**INFORMATION AND COMMUNICATIONS TECHNOLOGIES
IN THE
CANADIAN HEALTH SYSTEM:**

An Analysis of Federally-Funded ICT-Related Projects

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ABSTRACT

Since 1997 the federal government of Canada has invested almost $1.5 billion to foster the use of information and communications technologies (ICTs) in the provision of health information, services and expertise across the country. Because these projects have been funded through different departments and organizations, there is no central depository for tracking the status and achievements of these projects. The following study is an attempt to collect some basic information, as well as conduct a preliminary pattern recognition analysis of some of the major federally-funded projects. By undertaking this study and other complementary studies that will follow, it is hoped to provide a pan-Canadian picture of the use of ICTs in the health sector and to gain a better sense of the federal government's investment in this area.

This study reaffirms that a lot of ehealth activities are taking place across Canada. It points to the existence of a somewhat linear movement from theoretical and proof-of-concept research to more applied research and longer-term projects. The study also highlights the important role that the federal government is playing in the advancement and utilization of ICTs in the health sector (in providing both funding and leadership).

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1. Background and Objective

Over the past five years, the federal government has invested almost 1.5 billion dollars in a wide variety of health-related projects involving information and communications technologies (ICTs). Despite this large investment, and because these projects have been funded through different federal organizations and entities (i.e, Health Canada, Human Resource Development Canada, Industry Canada, National Defence, Veterans Affairs, Canada Health Infoway Inc., CANARIE Inc.), there is no central depository to track the status and/or the degree of these projects' success.

The importance of ICTs in reforming the Canadian health system has been a recurrent theme in recent health-related reports, including those of Romanow and Kirby. As was expected, in its 2003 budget, the federal government allocated millions of new dollars to ICT-related initiatives. It is widely anticipated that investment in this area will likely continue in the coming years as ehealth[1] generates more interest.

The following is the first phase of a multi-phased attempt to provide a pan-Canadian picture of the use of ICTs in the health sector. This study compiles some basic information and conducts a preliminary analysis of some of the major federally-funded ICT-related projects in the health sector. The main objectives of this study are to find out how much information about these projects is widely available and to conduct a pattern recognition analysis (to identify some of the common patterns).

In the next phase, some of the issues and ehealth categories highlighted in this report will be examined more closely. This is believed to be a necessary step in gaining a better understanding of the impact of federal government's investments in this area.

2. Methodology

This study was meant to be exploratory in nature and its scope limited to only federally-funded projects. The study relies mostly on the information available on-line and on OHIH's eHealth Resource Centre Database.

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[1]eHealth is the application of ICTs across the whole range of functions which, one way or another, affect the health of citizens and patients.

There are a few factors that might affect the overall findings of this study. First, only limited follow-up attempts were made to verify the validity of some of the information collected. Second, as some of the projects have been funded by more than one federal agency and under different names, there is a slight possibility of duplication. Third, there was no financial information available on-line for several initiatives/projects/programs. Our attempts to obtain this information from the appropriate bodies were not always successful. Finally, as there is no universally accepted criteria for categorizing ehealth initiatives/projects/programs, our categorization of these initiatives is, to some extent, arbitrary.

As some of the initiatives/projects/programs were found to fit into more than one category, the overall number of the initiatives may not correspond to the total number of projects reported under these categories.

3. Findings

3.1 Number of Projects

More than 15 federal funding initiatives/programs have been identified. These initiatives/programs in total have funded more than 153 ICT-related projects. The Health Infostructure Support Program (HISP), by sponsoring more than 35 projects, is the largest funding program in terms of the number of projects sponsored, and the Canadian Health Infostructure Initiative (CHI)[2], which received more than $112,500,000 (between 1999 to 2002), is the largest in terms of the amount of money spent.

The largest federal government investment to date, i.e. $1.1 billion, was made in Canada Health Infoway Inc. (*Infoway*). Established in 2000 as an independent, not-for-profit corporation, *Infoway* is mandated to accelerate the development and adoption of modern systems of health information and communications technologies and define and promote standards governing the health infostructure to ensure interoperability across Canada. Up to date, *Infoway* has committed to invest $156 million in 17 ehealth projects, all related to the implementation of the electronic health record (EHR).

The following table demonstrates the breakdown of projects supported through federally-funded programs, initiatives and organizations.

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[2]Health Canada's contribution to the development of a pan-Canadian health infostructure in areas of direct importance to its own mandate is through three core projects: The Canadian Health Network (CHN), the Centre for Surveillance Coordination (CSC) and the First Nations and Inuit Health Information System (FNIHIS).

