COACH offer specialized training in health informatics and health information management.

The table 8 shows all college and undergraduate HI and HIM level programs in Ontario. This list was obtained through access to the internet, and may not be fully complete. It does, however, provide an understanding of general educational trends in Ontario.

The list also includes other graduate, certificate and diploma programs in Eastern Ontario which may be of interest to students in the same area.

TABLE 8. COLLEGE AND UNIVERSITY LEVEL PROGRAMS

[61] COACH - Health Informatics Professional Core Competencies, Version 2.0, March 2009, http://www.coachorg.com/en/publications/resources/CoreCompetencies_May09-web.pdf
[62] eHealth in Canada – Current Trends and Future Challenges, April 2009, Information and Communications Technology Council, http://www.ictc-ctic.ca/wp-content/uploads/2012/06/ICTC_eHealthSitAnalysis_EN_04-09.pdf, p 22-23

INSTITUTION	PROGRAM TITLE	LENGTH OF PROGRAM	PROGRAM TYPE
Ontario Colleges			
Centennial College (Toronto)	Health Informatics Technology	3 years (9 semesters)	Advanced Diploma
Conestoga College (Kitchener)	Health Informatics Management (Bachelor of Applied Science) – (Coop)	4 years	BSc
Conestoga College (Kitchener)	Applied Health Informatics – (Coop)	4 semesters including one coop semester	Graduate Certificate
Conestoga College (Kitchener)	Information Management for Health Care – (Coop)	3 semesters including one coop semester	Graduate Certificate
Fleming College (Peterborough)	Health Information Management*	2 years	Diploma
George Brown College(Toronto)	Health Information Management*	2 years	Diploma
George Brown College (Toronto)	Health Informatics	2 years	Graduate Certificate
National Institutes of Health Informatics (Waterloo)	Applied Health Informatics Bootcamp	2.5 days on site + 90 hours of online presentations	Certificate
St. Lawrence College (Kingston)	Health Information Management*	44 weeks	Diploma
Ontario Universities			
McMaster University	Health Information	Unknown	Diploma
McMaster University	Health Informatics	Unknown	Diploma
St. Jerome University/University of Waterloo	Mathematics and Health Informatics	4 years	Bachelor of Mathematics
Ryerson University	Health Information Management*	2 Years	Bachelor of Health Administration

INSTITUTION	PROGRAM TITLE	LENGTH OF PROGRAM	PROGRAM TYPE
University of Ontario Institute of Technology (Oshawa)	Health Information Management Specialization in Health Science*	4 years	BHSc
University of Waterloo	Health Informatics Option in Health Studies	4-5 years	Bachelor of Science
York University	Health Informatics	4 years	Bachelor of Health Studies
York University (Toronto)	Health Industry Specialization in Information Technology	4 years	Bachelor of Arts
York University (Toronto)	Health Informatics	1-2 years	Certificate
Queen's University (Kingston)	Biomedical Computing Program	4 years	Bsc.
Carleton University	Master of Science in Health: Science, Technology and Policy	2	MSc
Carleton University	In development	In development	Graduate Diploma (for current graduate students) – Planned to start
Carleton University	In development	In development	Graduate Diploma for health professionals (planned)
Ottawa-Carleton Institute for Biomedical Engineering (OCIBME) – Joint Carleton University and Ottawa University Program-Ottawa	Biomedical engineering (medical informatics and telemedicine program area)	2 years	M.A Sc.
University of Western Ontario (London)	Software Engineering – Health Informatics Option	4 years	Bachelor of Science

INSTITUTION	PROGRAM TITLE	LENGTH OF PROGRAM	PROGRAM TYPE
University of Ottawa	Health Administration	2 years	MHA

* Courses are approved for study credit by the Canadian Health Information Management Association (CHIMA)

There are also a number of unique other post-secondary organizations of interest that are offer e-health related programs. Some are under development. Some institutions also focus primarily on research.

TABLE 9. OTHER PROGRAMS OF INTEREST

INSTITUTION	PROGRAM TITLE	LENGTH OF PROGRAM	PROGRAM TYPE
Canada's Health Informatics Association (COACH)	Health Informatics Training System (online)	Unknown	Certificate
Canadian Healthcare Association (Ottawa)	Health Information Management Program*	(2 years distance)	Certificate
National Institute of Health Informatics	Health Informatics Bootcamp	Mix of web monthly web cast courses and 90 hours of online	Unknown
Centre for Distance Education / Heritage Professional Centre(Sidney, Nova Scotia)	Health Information Management Program*	Two years on line (20-30 hrs per week) – monthly start dates	Diploma
Algoma University	Health Informatics	As of 2010, the program was in planning phase	Unknown

* Courses are approved for study credit by the Canadian Health Information Management Association (CHIMA)

College and Undergraduate Programs

Program Variety

There is a wide variety of HI and/or HIM programs offered in Ontario. Many of these are located in southern Ontario. Many focus on one of the two HI or HIM disciplines, although a few programs are now or about to blend both disciplines. From a curriculum perspective, some programs emphasize health, others business and others informatics. In the next few paragraphs we will describe some of the various programs offered in Ontario.

St. Lawrence College in Kingston offers a Health Information Management program. The program is offered by the School of Health and Science and is 44 weeks long. The program leads to a diploma. This three semester program has a strong focus on health in the first one and two semesters. In the third semester, students take a mix of management courses

and some computer courses. There is a practicum in the third semester, as well as a certification exam preparation course.

York University in Toronto offers a Health Industry Specialization in Information Technology program through the School of Information Technology of the Faculty of Liberal Arts and Professional Studies. This program is aimed at producing health informatics professionals. Program graduates earn a Bachelor of Arts degree. The program has focus on systems and software development with some management courses. There is limited health or health care training.

Centennial College in Toronto offers a three-year full-time undergraduate program at its Toronto campus. The program is part of the School of Engineering Technology and Applied Science. According to their documentation on the Centennial College web site, the skills acquired by graduates will enable them to design, develop, modify, and test software for health care applications.[63] The curriculum appears to be focused heavily on programming with only two courses on project management and business. There are no health courses.

George Brown College in Toronto offers a four semester - two year full time Health Information Management program. This diploma program has a considerable health focus and some focus on informatics, but appears to have little to no emphasis on business.

National Online College – The Centre for Distance Education (DD-ED) is a national online distance learning college based in Nova Scotia which has recently developed a Health Information Management diploma program accredited by CHIMA.

