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CANARIE

CANARIE e-Health Program

Final Report for

National Telehealth Outcome Indicators Project (NTOIP)

1.0 Description of Project

Project Objectives:
The objective of this study was to identify and define nationally accepted sets of outcome indicators that can be universally accepted and used by the broader telehealth community.

Project Description:
The project used a structured and systematic process, elements of which have been proven in other settings, through which to achieve success and national agreement on suitable outcome indicators for evaluation of telehealth applications. Primarily, this project addressed the need for standardized and consistently used telehealth terminology in relation to outcome indicators.

Three primary models were adapted for the NTOIP project: (a) the Institute of Medicine (IOM) Model was adapted for the four main NTOIP Themes of Quality, Access, Acceptability and Cost; (b) the CASPE framework was adopted to fully describe each of the Candidate Outcome Indicators; and (c) the model developed by the National Committee on Clinical Laboratory Standards (NCCLS) was adapted for the consensus building process.

Two primary research questions were addressed in this project: (a) Which specific outcome indicators are most suitable for evaluation of telehealth applications, and (b) How must identified outcome indicators be described to provide unequivocal definition, acceptance, and adoption by the broader telehealth community?

Development Work Undertaken:
As a result of the NTOIP project, three areas of development work were formulated: (a) the development and execution of a web based consensus process; (b) creation of 34 Telehealth Outcome Indicators and (c) identification of a core set of indicators to be adopted by the broader Telehealth community.

Innovative Aspects of the Project:
Within the Canadian telehealth environment, the project was entirely innovative. At its inception, no formal, structured process had been undertaken to synthesise information on outcome indicators, to examine which outcome indicators are appropriate for evaluation of telehealth activities, or to rigorously define any such indicators. Even the approach was innovative, with a nation-wide, iterative consensus process being integral to the project's design. NTOIP has introduced a simple yet effective open consensus building process that can be used by others to ensure national agreement on telehealth and other e-Health issues.

2.0 Project Results

Overview of Project Work and Results:

Rationale:
A variety of outcome measures for evaluation of telehealth have been documented in the literature. But prior to NTOIP there was no regional, provincial, or national agreement on which quantitative or qualitative measures (i.e. outcome indicators) were appropriate and of most value when evaluating telehealth applications. Worse still, there was no accepted definition for any of those measures that had

been used. As a result, tremendous uncertainty existed as to the general applicability of evaluation data, and direct comparison of one evaluation with another was potentially futile or even misleading.

To address these issues, the project 'A Canadian Consensus Approach to Identification and Definition of Outcome Indicators for Evaluation of Telehealth' was conceived. The project, abbreviated to NTOIP (National Telehealth Outcome Indicator Project), began in January 2002 and was completed in June 2004. NTOIP began the process of filling this identified need, and undertook the process of standardization around identification, definition, and dissemination of telehealth outcome indicators. As such it was a vanguard project.

NTOIP was successful in meeting all of its stated goals, and in introducing novel approaches to consensus building in Canada for telehealth. However, it is not the end of the telehealth outcome indicator journey. NTOIP has provided form and structure to what must be an ongoing process. Any individual or organization undertaking evaluation of a telehealth or e-health initiative has an obligation to place concerted effort into the identification, definition, consensus building, and selection of appropriate outcome indicators and related measures and tools.

Support:
Financial support for NTOIP was provided through a cost sharing agreement with CANARIE, and an open grant from the Richard Ivey Foundation. In addition, in-kind support was provided through the project partners – the Atlantic Health Sciences Corporation and the Health Telematics Unit. Ongoing dissemination has been made possible after completion of the project through an extension of funding through the Richard Ivey Foundation.

Process:
A systematic literature review provided an assessment of the state of the science, and provided the evidence base for the study. A workshop provided an opportunity for input from interested individuals from across Canada. Based upon this preliminary work, the project identified a series of 'Candidate Outcome Indicators' which were then reviewed and filtered to identify 34 Telehealth Outcome Indicators. Each of these indicators was then subjected to two levels of consensus building by the broader telehealth community, known as the Proposed and Tentative Stages. Consensus building was executed by a simple yet effective web-based process. The consensus building strategy was an inclusive process that involved a wide variety of people, encouraged participation, allowed for equal input for critique, developed co-operation, and created a sense of individual responsibility for the final decision. Upon revision of the descriptions for each indicator, based upon web-based feedback, each indicator was considered 'Approved' and no further critique was invited. From this pool of Approved Telehealth Outcome Indicators, the broader telehealth community was again invited to select their top 12 indicators (three from each category) – i.e. those they felt were most pertinent, and that should be recommended for routine use.