Table 1
Funding Programs

Funding Program and/or Organization	Number of Projects Funded
Health Infostructure Support Program (HISP), Health Canada	35
Canadian Health Infostructure Partnership Program (CHIPP), Health Canada	29
Office of Learning Technologies (OLT)*, Human Resources Development Canada	25
Canada Health Infoway Inc. (*Infoway*)	17
Knowledge Development and Exchange (KDE), Health Canada	14
Health Transition Fund (HTF), Health Canada	12
E-Health Program, Canadian Network for the Advancement of Research Industry and Education (CANARIE Inc.)	8
Canadian Rural Partnership Pilot Projects, Rural Secretariat, Agriculture and Agri-Food Canada	3
Canadian Health Infostructure Initiative (CHI)** , Health Canada	3
Canada Foundation for Innovation	2
National Rural Health Initiative, Health Canada	1
National Strategy for the integration of People with Disability, Human Resources Development Canada	1
Canada Prenatal Nutrition Program (CPNP), Health Canada	1
National Defence	1
Veterans Affairs	1
Total	**153**

*Note that Only OLT's 1999 to 2003 projects are reflected here.

**This indicates only the number of major components within the CHI Initiative. One should note that the Centre For Surveillance Coordination, one of the CHI Initiative's main components, consists of at least nine proof-of-concept projects, some of which have become or are in the process of becoming programs.

3.2 Categories

As the following table exhibits, the projects are divided into seven categories. As some of the projects fit into more than one category, they are recorded accordingly. Telehealth/Telemedicine is the broadest category, and as such, covers a wide range of services. This includes services such as tele-consultations, tele-psychiatry, transmission of X-ray images, telehome care and monitoring, etc. The majority of these telehealth projects are directed at people residing in remote and rural areas, as well as Aboriginal people.

Electronic Health Records (EHR) with 36 projects is the second largest category. The majority of the EHR projects seems to be experimental in nature and limited in scope. Several of these projects are designed to allow two or a small group of hospitals or other health care service providers to exchange or have electronic access to patient medical records.

Health Information and E-learning are the third categories with the highest number of projects (34 projects each). Although some of the projects under the health information category are designed to appeal to the population as a whole (or a wide audience), the target audience for a great number of these projects is a specific population group (e.g., children, youth), health care service providers (e.g., physicians, nurses in rural areas) or patients (e.g., diabetics).

Several of these health information projects are primarily the official web sites of particular associations of health care professionals or health advocacy groups (e.g., the Canadian Deaf/Blind Association, the Canadian Cardiovascular Society). Although attempts have been made to make these sites relevant to a wider audience by providing some general health promotion and health protection information in their specialty fields, it is obvious that these initiatives' main target audiences are their own members.

Table 2
Project Classification

Total Number of Projects	Category*						
	Telehealth	EHR	Health Informatics	E-Learning	Health Information	Privacy	Other
153	51	36	1	34	34	4	12

*Note that definitions of these categories are provided in appendix B.

HRDC's Office of Learning Technologies (OLT) has funded the majority of the E-Learning projects (more than 25 since 1999). Some of the OLT-funded e-learning projects can be categorized as Health Informatics.[3] An example of this is a project undertaken by the universities of Victoria, British Columbia, Regina and Alberta entitled: *Building Capacity in Health Informatics for Professionals in Health Settings*. Although this is meant to be a graduate program directed at various health professional groups such as physicians, nurses, lab technicians, pharmacists, administrators and information technology staff, it is still referred to as an "e-learning program."

The majority of OLT's e-learning projects are web-based courses aimed at providing those health care professionals who cannot attend traditional educational institutions/venues/settings, especially those residing and working in rural, remote and aboriginal communities, with the opportunity to continue their education and upgrade their skills. There are also a number of applied and other research projects that have been developed to test, assess and evaluate the use and effectiveness of CD-ROM, Internet and other related technologies for the delivery of courses and other training in various health fields to health professionals, students and care givers.

3.3 Scope

In terms of geographical coverage, the projects are divided into four categories: National, Regional/Local, Provincial/Territorial and Inter-Provincial/Territorial. As indicated in the table below, the ehealth projects are spread relatively evenly around the country. There are at least 47 national projects (initiative of a pan-Canadian nature or scope). The number of inter-provincial/ territorial projects (projects that involve two or more provinces or territories) reflect the level of cooperation between different levels of governments. The creation of an organization known as Health Infostructure Atlantic (HIA) has fostered a high level of cooperation among the Atlantic provinces. The same is the case with the western provinces where the Western Health Information Collaborative (WHIC) promotes closer collaboration among its members. The level of cooperation between some of the provinces and the three territories is relatively high as well.