Competition

The primary competitors for HI and HIM programs for Algonquin College are St. Lawrence College with a 44 week Health Information Management Program, Queen's University with a 4 year BSc Biomedical Computing Program, and the Canadian Healthcare Association's Health Information Management program located in Ottawa.

We understand that both the University of Ottawa and Carleton University offer new graduate diplomas/certificates in HI/HIM, but there is no information available on the web to understand their curriculum or the length of the programs.

A number of educational institutions in the USA offer on-line Bachelor of Science in IT programs specializing in Health Informatics. Some of their information documentation clearly indicates that the course is open to Canadian applicants (i.e. Capello University Online, DeVry University Online, and Drexel University Online). Some USA universities have reciprocal arrangements with CHIMA to allow their students to write exams in Canada.

In the United States, a number of educational institutions offer Nursing Informatics programs at the Master's level. Some are regular programs and some are online programs. At the present time, we have not found any nursing informatics programs in Canada.

[63] Centennial College, Health Informatics Technology, http://www.centennialcollege.ca/Programs/ProgramOverview.aspx?Program=3518

Other Related Post-secondary Institution Trends

Traditional programs such as the master's in health administration and undergraduate nursing programs continue to prosper but now integrate some courses in informatics.

Many e-health programs are collaborative efforts involving three fields of study: health sciences, business, and informatics. Today there are an increasing number of new multidisciplinary collaborative programs involving biology and informatics, and mathematics and informatics.

Some literature suggests that it is easier to begin with health knowledge and then add informatics and business than to start in the traditional method, which is by way of informatics training.

Interviews with key stakeholders felt it was essential that students obtain as much field experience as possible throughout their academic training period and during the summer breaks.

The recent creation of an e-health related research institute with an applied research vocation but no current teaching vocation such as the Mohawk Applied Research Centre will raise the profile of the HI and HIM professions and possibly offer employment opportunities to new HI and HIM graduates.

We understand that a number of educational institutions in Ontario are having difficulty in attracting new students in the HI and HIM programs. We also heard that these same colleges and at least two postsecondary institutions in Western Canada have or are planning to offer a combined HI and HIM program. It is not clear if this combination is to generate internal program savings or to better serve the students and industry, or both.

A number of researchers voiced concerns, however, that it may be unrealistic to expect college or undergraduate students to grasp all this material in a four-year or less program.

The growth of on-line HI and HIM programs will require all program administrators to be very in tune with changes in the market. The competition can come from anywhere.

5. CONCLUSION AND RECOMMENDATIONS

Demographics and Trends

Governments and non-governmental organizations have, and will likely continue to invest heavily in the e-heath sector. Even without the huge level of recent governmental financial support, the literature suggests that the e-health sector will likely continue to experience steady growth.

The literature review of the health care sector and its related sub sectors such as e-health shows that they are experiencing unprecedented change due to changes in demographics, patient needs and attitudes, organizational restructuring, public finance, and technology.

There is no evidence of an "e-health profession". The health information management (HIM) profession and the health informatics (HI) profession are the two main professions associated with e-

health, and there is a high demand for both professionals in government and in the private sector. HI and HIM professionals can work in the government sector for municipalities, agencies, and hospitals, and can work for the private sector in the delivery of services and products. Health informatics professionals can be involved in systems maintenance and news system development, but seldom at the same time.
Statistics Canada and Human Resources Development Canada do not have any published data on past and future employment trends for HI and HIM professionals. The leading associations in the HI and HIM field (COACH and CHIMA); divide HI and HIM professionals into 7 occupational groups and 27 occupational categories. Each of these categories could be one or more NOC occupations. A review of the data on the absolute number of professionals within each of the occupational categories and occupational groups shows large differences among them.

The two leading associations are working hard to obtain employment data that is meaningful and accurate. Their latest published five year projection covering the period 2009 to 20014 predicts employment to increase by 14.3%. Under the same scenario, it estimated that another 11.8% of the 2009 workforce will have to be replaced. Together, this means that the hiring requirement as a percent of estimated 2009 employment for HI and HIM, assuming moderate growth is 26.1%.[64] The associations' high growth trend is supported by many independent sources and the Canadian and the United States governments.

There is also evidence that there will be a considerable requirement for skills broadening. Research data shows that the need for skills is much higher than the need for new employees.

The latest analysis of vacancy rates in the various occupational groups and occupational categories seems to indicate that, in relative terms, high vacancy rates are in the business domains rather than in the technical domains.

Although many of the occupational groups and occupational categories share some common knowledge, skills, and aptitudes, it appears that there are considerable differences in the nature of work carried out between the occupational categories. These differences will be bound to increase with career progression. One of the unusual characteristics of HI and HIM professionals is that they have a very broad choice of employers.

Educational Institutions

Many Ontario postsecondary institutions offer HI and HIM programs. Most have been created within the last 10 years and are located in southern Ontario. In recent years colleges have begun to offer a mix of undergraduate programs, diploma programs and certificate programs. Universities have also introduced short certificate programs.

HI and HIM programs are usually multidisciplinary programs combining informatics, health and business. There are increasing numbers of new collaborative programs such as informatics and engineering, and biomedical and informatics that will surely make important contributions to the future of e-health.

Our research revealed through one of our telephone interviews, that a number of educational institutions in Ontario are having difficulty in attracting new students in the HI and HIM programs.

[64] eHealth in Canada – Current Trends and Future Challenges, April 2009, Information and Communications Technology Council, http://www.ictc-ctic.ca/wp-content/uploads/2012/06/ICTC_eHealthSitAnalysis_EN_04-09.pdf, p. 50

We understand that these same colleges and at least two other post-secondary institutions in Western Canada have or are planning to offer a combined HI and HIM program. It is not clear if this combination is to generate internal program savings or to better serve the students and industry.

Need for education

Both CHIMA and COACH, the leading associations in e-health have well developed documentation to assist in curriculum development and are willing and eager to assist Algonquin College in program development.

A review of the HI and HIM literature, together with limited research of IT literature, suggests that hard programming skills are not lacking. The literature suggests that HI and HIIM need to strengthen their business skills and change management skills, and that it is imperative to have knowledge and experience in the health care sector.

A number of researchers voiced concerns, however, that it may be unrealistic to expect college or undergraduate students to grasp all this material in a four-year or less program.

Summary

There is a large and very diverse market in the HI and HIM professions. The diversity extends to the type of job carried out and the type of employer. In most cases, employers are large government or multinational corporations which can provide a wealth of different career opportunities.

There are a modest number of postsecondary institutions offering HI and HIM programs, but their numbers appears to be growing. Data on the volume of graduates per year, growth of the number of graduates over time, and their employment are not available from secondary sources.