Results:
34 Outcome Indicators were identified as being useful when examining quality, access, acceptability and cost of any telehealth application. Sixteen (16) indicator 'elements' (including: indicator definition, how and when to use the indicator, and data sources), were examined and described during this project. For details of these 34 indicators, please refer to the final report entitled: ***Approved Telehealth Outcome Indicators Guidelines: Quality, Access, Acceptability and Cost.***

Conclusion:
Collectively NTOIP itself, and NTOIP's Outputs, raise awareness of outcome indicators in e-health; describe a process for systematic development of outcome indicators; present definitions for e-health outcome indicators, measures, and tools; and set the stage for continued reflection and refinement of these and future indicators that others may propose.

Direct Outcomes:
The following were the specific deliverables identified for this project - all of which have been achieved:

- Website
- Information Documents (synthesis of telehealth outcome literature)
- Workshop
- Workshop report - including identification of Candidate Telehealth Outcome Indicators
- Approved Outcome Indicator Guidelines
- Final study report
- Dissemination of study results

2.1 e-Health Program Criteria

Satisfying CANARIE Guidelines:

The project satisfied all of the ***mandatory*** criteria set by CANARIE. The lead contractor was a Canadian University, all work was performed in Canada, and there was a demonstrated commitment on the part of both project participants to the development and delivery of telehealth through the use of advanced, broadband networks. The project was a diffusion based R&D activity that involved an innovative approach to overcoming a major barrier to adoption of telehealth applications. The web-based consensus approach (which involved the broader telehealth community), ensured diffusion and application during the project. Additional funds were provided by the Richard Ivey Foundation. Both the product and conduct of this project had a significant impact on the telehealth sector.

The project also satisfied many of the ***desirable*** criteria set by CANARIE. The project not only emphasized, but provided tools necessary for, best practices with respect to project outcomes. These tools supported evaluation of applications that use, test, or demonstrate advanced, internet infrastructure in the delivery of telehealth and e-health. It also addressed a major barrier to the adoption of telehealth and, due to its broad applicability, it addressed significant health and health care issues for which telehealth applications may prove to be an option. The project advanced the experience and expertise of the project team. Finally, routine application of the product of this project could enhance the telehealth market development and Canada's position internationally.

2.2 Phase Deliverables

Listed and briefly described below are the specific deliverables for the NTOIP Process.

Objective/Deliverable	Actual Achievement with Comments
NTOIP Web Site	Creation of a web site which will remain active for at least three (3) years after the completion of the NTOIP project (to 30 June 2007). www.ucalgary.ca/ntoip
NTOIP Information Document	This Information Document detailed a synthesis of the telehealth outcomes literature. The document was sent to a variety of interested parties such as Policy Makers, Researchers and Telehealth Program Directors in May 2003. The document is available on the NTOIP website.
NTOIP Workshop	From June 23 to 26, 2003 an Outcomes Workshop was held at the University of Calgary. Over 21 attendees took part in the workshop, debating issues around outcome indicators and providing a preliminary listing of Candidate Outcome Indicators.

NTOIP Workshop Report	This document is a compilation of the NTOIP Workshop presentations, breakout discussions, and reconvened group discussions, as well as key accomplishments and next steps. All attendees had a chance to provide comments and suggestions as the report was written. The document, which is also available on the NTOIP website, was sent to a variety of interested parties such as Policy Makers, Researchers and Telehealth Program Directors in November 2003
Approved Outcome Indicator Guidelines	Through the use of a web-based consensus process, Approved Telehealth Outcome Indicators were developed. The indicators went through two stages of comments – known as the Proposed and Tentative Stages. The final Approved Indicators were placed on the NTOIP web site on 28 May 2004.
CANARIE Final Study Report	This report summarises NTOIP, from start to finish.
Dissemination of study results	Throughout the life of this project, there was ongoing dissemination of the work to date either through conference proceedings, written reports, or NTOIP website content. A 4-page summary was developed, and has been (and will continue to be) disseminated to a variety of parties (Policy Makers, Researchers, and Telehealth Program Directors). Additional dissemination is anticipated througfh use of residual project funding from the Richard Ivey Foundation.

2.3 Overall Objectives

An overall rating of 9.5 (very high) is given for the degree to which the project met its objectives.

Explanation:
Essentially, all project objectives were met and deliverables completed according to the initial SOW. One aspect that performed less well than desired was the web-based consensus process. The concept is sound and recommended, but participation was not as great as anticipated. Reasons for this include: (a) the uniqueness of this innovative approach; (b) the unexpected opportunity for the broader telehealth and e-health community to participate in such an open manner; and (c) the need for a much greater awareness building and marketing of both NTOIP and the consensus opportunity.