Table 3
Geographical Scope

Scope			
National	**Regional/Local**	**Provincial/Territorial**	**Inter-Provincial/Territorial**
47	36	43	2

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[3]Note that health informatics is distinguished from e-learning by the fact that it is provided within a university or any other post secondary institutions. See Annex B for definitions of these two terms.

3.4 Status

A preliminary search was done to determine the current status (as of May 2003) of the identified projects. The objective was to find out how many out of these 153 projects are still ongoing and how many were one time studies or pilot projects that for whatever reason have ceased to operate. We were able to determine the status of at least 145 projects. The result indicates that, up to May 2003, at least 109 projects are still ongoing. This means that either the funding period for these projects is not over yet, or that these projects have been able to find other funding sources after the original funding finished.

Our research also indicates that 36 projects are finished. This would probably mean that these projects were one time studies/pilot projects that fulfilled their mandates. However, it could also mean that we have not been able to trace them on the Internet. An accurate determination of the current and final status of these and other projects reviewed in the course of this study and the legacies they leave after the original funding programs sunset would require a thorough follow-up examination, which was not part of the mandate of this study.

3.5 Funding Sources

In this study, two funding sources were identified: federal and others. The other funding source could be either other levels of governments (aside from federal government), public institutions or private sector. Accordingly, 15 federal funding programs have been identified, which collectively have funded more than 153 projects. The funds allocated to at least 143 projects have been traced. These 143 projects have, in total, received more than $500 million from the federal government. At least 6 out of the 15 funding programs have had some kind of cost sharing arrangements with provinces and territories or have received monetary and other (e.g., in kind) contributions from other sources (as far as we were able to determine, the total amount of other monetary contribution is around $35 million).

3.6 Reports

In this section, attempts were made to find out how many of these projects have produced some kind of final or evaluation reports. The objective at this time was not to examine these reports, but to determine their accessibility, in the event that more in-depth studies on the lessons learned and other aspects of implementing these projects are conducted in the future.

A great number of completed projects have produced final reports. Most of these reports are available on-line. In a few cases, we had to contact the funding programs to access their reports.

We have not been able to get hold of that many evaluation reports. However, we have some indication that several evaluation reports have been produced. It may also be that final reports include an evaluation section, but the scope of the current study did not allow us to confirm this possibility.

4. Concluding Remarks

It is estimated that since 1997 the federal government has invested over 1.5 billion dollars in a wide variety of health care projects involving ICTs. This study has examined only 500 million dollars of that federal contribution.

As mentioned elsewhere in this report, the largest federal government investment in the area of information and communications technologies and health has been the 1.1 billion dollars allocated to *Infoway* ($500 million in the 2000 budget and $600 million in the 2003 budget). *Infoway* has only recently started actively funding ehealth projects. As this process accelerates and gains momentum, so should the development and implementation of the electronic health information systems in Canada.

Aside from this, there are a few other issues that are worth noting. For example, it is noted that remote and rural areas as well as aboriginal communities are by far the most targeted areas. Apparently, Internet-based technologies are the most dominant technologies used. In most cases, the projects have more than one function (e.g., health promotion and E-learning), and the technologies used can be easily adapted to respond to other health needs or to provide services in other specialized areas (e.g., from diabetic care to cardiovascular).

Finally, this study has reaffirmed the notion that a lot of ehealth activities have been taking place across the country over the past several years. A chronological review of these activities clearly points to the existence of a somewhat linear movement from theoretical and proof-of-concept research to more applied research and longer-term projects. Although it seems slow and, at times, fragmented, the fact is that efforts are being made to take these projects beyond piloting and to integrate them into mainstream practices.

This study also highlights the indispensable role that the federal government has played in the advancement and utilization of ICTs in the health sector. Not only has the federal government provided a substantial amount of funding, it has also provided leadership and fostered an environment for collaboration without which it would not have been possible to achieve what has been achieved in this area.

Appendix A: Overall Analytical Table

Initiative	# 0f projects	Category							Scope				Status		Funding*		Reports	
		Tele-Health	EHR	Health Informatics	E- Learning	Health Information	Privacy	Other	N	R/L	P/T	Intpro	Fin	Ongoing	Source	Amount ($)	Final/Eval	
CHIPP	29	21	12	--	--	--	--	--	---	11	9	9	--	29	CHIPP	70,788,262	In progress	In progress
															Other	30,090,327		
CHI	3**	--	--	--	--	2	--	2	3	--	--	--	--	3	CHI	112,500,000	√	Not found
															Other	---		
HISP	35	10	2	--	2	21	--	1	14	10	10	1	7	28	HISP	9,563,722	√	√
															Other	1,069,656		
HTF	12	10	1	--	2	1	--	4	--	7	2	3	13	--	HTF	34,861,362	√	√
															Other	--		
KDE	14	3	2	1	1	3	3	3	8	--	2	3	--	14	KDE	1,135,256	In progress	Not found
															Other	--		
CPNP	1	--	--	--	1	--	--	--	1	--	--	--	--	1	CPNP/HRDC	250,000	√	Not found
															Other	--		
National Rural Health Initiative	1	--	--	--	1	1	--	--	1	--	--	--	--	1	HC	322,000	√	Not found
															Other	1,300,000		