There is good potential for both an undergraduate and graduate certificate program primarily because of the healthy market situation and the great variety of occupations and employers in e-health.

Recommendations

Axion feels that Algonquin College should consider setting up one or both e-health programs. Given the variety of jobs available to e-health professionals, it would be prudent for Algonquin College to establish an advisory board to assist it in aligning its e-health programs to the market reality of Eastern Ontario.

The new programs could have either an HI or HIM orientation. Through one of our interviews, we understand that Conestoga College is about to create a combined HI and HIM undergraduate program. Two other postsecondary institutions in western Canada are apparently interested in a combined program. We believe it would be advantageous for Algonquin College to determine whether this is an emerging trend or whether there are other reasons for offering a combined HI and HIM program.

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Health Informatics and Information Management: Human Resources Outlook 2014-2019 [65]

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Prepared By: Prism Economics and Analysis June 2014

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 ehealth 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. Figure 1 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.

[65] Full Report Available online: http://www.coachorg.com/en/practices/2014-HR-Report.asp

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.

Figure 3

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 ehealth 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.[66]

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

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 healthcare system, and

[66] 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.

- 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. Figure 2 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		■	■

Figure 4

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 healthcare 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*.

OCAS Data on Related Degree Programs (November 2015)

In additional to a fulsome Labour Market Analysis, Algonquin College additionally reviewed OCAS applicant data to determine student demand for similar programming at other colleges. Conestoga College of Applied Arts and Technology is the only other Ontario College currently offering a related degree. Applicant information related to Conestoga's Health Information Science degree is provided in the following table.

Bachelor of Applied Health Information Science (Conestoga)

	APPLICATION				REGISTRATION				ENROLMENT			
Applicant Year/Type	2011	2012	2013	2014	2011	2012	2013	2014	2011	2012	2013	2014
BOTH	94	116	137	137	21	20	31	32	23	21	31	33
DIRECT	38	32	57	62	11	4	12	16	11	5	12	16
NON-DIRECT	56	84	80	75	10	16	19	16	11	16	19	16

Applicant Demand – Student Surveys

The following surveys were conducted within students from Algonquin College's existing Computer Engineering Technology – Computing Science Ontario College Advanced Diploma program and the Computer Programmer Ontario College Diploma programs on March 19, 2015.

	Total Interest	Extremely	Very	Somewhat
Bachelor of Technology (Digital Health) (Honours)	45	5	13	27
Bachelor of Technology (Business Systems Development)	63	10	19	34
Overlap	40			
Would have taken the program?	53			
Continue at Algonquin?	65			
Number of Participants	99			

Student interest surveys were conducted to gauge how much interest Algonquin College 1st year computer science students might have in bridging into either our proposed Bachelor of Technology (Digital Health) (Honours) or (Business Systems Development) programs. Of the 99 responses, 45 students expressed interest in the Digital Health program (Table 1), while 63 expressed interest in the Business Systems Development program (40 of those 63 students were interested in both programs). When asked, 53 students indicated that they would have enrolled in one of the two programs had it been offered when they were applying to Algonquin College. Sixty-three (63) students indicated that they plan to continue their studies at Algonquin upon completion of their current program.

1. The School of Business asked current students to participate in a survey on April 4, 2015. Among other questions, there were two relative to the proposed Bachelor of Technology – Business Systems Development.

After you complete your current program, do you think that you will continue your education at the college or university level in the future?

Response	Chart	Percentage	Count
Definitely will		48%	28
Possibly will		24%	14
Undecided		19%	11
Possibly not		7%	4
Definitely not		2%	1
	Total Responses		58

Algonquin College is considering offering several Four Year Degree Programs. How interested would be you in taking the following programs at Algonquin College, recognizing that there would be tuition fees and expenses involved?

	Extremely interested	Very interested	Somewhat interested	Not very interested	Not at all interested	Unsure, more information required	Total Responses
Bachelor of Technology (Business Systems Development)	5 (11%)	4 (9%)	10 (22%)	9 (20%)	13 (29%)	4 (9%)	45
Bachelor of Technology (Digital Health)	2 (4%)	4 (9%)	10 (22%)	11 (24%)	14 (31%)	4 (9%)	45
Bachelor of Commerce (Strategic Human Resources)	9 (20%)	6 (14%)	13 (30%)	6 (14%)	8 (18%)	2 (5%)	44
Bachelor of Commerce (Digital Marketing)	9 (20%)	7 (16%)	15 (33%)	9 (20%)	5 (11%)	0 (0%)	45
Bachelor of Commerce (Leadership)	10 (21%)	10 (21%)	10 (21%)	5 (10%)	5 (10%)	8 (17%)	48
Bachelor of Commerce (Supply Chain Management)	11 (24%)	4 (9%)	13 (28%)	9 (20%)	6 (13%)	3 (7%)	46

Current Employment Opportunities

The following job advertisings provide additional evidence of the economic need for this program. Employers (locally, provincially, and nationally) are seeking candidates for Digital Health related positions. These particular postings were selected because of the relevance of the proposed degree learning outcomes to the position.

The following positions were advertised on popular job search websites as listed below between September 23, 2015 and October 31 2015.
www.monster.ca
www.monster.com
www.indeed.com
www.linkedin.com
www.workopolis.com

Position and Organization	Location	Job Descriptions	Education Requirements
Senior Solutions Architect Eagle, Profgessional Resources	Victoria, BC	The successful candidates will be responsible for: Working closely with clients to understand their business strategy and challenges and bring forward relevant solutions; Providing opportunity pursuit services starting at awareness generation stage all the way through to proposal and closing of the sale; Working closely with sales account teams to assist in the development of account plans in the health sector; Describing the solution, defining the approach, and estimating the work effort to develop a solution; Assisting in the planning and execution of market events including: seminars, speaking engagements, and authoring engagements to stimulate demand creation; Assisting in the management of strategic alliances to position our client as a leading service provider; Assisting in the creation and collection of intellectual assets to support sales. Sales focused intellectual assets include such things as: Offer and service definitions; Client references; Case studies; Competitive research and advice; Providing thought leadership and project advisory services to key clients on a billable	Working knowledge of one (1) or more of the following: Electronic Health Records, Health Information Exchange, e-Referrals, IT systems integration, Big Data Analytics, Cloud Services; A Post-Secondary Degree in a related discipline or equivalent work experience;

