Evaluation of the SchoolNet1 Initiative

Final Report

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Industry Canada

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Executive Summary

A. SchoolNet

SchoolNet (SN) has been a key element of the federal government's *Building a More Innovative Economy* strategy, tabled originally in 1994. SchoolNet has been extremely successful in meeting its original objective of facilitating the electronic connection of Canada's public schools, First Nations' schools, and public libraries (LibraryNet), and continues to play a strong role in the new 1998 *Connectedness Strategy*. In large part, the success of SchoolNet is a function of innovative delivery mechanisms which have involved provincial partners, and a wide range of other educational, business, and professional organizations. Through these partnerships, SchoolNet has been able to leverage significant resources – measured in terms of both level and impact – that have allowed the overall project to be developed far beyond the federal involvement alone of roughly $40 million. Indeed, partnerships and leveraging relationships can be viewed as the backbone of the SchoolNet initiative.

B. Overall Conclusions

Our conclusion is that SchoolNet has played a strong role in establishing connectivity between Canadian schools and libraries. Moreover, it has done this in an environment where jurisdictional sensitivity is of paramount concern, and resource availability is scarce. This has resulted in an interesting and important mix of partnerships between federal, provincial, organizational and private sector actors that, given the constantly changing nature of knowledge and technology in the modern context, will require continual renewal into the future.

C. Specific Findings

1) Collaboration and leveraging. Collaboration and leveraging arrangements that have played such a key role in the overall SN initiative. SchoolNet has been, in our opinion, outstandingly successful in this arena. In fact, it is not unreasonable to suggest that the wide range of SN partnerships represents one of the key successes of the program, and that SN would not exist without them. Not only do these partnerships allow for increased resources, they also lead to the sort of shared management practices that has fram[illegible] the SN approach. And while many partners feel the partnerships would benefit from an increased level of overall funding, in their own right they have been instrumental in facilitating substantial additional resource generation and deployment amongst the variety of actors in the educational system.

2) Federal involvement. There is a clear sense that federal involvement in the form of a national connectivity strategy was both necessary and legitimate in the eyes of affected parties in the educational system. This is not to say that jurisdictional tensions have been absent, but rather that, when evident, they have been resolved with relative ease. In large part, this a reflection of the common desire held by all actors to facilitate the use of information and communications technology in Canadian schools — a desire that transcends jurisdictional boundaries. Federal-provincial cooperation was enabled through a healthy mix of decentralized administration (all the way down to the school and even classroom level), combined with a federal role that was more that of *agent provocateur*, than that of micro-manager. It is clear that Industry Canada is but one player: the active participation of provinces and School Boards/Districts has been crucial. Having said this, there are several specific examples where the federal role has been crucial, especially in the areas of acting as a focal point to develop a collaborative national vision, and in addressing some technical issues within information and communications technology (ICT) that are within the federal mandate. Our conclusion is that achievement of SN goals would not have been sustainable without federal involvement.

3) Impact on connectivity and use of ICT. Specific examples of SN programming have resulted in increased connectivity and use of ICT in Canadian schools and libraries. At a general level, the answer is a simple 'yes' – SN has resulted in more computers (through CFS), increased connectivity, and increased provision of educational resources (e.g., through GrassRoots). In fact, 100% of schools and libraries that wish to be connected, now are connected. For First Nations schools, this is particularly relevant because of the remote settings for many of these schools—here First Nations SchoolNet has provided satellite connections to schools that almost certainly would not have them otherwise.

4) Computers for Schools (CFS). The CFS program has played an important role in increasing the availability of computers for use in schools and libraries. As of the end of March 2000, over 200,000 computers had been supplied by CFS to schools and libraries. While the total number of computers at schools/libraries has increased because of CFS, some respondents have commented on the quality of the computers supplied. Many CFS computers are 'low-end' and do not meet minimum configuration standards for modern software, or for effective Internet connection. Consequently, in order for the CFS computers to be of use to schools/libraries significant expenditures (or effort) have been required on the part of the School District to upgrade the computers to meet current standards which permit connection to the Internet. Should such resources be devoted towards bringing older computers to the basic level needed to permit connectivity, or should these resources be devoted towards the purchase of fewer computers but with superior technology? The response to this question may vary depending upon the educational levels taught at the schools. Older computers can be used as simple resource stations for running specific educational programs, thus appropriate for younger school levels, and may even be used for "spare parts" or to help students learn how to "tear them down". One of the computer purchaser respondents had mentioned: " The main use in this area has often been at the high school level where students want a machine they can

'hack apart'". More advanced computers, with greater hard drive space will enable students to 'surf' the Internet and become familiar with more advanced software packages, thus appropriate for higher school levels and libraries.