2.4 Project Contribution to Sector/Social Objectives

While the contribution of the project to broad sector or social objectives is not identified in the Project Agreement, it was identified in the Project Proposal. Please describe the sector or social objectives, which were identified in the Project Proposal.

Sector / Social Objectives:
The availability of consensus-based outcome indicators should rapidly lead to more consistent evaluation of telehealth applications. This will permit meaningful comparison of various telehealth applications and result in accelerated adoption and implementation of those components of telehealth applications and services with proven performance and value. As a result strategic investment in appropriate telehealth solutions will occur, to the economic and social benefit of all Canadians. Industry will also find their ability to market proven applications enhanced beyond their current focus on technical performance, leading to improved corporate performance.

A rating of 9.0 (very high) is given for the extent to which completion of NTOIP will contribute to achievement of the sector or social objectives described above.

Explanation:
Impact continues to be seen. Periodic feedback, including at the recent invitational CANARIE-Infoway Workshops, shows that the concept is supported and the material produced has proven valuable. Out of the 34 Approved Telehealth Outcome Indicators, 12 indictors were deemed to be most relevant and useful and should be adopted and consistently used by the broader e-heath community. These 12 indicators were voted on by the telehealth community at large.

The reason for the score of 9 is that achieving the identified sector objectives will require voluntary adoption and consistent use of these indicators. While NTOIP results have been broadly disseminated, the project has no control over the application of the material.

3.0 Schedule

The table below presents the schedule proposed in the Project Agreement, together with the actual finishing dates for each 'phase' (deliverable) and the final status for each of these project deliverables (all complete).

Objective/Deliverable	Original Completion Date (SOW)	Actual Finishing Date	Final Status of Task/ Deliverable
NTOIP Web Site	Not stated	June 2003	Complete
NTOIP Information Document	Qrt3, 2002	May 2003	Complete
NTOIP Workshop	Qrt4, 2002	June 23-26/2003	Complete
NTOIP Workshop Report	Qrt4, 2002	Nov 2003	Complete
Approved Outcome Indicator Guidelines	Qrt4, 2003	May 28/2004	Complete
Final Study Report*	Qrt2, 2004 (CANARIE extension provided)	January 2005	Complete
Dissemination of study results *	Qrt4, 2003	Ongoing *	Complete (for contract purposes)
* The project continues through Richard Ivey Funding for dissemination, and is scheduled for final completion in July 2005, at which time the 'Final Report' will be completed.			

4.0 Profile of Project Participants

Organization Name	Province of Operation	Organization Type [1]	Industrial Sector*	Number of Employees*	Annual Expenditures*
University of Calgary	Alberta	UN			
Atlantic Health Sciences Corporation	New Brunswick	PU			
Extra vacant line					

[1] UN = university, PU = public sector
* for private sector firms only

5.0 Project Participation

5.1 The following table indicates the specific roles and contributions of project partners and participants.

Organization Name	Participate in R&D	Involved in testing/pilot	Commercialization	Other (please describe)
University of Calgary	X	X		Development of National Outcomes Conference
Atlantic Health Sciences Corp.	X	X		

5.2 The following table identifies the changes from the original roles for each participating organization in the Project Agreement.

Organization Name	Contribution as proposed	Increased Contribution	Reduced contribution	No Contribution	Joined after project began
University of Calgary	X				
Atlantic Health Sciences Corp.	X				

6.0 Project Budget and Funding

The following table compares the actual budget and funding to the proposed one.

Project Funding		Percentage of Total	Actual levels	Percentage of Total
CANARIE funding	$144,460	49.3%	$145,341	49.3%
Other federal funding				
Other public funding	$148,561	50.7%	$149,468	50.7%
Participants' Eligible Contributions				
Total	**$294,809**	**100%**	**$294,809**	**100%**

Project Budget

- The following Table compares the SoW budget to the actual project expenditure. A variance was considered to exist only if the difference was greater than 10%.

Cost Categories	SoW Budget * Amended July 2003	Actual Eligible Cost	Variance*	Reasons
Labour **	$217,808	$252,390.80	$34,582.80	Underestimated time required for CANARIE Reporting requirements, final report and website administration.
Consultants – Sub-contractors	$3,000	$2,732.08		
Direct Materials	$21,605	$12,199.56	(9,405.44)	Majority of dissemination happened after the end of the Project.
Training	0	0		
Travel	$33,702	$14,712.63	($18,989.37)	Majority of Dissemination happened after the end of the Project.
Other (inc. audit)	$10,000	$6,332.40	($3,667.60)	Majority of Dissemination happened after the end of the Project.
Special Purpose Equipment	$6,096	*Actual cost minus residual value* $4,441.80		Hardware and software rapidly lose value
Project Total	$293,021	$292,809.27	$3,788.27	

* ($) under-budget, $0 on- budget, $ over- budget
** Direct Labour includes Overhead and Fringe Benefits

- Note: The project was undertaken within a Canadian University, and the SPE remains in that environment. No formal letter was created since it would be from the University to itself!