Position and Organization	Location	Job Descriptions	Education Requirements
		basis; Designing and providing direction on business solution architectures and their delivery approach; Providing quality assurance services on delivery projects to ensure that the quality of delivered solutions reflects what was proposed; Mentoring and coaching other staff to ensure consistent delivery of quality solutions; Ensuring that intellectual assets created during the delivery process are collected, evolved and captured in the knowledge base in a manner that is reusable and relevant, including: Delivery and process models; Sample project plans; Sample deliverables; Estimating and cost models; and, Effective resource allocation to projects.	
Senior Project Manager Eagle Professional Resources	Surrey, BC	The successful candidate will be responsible for: Assuming the role of PM with all the associated responsibility of a PM; Delivering results as measured by project milestones and key deliverables and integrate into the culture and environment of the project team; Developing, maintaining Project Charter, Project Management Plan, Direct and Manage project execution; Monitoring and controlling project work; Performing change control; Closing project or phase; Ensuring proper development, test, and production environments are setup and aligned with best practices; Working internal and external vendors to configure and install necessary software; Following the IM Department PMO process; Calling and chairing project team meetings; Documenting all findings and	Experience working in Health Care – particularly on IM/IT initiatives Experience working in large health care organizations preferred; A Project Management designation is preferred, but not necessary.

Position and Organization	Location	Job Descriptions	Education Requirements
		recommendations in a central area accessible to all project stakeholders; Working with project resources to collect requirements, define scope, WBS creation, verify, and control scope; Working with stakeholder groups to review, identify, clarify, and prioritize business and technical requirements; and, Definition of project goals and responsibilities including creation of a responsibility assignment matrix.	
Senior Informatics Consultant Alberta Health	Calgary, AB	You are a highly motivated professional who is client-focused and committed to providing quality services. You have a keen interest in people, processes and technologies that can help drive efficiency and innovation. Your aim is to apply your advanced Organizational Change Management (OCM) skills in order to lead teams in achieving business transformation. You are equally adept at working independently or within a team, with strong leadership, planning, communication and facilitation skills. You demonstrate independence and initiative in your work and have experience in working across all levels within an organization including senior executives, managers, front line, corporate and technical staff. Your Role: Your role brings a people-centric approach to the development, planning and successful execution of multiple projects and/or programs. You will establish and maintain strong stakeholder relationships at senior levels, across multiple and diverse business environments. As a key client interface, you will need to demonstrate expertise in developing and executing plans for OCM, but also demonstrate broad knowledge of the following work streams: Business Analysis and Process Design, Benefits Realization, Learning and Content Design.	A minimum of a bachelor's degree in a health related area plus other recognized designations related to health informatics are preferred. Equivalencies considered

Position and Organization	Location	Job Descriptions	Education Requirements
Senior Data Analyst Homewood Health	Guelph, ON	Homewood HealthTM is looking for a Senior Data Analyst who will be responsible for the creation and analysis of reporting, using electronic tools to assist managers in their decision making. The Senior Data Analyst acts as the subject matter expert as it relates to the data sources and how the data relates to our business, takes the lead on the more complex task requirements for the department, and provides support and guidance to other team members. The successful candidate will work closely with the Management and Executive teams to develop required reports and analyses. In addition, they will be an internal expert for various reporting tools (Excel, Showcase Query, Report Writer, OLAP Cube reporting, Cognos, Odyssey, OHasis Crystal Reports, etc.) and must be very knowledgeable about all accounting systems and database designs for virtually all applications within Homewood Health Inc.	Bachelors or Diploma in Information Technology, Business Administration or a related discipline
Senior Business Analyst, Alternate Level of Care (ALC) and Mental Health Cancer Care Ontario	Toronto, ON	Access to Care (ATC) is seeking a Senior Business Analyst to support the Mental Health business. As a part of this role, the Senior Business Analysis identifies requirements, collects and analysis information/data, interacts with key stakeholders and providers ongoing line of business support as required. A Senior Business Analyst works on multiple projects and programs which have complex mandates and objectives, broad and varied scope, larger teams and/or a diverse set of stakeholders. The Senior Business Analyst is a leader within the Mental Health team. This individual will be responsible for the development of strategic business plans, business analysis and translating business requirements into Mental Health reporting products. This leadership role works collaboratively and cross-functionally with stakeholders (internal and external) in order generate new insights and inform key decision makers within the healthcare system. This role will be part of a team	Undergraduate Degree in a Regulated Health Profession, Health Sciences, Health Administration, Information Management, Business Administration, or Health Informatics or related field is required; Minimum of 4 years of experience in a Business Analyst role or equivalent in a health care systems

Position and Organization	Location	Job Descriptions	Education Requirements
		accountable for IM/IT project planning, implementation, operations and evaluation. Key responsibilities include the ability to manage moderate to complex projects with medium and large scope, status reporting, risk/issue management, and making recommendations to improve the efficiency and effectiveness of Mental Health Access and Wait Times. The ability to work independently and as a part of a team, to prepare reports, communications, presentations and other assigned responsibilities are essential to the role.	experience required; Clinical experience as asset;
System Engineer and Integration Lead ISG Search	Toronto, ON	The Systems Engineer and Integration Lead role is focused on managing the technical project elements for our clients product suite. A key member of the IT Services and Operations Department, the Systems Engineer and Integration Lead possesses deep technical design and implementation skills, the ability to manage technical project elements, and the capability to effectively and positively interact with internal and external stakeholders. **Key Responsibilities:** Lead the EMR and EHR integration, implementation and testing efforts for deployment of core products. Lead the testing efforts related to the conformance of 3rd parties to internal interface specifications Creates and updates test strategies, test plans and supporting deliverables for the product interface specification conformance testing. Advises 3rd party vendors on changes required to the message format to integrate with our products / middleware. Collaborates with vendors and the Operations team to ensure that test	Post-secondary education in Computer Science, or Engineering.

Position and Organization	Location	Job Descriptions	Education Requirements
		environments are ready for execution. Validate 3rd party vendor compliance to the interface specification Coordinates testing and confirmation with 3rd party vendors upon successful test validation.	
Support Analyst Sick Kids Hospital	Toronto, ON	**Here's What You'll Get To Do** Providing application support to various clinical application initiatives. Responsible for a variety of application support activities including testing, configuration and liaising with staff to ensure the applications meet the business and clinical needs of SickKids. Execute a diverse range of tasks including auditing of log files, maintenance of accounts, setting up printing, configuration of functions, testing of changes and liaising with vendors. Create and maintain documentation for support staff to follow and document all standard processes relating to the applications. Work with vendors and other IS teams to resolve issues, and assist with any required application upgrades. Work with clinicians to define, test and implement application changes relating to SickKids practice changes.	Diploma in Computer Studies from a recognized college or equivalent computer experience. Minimum of 1 year experience in the health care field and understand its unique challenges, including the laws surrounding the privacy of information. Solid understanding of database structures is essential. Technical orientation with knowledge of health care interfaces (HL7) and medical imaging devices is a definite asset.