5) Addressing ICT Barriers. Several steps were taken by SN to overcome barriers to increased ICT use in schools. Those pertaining to a key barrier—professional development of teachers—included creation of the SN Youth Employment Initiative which was funded by HRDC, the development of a paper-based SN Offline tool, and Alberta's School Integration Resource. While these steps, and others, have been undertaken by SN, many teachers, principals, and librarians acknowledge their lack of professional development in computer/Internet use. SITES data also confirms that few schools have offered ICT training for all teachers. Failure to instruct teachers/librarians in the use of information and communications technology limits the promotion of the Internet and other web-based educational resources. It is unclear whether the responsibility for ensuring that teachers/principals/librarians are properly instructed falls upon the shoulders of the SN program, or whether it should remain mainly a provincial responsibility. However, it is important to note that the SchoolNet program has a played a facilitator or catalyst role and it is thus a worthwhile investment to maintain. There is a wide variety of barriers to effective ICT use that will be important in the near future, including technical issues related to high-speed access to the Internet, lack of ICT technical support, and so on. Interviews with various stakeholders (e.g., teachers, provincial officials) reveals that SchoolNet is considered to have a moderately important future role in addressing virtually all of them.

6) On-line Resources. SN on-line resources and initiatives, and especially GrassRoots, has attracted numerous schools. GrassRoots is considered by many educators as an effective program as it offers funding to schools which helps cover the costs of creating and implementing classroom learning projects on the Internet. Developing useful on-line resources is an effective strategy that encourages librarians and teachers to access the Internet and meet Industry Canada objectives, while limiting the costs to the program of ensuring that all 20,000 schools and libraries across Canada are connected. While the GrassRoots initiative was considered useful and successfully encouraged teacher and student involvement in Internet-based activities, few other SN on-line resources are as highly used by as many respondents, or as highly useful (on average). This may simply mean that fewer users exist for each individual initiative, but the situation warrants careful attention to ensure the development of educational materials and resources that meet the curriculum needs of School Districts and individual schools and teachers. An important lesson learned is that every on-line resource must be designed with careful attention to how it is to be used in the field. While it was not specifically addressed in this evaluation, there are several indications that the library community feels that LibraryNet has been relatively neglected, with much less thinking about the needs of this community, and interaction with it, than is necessary.

7) Sustainable Development. SN, LN, and FNSN are clearly not programs for which the major portion of sustainable development (SD) goals are relevant, in that they have few environmental implications. However, they do contribute to some portions of the government's SD objectives, as they have helped improve social equity through provision of computers, Internet access, and technical advice to all Canadian communities, no matter how remote. Further, all programs demonstrate a clear commitment to broad, participatory decision-making, in which both policies and products are designed and delivered through working groups at all levels of government, the K-12 school system, and the private sector. Finally, the federal involvement was crucial to the long-term sustainability of the program, and will continue to be in the future.

8. Put more resources into LibraryNet. Limited data suggest that LibraryNet is the "poor relation" in the SN program. It has had considerably less effort put into determining the programmatic and resource needs of libraries, librarians, and library users, and in finding ways to address these needs. If there are still important library needs that are unresolved, and if SN can play a role, then this lack should be addressed.

D. Key Lessons Learned

Some of the key lessons learned by SN to date have been:

- Tension between provincial and federal parties can be overcome when both are working towards a common goal, and when all parties are willing to offer resources while foregoing program control at the delivery level. The presence of an apparent champion and a well-defined vision also ensure that the needed synergies are created and maintained.

- The partnerships facilitated by SN are crucial to success of this endeavour and must be nurtured and maintained. Partners should be engaged at all stages of development and operations, and must be willing to be flexible and adaptive. The in-kind support from partners is as important as the cash contributions.

- SchoolNet's partnerships require continuing direction and resources from Industry Canada and/or SN to be sustainable over the medium to long term.

- Computer and Internet technologies, and the uses to which they are being put, are evolving so rapidly that SN and CFS should consider monitoring these factors on an ongoing basis in terms of setting program goals. While respondents acknowledged that SN is not responsible for addressing all barriers to ICT use, misconception of SN's role and its objectives has resulted in the program being viewed as being responsible for supplying high-end computers to School Districts that enable connection to the Internet.

- It is crucial to incorporate input from the classroom level to ensure that on-line content reflects curriculum, and addresses the interest/needs of teachers and students. "Real-world" ICT use must be monitored to ensure that resources are actually used and useful.