Initiative	# 0f projects	Category							Scope				Status		Funding*		Reports	
		Tele-Health	EHR	Health Informatics	E- Learning	Health Information	Privacy	Other	N	R/L	P/T	Intpro	Fin	Ongoing	Source	Amount ($)	Final/Eval	
National Strategy for the Integration of People with Disability	1	1	--	--	1	--	--	--	--	1	--	--	--	1	HRDC Other	92,200 4,000	√	Not found
Canadian Foundation for Innovation	2	1	2	--	--	--	--	--	1	1	--	--	1	1	Canadian Foundation for Innovation Fund Other	2,440,270 2,440,270	Not found	Not found
Canadian Rural Partnership Pilot Projects	3	1	--	--	--	2	--	2	--	--	3	--	1	2	Canadian Rural Partnership Pilot Projects Other	132,708 65,000	Not found	Not found
CANARIE Inc.	8	4	1	--	1	2	--	2	3	2	1	2				Not Available Not Available	Not found	Not found
Office of Learning Technologies (HRDC)***	25	--	--	--	25	--	--	--	6	--	13	6	14	11	OLT/HRDC --	2,690,104 --	√	Not found
National Defence	1	--	--	--	--	1	--	--	1	--	--	--		1	DND/TB --	115,000,000 --	In progress	Not found
Veterans Affairs	1	–	--	--	--	1	--	--	1	--	--	--				Not Available Not Available	Not found	Not found

Initiative	# Of projects	Category							Scope				Status		Funding*		Reports	
		Tele-Health	EHR	Health Informatics	E- Learning	Health Information	Privacy	Other	N	R/L	P/T	Intpro	Fin	Ongoing	Source	Amount ($)	Final/Eval	
Infoway	17	--	16	--	--	--	1	--	8	4	2	3	--	17	*Infoway* Other	156,000,000 Not Available	In Progress	Not found
Total	153	51	36	1	34	34	4	12	47	36	43	27	36	109		505,775,884 34,969,253		

*This only includes monetary contribution. In-kind and other contributions are not included in this.

**This indicates only the number of major components within the CHI Initiative. One should note that the Centre For Surveillance Coordination, one of the CHI Initiative's main components, consists of at least nine proof-of-concept projects, some of which have become or are in the process of becoming programs.

***Only OLT initiatives from 1999 to 2003 are reflected here.

Annex B: Glossary of Categories

EHR - An Electronic Health Record is a longitudinal collection of personal health information of a single individual, entered or accepted by health care providers, and stored electronically. The record may be made available at any time to providers, who have been authorized by the individual, as a tool in the provision of health care services. The individual has access to the record and can request changes to its content. The transmission and storage of the record is under strict security (Source: *Tactical plan for a pan-Canadian health infostructure,* Health Canada).

E-Learning - E-Learning is a component of distance education that employs a form of technology (e.g., Internet or other information a communications technologies) to enhance learning experiences (Source: *E-learning and Distance Education Practices, November 24, 2002,* University of Victoria School of Health Information Science). In this study, e-learning projects refers to the use of the Internet and/or other ICTs to provide health care professionals and health care service providers with the opportunity to continue their education and to upgrade their skills.

Health Informatics - Health Informatics is the combination of computer science, information science, and the health sciences (medicine) designed to assist in the management and processing of data to support the delivery of health care (Source: University of Victoria School of Health Information Science Web site). It is provided through a university or other post secondary institutional institution, and may involve e-learning practices.

Health Information - Refers to those projects that are utilizing ICTs to provide the public or health service providers with the access to trusted information to enable them to care for themselves where appropriate.

Privacy - Privacy is defined as the right of individuals to control or influence what information related to them (in this case, health information) may be collected and stored and by whom and to whom that information may be disclosed. In this study, the Privacy category includes those projects that are trying to develop policies, procedures and systems to protect any unauthorised disclosure and misuse of health information.

Telehealth - Telehealth is defined as the use of information and communication technologies(ICTs) to deliver health services, expertise and information over distance (Source: OHIH Web site). Telehealth projects covered in this study provide a wide variety of services, including tele-consultations, tele-psychiatry, tele-radiology and transmission of X-ray images, telehome care and monitoring, wound care, etc.

Other - This includes all those projects that did not fit under any of the above categories.