Position and Organization	Location	Job Descriptions	Education Requirements
Report Developer ConnexOntario	London, ON	ConnexOntario Health Information Services is a not-for-profit organization that works with various sectors of the Ontario health care system in the collection and provision of information and in the creation of innovative data solutions. We currently have a full-time position available for a Report Developer. Competitive salary and benefits offered. Reporting to the Director-Data, Product and Project Management, the successful applicant will be responsible for: -Maintaining accurate and up-to-date centralized databases of information; -Designing, programming and maintaining various standard and customized reports and products resulting from the extraction of data from the Oracle database.	University graduation with an honours degree or community college diploma in web technology, information technology, computer sciences and/or other disciplines directly related to the computer field, or comparable training
Senior Software Developer Merge Healthcare	Mississauga, ON	**Overview**: Merge Healthcare is growth oriented company on the cutting edge of an industry that affects everyone. As a company, we are uniquely positioned to make a difference in health care. We have demonstrated a commitment to innovation and need talented people like you to continue moving forward. Everyone's contribution makes a difference and a career with us can be very rewarding. **Essential Responsibilities:** Merge Healthcare is looking for a positive and energetic software developer to join our team of healthcare IT software professionals. As a Senior Software Developer, you will perform product development under minimal supervision and will develop specifications and designs to improve, enhance and resolve problems with those products and code and implement those designs. Provide technical liaison and consulting	Bachelor's degree in computer science, information systems or related field or equivalent work experience

Position and Organization	Location	Job Descriptions	Education Requirements
		services concerning departmental products to internal customers and other Merge Healthcare staff Provide input to into the design and development of software modules; system-level design and development Prepare updates to system specifications, designs, test descriptions, hazard analysis, validation test procedures, and related documentation supporting software development to known standards Participate in the review of product engineering artifacts (e.g., specifications, designs, test descriptions, implementations, tests, records, reports, etc.)	
Database Administrator Merge Healthcare	Mississauga, ON	**Overview:** This person will perform database development activities related to existing and new product development. The person will be directed by the team leader, architect, and/or manager and will liaison with customer technical staff and Merge Healthcare technical/clinical staff to perform the following high-level tasks: 1) Understand new requirements and existing design constraints within the product; and 2) Understand or troubleshoot existing problems within the product.. The person is expected to develop and document requirement specifications and designs for modules, code and implement those designs, and perform developer verification and validation of those implementations according to the Merge Healthcare Standard Operating Procedures. **Essential Responsibilities:** Database management including: schema design, performance tuning, query optimization, automation, High Availability, backup and recovery	An undergraduate degree or better in computer science or equivalent discipline or equivalent level of industry related experience; Experience in Healthcare Information Systems, Electronic Medical Records, Practice Management, HL7, 837/835 Experience with DICOM and HL7 is an asset

Position and Organization	Location	Job Descriptions	Education Requirements
		Detect, report, investigate, and fix product defects; Assist with escalated customer support investigations Participate in the review of product engineering artifacts (e.g., specifications, designs, test descriptions, implementations, tests, records, reports, etc); Prepare technical reports as required; Under minimal direction, prepare updates to system specifications, designs, test descriptions, hazard analysis, validation test procedures, and related documentation supporting software development to known standards; Mentor less senior team members and peer review product artifacts including requirement specifications, design specifications, code, etc.; Interface with customer and Merge Healthcare staff to gather product requirements, present technical aspects of the product, and understand problems with the product;	
Decision Support Analyst Sault Area Hospital	Sault St. Marie, ON	To provide consultative and analytical support through the provision of integrated statistical, and clinical information to support evidence-based decision making and the monitoring of performance. Required analyses may include trending, impact analysis, benchmarking, case costing and support for quality improvement initiatives. To assist in the development, execution and promotion of corporate benchmarking, data validation methodologies, decision support and continuous improvement **DUTIES:** • Plan, develop, design and implement reporting systems to support decision making needs throughout the	Bachelor's Degree in Business, Statistics, Health Informatics or Information Management.

Position and Organization	Location	Job Descriptions	Education Requirements
		organization. • Work collaboratively with end users developing customized data formats that provide information to address specific clinical, administrative and research questions. • Work collaboratively with internal support service departments to design, develop, implement, validate and maintain databases and performance reporting systems. • Work collaboratively with stakeholders and end users ensuring data and benchmarking information is accessible, accurate, reliable and relevant. • Support and follow all standards, policies and procedures set out by the organization. • Other duties as assigned.	
Data Analytics Architect Stericycle Communication Solutions, ULC	Etobicoke, ON	The Data Analytics Architect will be responsible for designing, implementing, and deploying high-performance applications at scale using Big Data technologies, as well they will champion efforts to improve business performance through enterprise information solutions and capabilities. This position will Architect and deliver a consolidated data warehouse and analytics environment including strategic and operational reporting and dashboards. The individual in this position will develop roadmaps and implementation strategy around data science initiatives including recommendation engines, predictive modeling, and machine learning **Key Responsibili9es/Accountabili9es:** Architect and deliver a consolidated data warehouse and analytics environment including strategic and operational reporting and dashboards. • Design, implement, and deploy high-performance applications at scale using Big Data technologies.	Bachelors Degree with a major in a relevant program of study or equivalent experience. Professional certifications are highly desirable. Experience in building systems to comply with HIPAA, Meaningful Use, SSAE 16 Type 1 and Type 2 and other health care regulations.