Special Purpose Equipment	SoW Budget	Actual Cost	Residual Value	Recipient
PC and printer	$6,906	$6,332.40	$2,000	Research Associate
SPE Total	$6,906	$6,332.40		

7.0 Budget Allocation

The following identifies the actual allocation of CANARIE and other public sector funding among project participants.

Participant	CANARIE	Other federal	Other Public	Participant Eligible Contributions
Lead Contractor (University of Calgary)	$145,341		$149,468	
Total	$145,341		$149,468	

8.0 Additional Contributions

The in-kind contributions from the University of Calgary and AHSC related to the salary for the principal and co-investigators.

9.0 Information Dissemination/Technology Transfer

Dissemination:
Dissemination of the results from the NTOIP project has occurred on four accounts: (a) through attendance of numerous conferences and workshops; (b) publications and abstracts (refer to below for more details); (c) the NTOIP website and (d) awareness through description of the project to COACH and CST members and KUUC website.

In addition, the project was consensus based, involving the broader telehealth community. As a result it is anticipated a sense of ownership will result in ongoing voluntary adoption and diffusion.

The continued availability of Richard Ivey funding is permitting ongoing dissemination activities.

In all modes of dissemination the funding and support of CANARIE was acknowledged, as well as the funding, support, or cooperation of other the Richard Ivey Foundation.

9.1 Conferences/Workshops

The table below lists all conferences and workshops at which presentations related to the project were made up to May 2004. [Categories as per CANARIE: CS = CANARIE sponsored conference, NC = non CANARIE sponsored conference, PS = project sponsored workshop/seminar. The number of attendees are estimated in each case, and the audience in each case was mixed].

Conference/ Workshop/Seminar	Category	Registration Fee (y/n)	Number attending	Audience
National Telehealth Outcomes Indicators Project Conference -2003	PS	Yes	~ 30	M
Canadian Society for Telehealth Workshop	PS	Yes	~ 45	M
COACH e-Health 2004 Workshop	NC	Yes	~ 30	M
CANARIE – Infoway Invitational Workshop	CS	Yes	~ 50	M

9.2 Publications

In addition to the publications identified below, additional dissemination has occurred beyond the CANARIE funded period (e.g. CST Conference in October 2004) permitted through Richard Ivey funding. Each publication is available on the NTOIP website (www.ucalgary.ca/ntoip).

Article title and location	Audience
1. NTOIP Information Document -	M
2. Report of the NTOIP Workshop 2003 -	M
3. Approved Telehealth Outcome Indicators for: Quality, Access, Acceptability and Cost	M

9.3 Print and Electronic Media (Promotion/Communication)

The following table describes the print and electronic media presentations and events in which the project has been promoted or communicated.

Title/event	Audience
NTOIP Web Site	M
COACH Web Site	M
CST Web Site	M
KUUC Newsletter	M

10.0 Project Final Status

The following statements of deliverables applies to the completed project

Project Final Status	Print X if true
Project cancelled before completion	
Project incomplete	
Proof of concept completed	X
Developed regulations, standards	X
Technology development not yet completed (no agreement on further work)	
Technology development not yet completed (work continuing)	
Technology development completed	
Product/service development not yet completed (no agreement on further work)	
Product/service development not yet completed (work continuing)	
Product/service agreement completed	X
Other (please describe)	

11.0 Application/Commercialization

As noted in the contract, no marketable IP / Commercialization is expected from this project.

Project Commercialization/Application Status	Print X if true
No plans to apply project results	
Potential utilization of project results within partner organization(s) being studied	X
Project results being utilized within partner organization(s)	X
Project results commercialization on hold pending review/market study	
Commercialization on hold pending search for partners	
Commercialization in progress by project participants	
Commercialization in progress with new partners	

Application on hold pending search for partners	
Application in progress by project participants	
Application in progress with new partners	
Product/technology licensed	
Other (please describe)	

12.0 Use of the Internet

What Internet bandwidth/speed was this project designed to make use of? Presently available Internet speeds. The University of Calgary's Network Connection speed is 100Mb/s.