E. Recommendations

Based on our evaluation of the SchoolNet Initiative we suggest the following eight recommendations be implemented:

1. Maintain the SchoolNet, Computers for Schools, and LibraryNet programs — These programs have been important catalysts and facilitators, bringing together the complementary needs and resources of federal, provincial, and private sector partners. It is clear that the majority of tasks addressed in the past—as well as those that must be addressed in the future—have broad cross-jurisdictional implications, and would be impossible for individual partners to effectively tackle alone. SN has shown that it is an effective instrument to meet these challenges, both in terms of policy and in terms of operational matters. LN has been less successful, but has equally good potential. It would be valuable to create a more fully defined strategic context for both programs that deals with issues such as infrastructure funding, maintenance of partnerships, etc..

2. Provide ongoing ICT infrastructure investment — Continued investment is needed for maintaining and improving the quality of ICT infrastructure, which is rapidly becoming inadequate to serve current needs. This would involve providing increased bandwidth (taking into account that future demand will likely continue to grow, in remote and rural communities as well as urban ones), and supplying and maintaining higher numbers of higher-quality computers and their associated hardware/software. This investment must be a joint effort of all SN partners as this is a cross-jurisdictional issue.

3. Continue to address other ICT barriers — There remain many other ICT barriers for which SN can help find solutions.

4. Address First Nations SchoolNet problems — Special effort needs to be made by First Nations SchoolNet to ensure that the connectivity gains already realized do not disappear. FNSN should clearly distinguish its role and that of the Internet Service provider.

5. Nurture important existing partnerships and collaborations — SchoolNet's partnerships and collaborative efforts require continuing direction and resources from Industry Canada and/or SN to be sustainable over the medium to long term. Several highly-visible partnerships are currently in danger of collapse due to a lack of sufficient program funding, and lack of co-ordination and vision. We recommend that a "snapshot

inventory" be carried out which investigates, for each partnership, the partnership model being used, its usefulness and importance, perceived problems, short-term needs in terms of resources and co-ordination, and the expected roles of Industry Canada and SN. This inventory might be done through the SN Advisory Board.

6. Continue to design educational and administrative resources for "real world" relevance — The on-line SN resources have had mixed success—GrassRoots is highly used and highly useful, but most others enjoy more limited use and usefulness. It is vital that existing resources be monitored closely to ensure their continued relevance, and that new ones be designed to maximize their effectiveness.

7. Analyze future programming in terms of incremental impact — There are many possible areas in which SN could put effort. Due to the many complex cross-jurisdictional aspects, as well as the actions of various partnerships, it is vital that SN's activities be directed towards areas where they can lever the most additional impact.

8. Put more resources into LibraryNet — Limited data suggest that LibraryNet is the "poor relation" in the SN program. It has had considerably less effort put into determining the programmatic and resource needs of libraries, librarians, and library users, and in finding ways to address these needs. If there are still important library needs that are unresolved, and if SN can play a role, then this lack should be addressed.

1

Introduction

This report is an evaluation of the SchoolNet1 program of Industry Canada, which was created and maintained through the creation of partnerships with the provinces and territories, as well as many other private and public sector bodies. The report is organized according to the major evaluation issues. Where relevant, different data sources are discussed separately within those issues. For the sake of brevity, the statistical results from the various surveys are found in the appendices. Where appropriate, the text contains a note referring to the appendix and question(s) relevant to the discussion. For example, the distribution of responses from provincial and territorial officials regarding the role of the federal involvement in fostering connectedness is found in Appendix A, question 3—this would be referenced as (A: 3).

A. Methodology

The major evaluation methodologies are described briefly below.

1. Document Review

Numerous Industry Canada documents and other reports were reviewed to judge their relevance to the evaluation issues. These included those listed below.

- GrassRoots Program: 1996-97 Case Studies
- SchoolNet Evaluation Framework
- SKILNET.CA
- The Information Highway: Avenues for Expanding Canada's Economy, Employment and Productivity in the New World Marketplace, 1994
- Building the Information Society: Moving Canada into the 21st Century, 1997
- Telecommunications Act, Policy and Regulations in Canada, 1993
- News Release: New Program to Promote Aboriginal Business, Culture and Youth Employment
- First Nations SchoolNet Program Evaluation Final Report
- Evaluation of the Alberta SchoolNet Project
- Case Study of SchoolNet in Newfoundland and Labrador
- Canada's Computers for Schools: National Program Policies and Regional Operations
- Canada's SchoolNet Support Parents Program: Background information, 17 September 1998
- Integrating Information Technology into Learning: May – June 1998
- LibraryNet

- IHAB Operational Plan 1998-1999
- SchoolNet Youth Employment Initiative, presentation to HRDC, 28 May 1998
- Vision of Learners in the 21st Century, 14 May 1996
- Youth Employment Strategy, working document, May, 1998

2. Interviews with Federal Government Officials

Interviews were conducted with seven senior Industry Canada representatives regarding evaluation issues related to the original need for federal government involvement, the continuing need for federal involvement, the role of SN in increasing connectedness, the usefulness of SN materials and resources, the extent to which the program addresses information and communications technology (ICT) barriers in schools and libraries, and identification of examples of collaboration, partnering, and leveraging. The respondents are found in Appendix E.