Position and Organization	Location	Job Descriptions	Education Requirements
		• Champion efforts to improve business performance through enterprise information solutions and capabilities. • Develop roadmaps and implementation strategy around data science initiatives including recommendation engines, predictive modeling, and machine learning. • Provide recommendations on industry standards and best practices. • Assist with scaling of Prompt operational systems. • Evaluation and recommendations on NoSQL technologies. • Review and audit of existing system architecture. • Perform profiling, troubleshooting of existing solutions; • Create technical documentation to support initiatives. • Mentor other team members regarding technology and best practices.	
Data Analyst Homewood Health	Guelph, ON	Homewood HealthTM is looking for a Data Analyst who will be responsible for the creation and support of reporting functions, using electronic tools to assist managers in their decision making. The successful candidate will also be responsible for training end users in the use of the reporting tools and collaborate with other team members to ensure management reporting needs are met. **Key responsibilities:** Work closely with end users to develop reports and analyses Create reports and perform analysis to provide answers for any questions that arise Assist end users in creating and running their own reports, analyse existing reports and assist in updating, correcting and validating	Bachelors or Diploma in Information Technology, Business Administration or a related discipline

Position and Organization	Location	Job Descriptions	Education Requirements
		reports Determine any changes that are required to the meet the users need and implement the process to extend the data warehouse Support the Helpdesk on any tickets that involve reporting tools Work with Homewood Health's various reporting tools (Excel, Showcase Query, Cognos, etc.)	
Consultant, Health Informatics - Community & Primary Care Fraser Health Authority	Surrey, BC	Build on your project planning and management skills while working with a dynamic consulting portfolio in a role where you can make a real difference! Responsibilities include: Working under the guidance of the Senior Consultant, Health Informatics for the Community and Primary Care areas of Fraser Health in providing consulting services in the area of health informatics for Community & Primary Care clinical support areas of Fraser Health. . Leading small to medium sized health informatics projects; providing leadership to team members and facilitating change management strategies as part of the project. . Working with numerous stakeholders and building strong linkages within the Fraser Health organization as you lead clinical information systems projects, define tasks, identify required resources and report on project status. Be part of a dynamic team in a complex, contemporary IT/IM environment and gain experience on enterprise-wide projects.	Bachelor's Degree in Health Information Management, Computer Science or a related field in healthcare and five years' experience as a Project Manager within a medium to large sized organization. Knowledge of health informatics, business processes, technologies, applications and specific experience with electronic health information systems, Meditech, PARIS and or Intrahealth Profile is preferred.

Position and Organization	Location	Job Descriptions	Education Requirements
Consultant, Health Informatics - Acute Care & Clinical Support. Fraser Health Authority	Surrey, BC	Build on your project planning and management skills while applying your superior technical and analytical skills in a role where you can make a real difference! As the **Consultant, Health Informatics - Acute Care & Clinical Support**, you may be responsible for: --providing consulting services in the area of health informatics for the acute care and clinical support areas of Fraser Health. --leading small to medium sized health informatics projects; providing leadership to team members and facilitating change management strategies as part of the project. --Working with numerous stakeholders and building strong linkages within the Fraser Health organization as you lead clinical information systems projects, define tasks, identify needed resources and report on project status. Be part of a dynamic team in a complex, contemporary IMIT environment and gain experience on enterprise-wide projects.	Bachelor's Degree in Computer Science, Health Information Management, or a related field in healthcare and five years of recent experience as a Project Manager. Knowledge of health informatics, business processes, technologies and applications and specific experience with electronic health information systems, such as the Meditech system, is preferred.
Clinical Informatics Specialist Grand River Hospital	Kitchener, ON	The Clinical Informatics Specialist promotes the understanding, integration and application of information technology in a healthcare setting and uses expertise in nursing and clinical computer applications to provide leadership and support in the field of clinical informatics. The Informatics Specialist will collaborate with hospital staff including physicians, nursing and allied health at a programmatic and individual level to ensure the achievement of strategic goals as they relate to decision-making, education, implementation, ongoing evaluation, documentation, maintenance and upgrading of technologies and clinical information systems used throughout the hospital. The Informatics Specialist integrates research into practice and uses critical thinking and	Diploma/Degree in Business, Computer Sciences or Health Informatics/Health Care discipline

Position and Organization	Location	Job Descriptions	Education Requirements
		problem-solving skills to guide evidence-based decisions in advocating for positive patient outcomes.	
Business Analyst, Provincial Projects University Health Network	Toronto, ON	Critical Care Services Ontario's (CCSO) mission is to identify critical care system needs and collaborate with healthcare partners to improve access, quality and integration for patients. CCSO collaborates with clinicians, hospital administrators, Local Health Integration Networks (LHINs), the Ministry of Health and Long-Term Care (MOHLTC) and other health sector partners in strategic planning and priority setting, monitoring performance management and system accountability, developing policy, programs, and evaluation, and integrating best practices. As an integral member of the CCSO team, the BUSINESS ANALYST'S primary responsibilities are to work with Senior Business Analysts, Project Managers and Directors to support the provincial implementation of the Ontario's Critical Care Plan and related projects and to support stakeholder groups through research, analysis, and project coordination. In addition, the Business Analyst contributes to project planning and evaluation, business case development, and operational logistics. The Business Analyst will also perform administrative and cross-functional duties consistent with the job classification, as assigned or requested. This is a multi-faceted position requiring research, writing, analysis, stakeholder consultation and strong project management skills. Project Manager supervises the Business Analyst on a day-to-day basis; however, the Business Analyst formally reports to the Director of the CCSO.	Undergraduate Degree in Business Administration, Health Sciences, Health Informatics or related field or recognized equivalent required. Training/education in health informatics is an asset Training and ability to implement LEAN/SIX Sigma and other process improvement techniques (e.g. value stream mapping) is an asset.

Position and Organization	Location	Job Descriptions	Education Requirements
Data Analytics Lead CGI	Toronto, ON	The Data Analytics lead will be responsible for the design and delivery of analytics solutions to our clients in the healthcare industry. Key Responsibilities Develop market strategy for health analytics and business intelligence in the Canadian Health sector Identify and develop new opportunities to grow funnel and analytics team within the health sector while developing "trusted partner" relationships with key clients Build strategic relationships with vendor partners providing solutions in the health analytics space Participate in user groups/committees (clinical, government) to understand health analytics landscape in order to guide health analytics market strategy Lead sessions to identify business value of big data solutions to clients Investigate new clinical data sources to support comprehensive health analytics strategy (Public Health/Government, Research, etc.) Provide health analytics domain subject matter expertise to support various CGI delivery and operations teams Develop predictive analytics data models to support specific client business requirements and use cases Manage and lead project teams across multiple engagements to ensure delivery excellence Winning and successfully delivering Business Intelligence and Big Data health analytics solutions for clients Technical Skills: Working experience/familiarity with Big Data analytics solutions (Hadoop, MapReduce, HBase) Strong proficiency with various predictive data modelling and statistical techniques Development experience (Java, C++) Scripting experience (Python,	B.Sc. (M.Sc. or Ph.D preferred) degree in Mathematics(statistics), Physics, Computer Science or related field Degree/certification in Project Management an asset Excellent understanding of data profiles associated with various medical ontologies and health enterprise data management components Knowledge of privacy and security legislation (e.g. PHIPA) principles related to health analytics 5-10 years of experience working in a clinical data analyst/architect capacity