Is this project viable using the presently available commercial Internet speeds? Yes.

Is the application developed through this project designed to make use of higher bandwidth/speed? Not essential.

Describe the extent to which the application developed through this project would be made more viable/improved/accelerated using higher speed bandwidth than presently available? N/A.

13.0 Socio-economic Impacts

The beneficiaries, intended impacts, actual impacts, and contribution of the NTOIP project are listed below:

Beneficiaries:
The intended beneficiary of this project is the broader telehealth and e-health community including: telehealth researchers, telehealth program directors, and telehealth policy makers. This project is primarily designed to support all levels of government responsible for telehealth.

Intended Impacts:
The primary benefit of this project is to assure that outcome indicators that are used to evaluate any telehealth application are standardized and universally accepted. Standardization of outcome indicators will result in less uncertainty of the general applicability of evaluation data, and direct comparison of one evaluation with another will no longer be rendered futile or misleading.

The project will enhance the use and 'uptake' of proven telehealth applications within the Canadian health care system. Once demonstrated, this diffusion project will place Canada in a position of international leadership in identifying best practice solutions in telehealth. Beyond such specific outcomes, there is also inherent value in developing a clear process by which candidate outcome indicators can be identified, defined, and established as accepted standards in the future.

Actual Impacts:
To date, actual impacts can be seen. Periodic feedback, including at the recent invitational CANARIE-Infoway Workshop and the COACH e-Health 2004 Workshop, shows that the concept is supported and the material produced has proven valuable. As a result of this project, two of the project leads have been invited to contribute to Infoway's "Process Indices" development project.

Contribution (Research and Organizational):
Research - The conceptional research undertaken through NTOIP provides an on-going structure that can be built upon and identifying, defining, describing and applying new e-health (health telematics and telehealth) indicators in the future.

Organizational – The telehealth outcome development framework and processes for identifying, defining and describing indicators provides organizations with practical tools and conceptional approaches to consistent and comprehensive evaluation of telehealth applications.

14.0 Role of CANARIE

This last question focuses on the role of CANARIE in this project. Please provide a rating for the following statements. Use a scale of 1 – 10, where 1 is not at all and 10 is to a great extent)

Role of CANARIE	Rating (1-10)
CANARIE staff provided valuable support to the project	8
CANARIE helped assemble the project team	1
CANARIE helped improve the original Expression of Interest/Project Proposal	6
CANARIE support during the project contributed to project success	1
CANARIE support contributed to improved collaboration among the partners	1
CANARIE support contributed to improved project management skills	5
Other (please describe) – supported dissemination efforts through CANARIE workshops	10

Please describe any additional benefits due to CANARIE's role in this project. Without CANARIE funding, this project would have not proceeded.

Please describe any problems caused by CANARIE's role in this project. Onerous paper work and reporting requirements (some redundant), even beyond project completion.

Based on your experience, what can CANARIE do to improve program delivery and support to projects? Continue to support e-health initiatives that are not easily funded under currently available funding programs.

15.0 Evaluation Report

Evaluation:

Evaluation of this project was not possible using common methodologies or traditional study designs. Success was determined in several alternate ways:

1. Success of the Workshop was based upon three criteria: the number of Candidate Outcome Indicators identified from the Workshop {***34 candidate outcome indicators were identified and refined as a result of the Workshop***}; analysis of responses to a post-workshop evaluation form {***a poor response rate precluded meaningful analysis***}; and subjective assessment of the quality of the Workshop report {***participant responses to the Workshop Report were very favorable – stating that the report reflected all of the impertinent information gleamed from the Workshop*** .

2. Success of the consensus process was based upon analysis of the number of responses to the open invitation to critique Tentative and Proposed Outcome Indicator Documents. ***{There were a total of 155 responses for the Tentative and Proposed Stages. We view the consensus process as being conceptionally sound, but there is a need to increase participation}.***

3. Success of the overall project was based upon three criteria: satisfactory and on-time completion of the Outcome Indicator Guidelines ***{the Guidelines are satisfactory, as they include input from a wide variety of individuals. The schedule slipped 3 months, extending beyond the planned end of the CANARIE support}***; achieving broad dissemination of the final report ***{this has been 'completed' to a large extent, but is also an on-going process supported through Richard Ivey***

funding}; and requests for NTOIP material assessed as 'hits' on the website ***{fom July 2003 to ~ July 2004, there were over 1,315 visits to the NTOIP web site}***.

4. Success of the Approved Outcome Indicator Guidelines, the final products of the project, cannot be reported, but will be based upon demonstrated utility. This long-term indicator will be measured using a feedback mechanism placed on the NTOIP website.