Position and Organization	Location	Job Descriptions	Education Requirements
		SQL) Database experience (Oracle, MS SQL, NoSQL) Experience with integrating health standards (HL7, DICOM, IHE, ebXML) Expertise in creating and deploying analytics best practices and methodologies Proficiency with MS Office suite (Project, Powerpoint, Access, etc.)	
Senior Consultant, Informatics and Business Intelligence ISG Search	Toronto, ON	Leads the development of a structured business intelligence centre of excellence to provide organization-wide access to customer insights and feedback and help support decision-making including: • Leads discussions with key stakeholders in the organization to identify their information needs. • Provides analytical support to the organization on key data captured and develops management and operational value based reports for decision making. • Proactively demonstrates the value of Practice Insights by generating insightful analytical dashboards, reports and presents trending information associated with program targets for both internal and external stakeholders. • Promotes and educates business users on self-service reporting techniques and tools. • Maintains library of business data (metadata), model documents, templates, operational processes, or other reusable knowledge assets. • Participates in the development of the data governance strategies and approaches. Improves and streamlines processes regarding data flow and data. • Implements strategic goals in alignment with the organization's mandate particularly with respect to EMR Benefits Realization Projects and Internal and External Reporting Requirements. • Supports EMR Practice Enhancement Program (EPEP) with oversight and provides benchmarking to demonstrate the effectiveness and value of the EMR. • Designs assessment methodologies	A bachelor's degree and approximately 5 years of related work experience; or preferable a master's degree and approximately 3 years of related work experience (in Informatics – preferably Health Sciences – or equivalent experience.)

Position and Organization	Location	Job Descriptions	Education Requirements
		through research and analysis to measure EMR adoption progress. Develops, maintains and enhances data collection tools that gather qualitative and quantitative data. Connects M+E activities across the organization to maximize the integration and value of data gathered.	
Healthcare Data Analyst Essence Healthcare	Maryland Heights, MO, USA	This role reports into the Senior Director Corporate Analytics within Essence Healthcare. The Healthcare Data Analyst will be responsible for conducting analyses that will be used to provide actionable information to a variety of constituencies within the healthcare space, including medical directors, clinicians, and financial officers. Our team has access to an extraordinary range of healthcare data including medical and pharmacy claims, enrollment, EMR, referral, laboratory results, HRA/ biometric and clinical outreach results. **Role and Responsibilities:** • Conducting medical cost and revenue analyses using claims and other data sources. • Use data analysis skills to query data warehouse to design new reporting and analytic tools to identify opportunities. • Create presentations that will be used by the Medical Management Department, Medical Directors, clients and CFO. • Skilled in compiling large amounts of data into innovative presentations of information. • Ensure the quality of deliverables in terms of the technical design, implementation, testing and adherence to technical compliance standards • Create and Execute SSRS reports and tools capabilities • Design, Develop, Test and Deployment Preparation for SSRS reports and related artifacts	B.S. Degree in Healthcare, Mathematics, Computer Science, related field, or relevant experience. Experience working with large transactional databases and data warehouses. Experience in SQL Server Reporting Services (SSRS) 2 years of experience with medical claims data.

Section 14: Duplication

The material presented in this section addresses the Board's standards and benchmarks for Duplication. The proposed Bachelor of Technology (Digital Health) (Honours) program, with its focus on applied knowledge, has been developed as a parallel educational path to programs offered at Ontario Universities, not as a duplication of existing educational opportunities.

This proposed Bachelor of Technology (Digital Health) (Honours) program:

1. surpasses the standards of related diploma programs,
2. is related to, but sufficiently different from, existing degree programs offered at Ontario universities, and
3. meets a need, by virtue of the preceding two facts, that is not adequately addressed by other postsecondary programs in Ontario.

Section 14.1: Analysis of Similar College Programs

Based on research conducted during the initial stages of program development, four different programs offered at Ontario colleges share some components of this proposed Bachelor of Technology (Digital Health) (Honours) program. The analysis in the table below looks at those related programs that are unique to specific colleges.

TABLE 14.1: Comparison of Bachelor of Technology (Digital Health) (Honours) to Similar College Programs

College Program (Credential)	Similarities	Differences	Analysis
Bachelor of Applied Health Information Science **Conestoga College** (Bachelor's Degree)	• Provides students with an overview of the Canadian healthcare system, its regulatory structure, function and associated "language" • Some focus on systems design • Provides a solid understanding of the kinds of technologies common in today's digital health ecosystem, and the role those technologies play within it	• Focuses on programming ***concepts*** rather than software development ***skills*** • Focuses heavily on Health Information Management in order to meet the requirements of the Canadian Health Information Management Association (CHIMA) accreditation standards. • Does not provide students with a focus on data analytics or strategic business analysis • Two (2) Co-op terms (our program has one)	Conestoga's program is focused primarily on health information management, which is not meant to develop software development skills or advanced data analytics sills or strategic business thinking. Our proposed program aims to develop skilled software developers who have the knowledge required to design, analyze and develop the digital solutions necessary to drive the strategic business needs of healthcare organizations. Though there is some overlap between the two programs they are quite different in their goals.

TABLE 14.1: Comparison of Bachelor of Technology (Digital Health) (Honours) to Similar College Programs

College Program (Credential)	Similarities	Differences	Analysis
Health Informatics Technology **Centennial College** (Advanced Diploma)	• Strong focus on software development (programming) skills • Good focus on healthcare specific: workflows, regulatory structures, and data concerns	• 3-year Advanced Diploma program • Focuses primarily on software development (programming) skills with little-to-no strategic business or data analytics focus • No research focus • Three (3) co-op work terms	Centennial's program provides students a solid background in software development and healthcare studies. However, because it is only a three-year program, it cannot offer the business focus that our proposed program is designed to deliver. Therefore, our program will add a focus on strategic business thinking and leadership, business analytics, business intelligence and entrepreneurship, over and above the knowledge and skills offered at Centennial. Our program will therefore offer career advancement opportunities that Centennial's program simply cannot provide.
Health Information Management **Flemming College** (2-year Diploma)	• Offers students a solid focus on health information management knowledge and skills, such as data quality concepts, data collections and storage, etc. • Solid focus on healthcare terminology and practices	• 2-year Diploma program • No software development or strategic business thinking focus • Little to no focus on leadership skills • No data analytics focus • No systems design focus • No research focus	Flemming's program is meant to prepare students for a career in health information management, and therefore does not provide students with the advanced business, software development, or leadership skills expected of a bachelor's degree graduate.

TABLE 14.1: Comparison of Bachelor of Technology (Digital Health) (Honours) to Similar College Programs

College Program (Credential)	Similarities	Differences	Analysis
Health Informatics **George Brown College** (Ontario College Graduate Certificate)	• Focus on research methods • Some focus on health technologies, including the role that technologies play in the Canadian Healthcare System • Project Management and strategic planning courses	• 1-year (three semester) Graduate Certificate program • Minimal overall focus on knowledge and skills owing to the length of the program. • Little to no business focus • Little to no healthcare studies focus • No software development focus	Although there is some overlap between the two programs, the overall difference in length between the two programs is significant. The two programs are difficult to compare as a result. Our proposed program offers significantly more focus in all knowledge domains: business, software development and healthcare studies.

Section 14.2: Analysis of Similar Ontario University Programs

Based on a review of the Ontario Universities' Application Center program listing for secondary school students and other undergraduate applicants, the five most similar or related programs to the proposed Bachelor of Technology (Digital Health) (Honours) offered by universities have been identified. The following table (see TABLE 14.2) provides an analysis of the similarities and differences that exist between the proposed program and the identified related programs. We have concluded that the proposed program offers an education opportunity that is entirely unique, in that other university programs do not offer the same blend of knowledge and skills.

TABLE 14.2: Comparison of Bachelor of Technology (Digital Health) (Honours) to Similar University Programs

University Program	Similarities	Differences	Analysis
Bachelor of Medical Science (Honors Specialization in Medical Health Informatics) **University of Western Ontario**	• Focus on research in healthcare • Strong focus on data analytics	• Very focused on health sciences (e.g. biochemistry, biology, pathology) • No focus on business or leadership • No focus on software development • No clinical focus • Little to no focus on regulatory structure of healthcare • No co-op • No large team-based projects	This program prepares students in the hard sciences, with an option to focus on data analytics. Though the program does provide a solid foundation in practical analytics knowledge/skills, it does not provide students with a focus on the bigger picture of where those skills fit into the healthcare system. Therefore, this program is narrowly focused on health informatics as a data analytics function. It also does not provide students the opportunity to work on large projects or gain practical co-op experience. Our proposed program adds strategic business and leadership skills, as well as clinical integration and business software systems development components to round out the digital health professional.

TABLE 14.2: Comparison of Bachelor of Technology (Digital Health) (Honours) to Similar University Programs

University Program	Similarities	Differences	Analysis
Bachelor of Health Studies **York University**	• Good focus on healthcare studies and clinical integration of digital health solutions • Good focus on regulatory and policy issues in the Canadian Healthcare System • Some focus on health data analysis • Focus on health research	• Very little focus on software development • Minor focus on strategic business thinking/intelligence and leadership • No co-op • No large team-based projects	This program balances health studies with a solid focus on integrating digital health systems into a clinical environment. However, it does not focus on software development or strategic business intelligence. Though this program overlaps with our proposed program, the two are still quite unique from one another. It also does not provide students the opportunity to work on large projects or gain practical co-op experience.
Bachelor of Science Honours Health Studies (Health Informatics Option) **University of Waterloo**	• Focus on research methods in healthcare, and the structural and regulatory aspects of healthcare • Some focus on business • Some focus on regulatory aspects of healthcare • Some focus on software systems design • Some focus on health data analytics	• Strong focus on health studies (e.g. the concept of health, aging and health, psychosocial aspects of health, social determinants of health, public health, etc.) • Focus on health sciences (e.g. chemistry, biology) • Little to no focus on software systems development (e.g. programming, design or analysis) • Optional co-op	This program dedicates a lot of time to focusing on the psychosocial aspects of health. It provides a nice complement of course to introduce students to the language of digital health without providing the hard knowledge and skills required to develop healthcare software systems from the ground up. There is little to no focus on business, strategic thinking or leadership. Though this program does offer a co-op it is optional, and the program also does not offer large project based courses as culminating experiences.

TABLE 14.2: Comparison of Bachelor of Technology (Digital Health) (Honours) to Similar University Programs

University Program	Similarities	Differences	Analysis
Diploma in Health Informatics **McMaster University**	• Some focus on regulatory aspects of healthcare • Project management course • Some systems design focus	• Part-time, online, only 8 courses. • Little to no focus on business, software development, clinical analysis/integration, strategic thinking, data analytics, business intelligence, and leadership. • No co-op • No large team-based projects	As an 8-course Diploma program, this program does not provide the depth and breadth of a Bachelor's degree program. It touches on various similar topics, but is focused on adding to the knowledge and skills of practicing healthcare professionals.
Certificate in Health Informatics **Ryerson University**	• Some focus on human factors in human computer interface • Some focus on healthcare information systems • Students can select electives in: o Information Technology Management o Regulatory aspects of healthcare o Health Services Management o Health Information Management	• This is a short, 8-course Certificate. • No integrated focus on business, software development, clinical analysis/integration, strategic thinking, data analytics, business intelligence, and leadership. • No co-op • No large team-based projects	As a 8-course Certificate program, this program does not provide the depth and breadth of a Bachelor's degree program. It touches on various similar topics, but is focused on adding to the knowledge and skills of practicing healthcare professionals.

Section 14.3: Conclusion

The proposed Bachelor of Technology (Digital Health) (Honours) degree program presents a unique offering in the landscape of digital health education. There are no comparable programs offered by either colleges or universities that we are aware of. While somewhat related to Programming health informatics and health information management that is offered by other colleges and universities, this proposed degree is unique in that it provides a strong focus on software systems development, healthcare studies with clinical integration, and strategic business thinking including business analytics. This program will benefit students who are interested in developing next-generation digital health solutions, and employers who need graduates that understand the unique needs of healthcare organizations.

Digital Health is a rapidly emerging field that requires a unique blend of knowledge and skills for success. The proposed Bachelor of Technology (Digital Health) (Honours) program will prepare graduates to meet this increased need through existing and expanding opportunities in a thriving industry.

Algonquin College is ideally positioned to deliver the proposed Bachelor of Technology (Digital Health) (Honours) degree program. The labour market and applicant demand analyses, as well as the letters of support conveyed within this Application for Ministerial Consent, indicate that the regional market for this degree is substantive. Furthermore, it is anticipated that the program will have a broader provincial, and potentially a national appeal.