3. Interviews with Provincial Officials

Interviews/surveys were conducted with 11 provincial officials who were highly familiar with SchoolNet and/or LibraryNet. (A special effort was made to obtain input on LibraryNet through this data source.) The respondents are found in Appendix F, and the survey instrument and data are found in Appendix A.

4. Survey of School and Library Administrators Re: Computers for Schools

Individuals responsible for technology purchases in the different provinces and territories were identified with the assistance of the Computers for Schools (CFS) Provincial Advisory Committees (PACs). Surveys were distributed to a census of these individuals regarding the incremental impact of CFS on the availability of computers in their schools. A total of 11 responses were returned (response rate 31%). Due to variations in how computers are purchased among different jurisdictions, some individuals answered for their entire province, others for individual School Districts or School Boards. The survey instrument and data are found in Appendix B.

5. Survey of Teachers, Principals, and Library Administrators

Surveys were distributed to a sample of Canadian teachers, principals, and library administrators. The survey instrument and data are found in Appendix C. As there

is no easy way to obtain contact information for these individuals[1], nor is there an easy way to identify individuals for whom SchoolNet or LibraryNet was relevant (presumably not all individuals use it), contact lists were drawn from several sources, as shown below.

Source	# Surveys Sent	# Surveys Completed	Response Rate
SchoolNet listserve	671	See text	See text
Rescol listserve	218	See text	See text
Inclass listserve	1,681	See text	See text
Contact data from 13 lists from: GrassRoots, SN magazine subscriptions, Network of Innovative Schools, and lists supplied by provinces	1,160	See text	See text
BIBCANLIB listserve	604	See text	See text
TOTAL	3,934	216	5.5% (out of total) 6% (out of surveys with correct addresses sent out)

The first four lists shown are from various Industry Canada sources, the last is a listserve for Canadian library administrators and officials.

Extensive consultation was carried out with members of the Provincial Advisory Committees to determine the best method to identify respondents and for survey distribution. No single method was found suitable for all possible respondents. In the end, surveys were sent via e-mail to all individuals in the table above, either through the listserves, or through distribution lists for the GrassRoots and other contact lists. Two follow-ups were done, also via e-mail. The first distribution of surveys included the survey in the main text of the message. The first follow-up encouraged individuals to complete the survey via an alternate method, a web-based

1 *Many jurisdictions do not have contact data for individuals, only for schools; the lists are considered confidential in many jurisdictions; not all individuals have e-mail; the situation is different in each jurisdiction; etc*

version put into place by a SchoolNet partner, the Education Network of Ontario[2]. The second follow-up also included the survey as an attachment in rich text format[3]. A dedicated e-mail address was created for survey returns, although respondents also had the option of responding by fax or regular mail. Each respondent received both an English and a French version of the instrument.

As it is impossible to determine which respondents were from which contacts source (the individual names of respondents in the list serves are confidential), it is impossible to determine the response rate from the different sources. Many of the contact addresses turned out to be incorrect—roughly 340 "wrong address" responses were obtained. Thus the true response rate is roughly 6% (i.e., the response rate from "correct address" surveys sent out). This overall response rate is rather low (roughly half what one would normally expect from a "blind mailing" survey), due to a combination of factors:

- Timing difficulties resulted in the survey not being distributed until May 23, with the follow-ups done in early June. This is an exceptionally busy time for the respondents in the schools.
- Due to the complexity of the issues that needed to be addressed, the survey itself was long.
- There were difficulties associated with the e-mail methodology, including garbled survey text in the first mail out, or e-addresses from the distribution lists being copied into the main message text. Various methods were used to try to overcome these difficulties in the follow-ups, but some respondents still experienced problems reading the surveys.

Nonetheless, the survey results are consistent with the information from the other lines of evidence, and we believe they are accurate and reliable.

6. Survey of First Nations Communities

Surveys were sent to the 138 communities that participated in the evaluation of First Nations SchoolNet carried out in 1999. These were faxed by Industry Canada to respondents, and each respondent was called individually by Kenneth Paul, the

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2 *Our thanks to the individuals involved, Mary Beam and Andrew Long.*

3 *There are many different e-mail systems among respondents, and this three-pronged approach "covered the bases" in terms of how the survey could be read. Some surveys in other formats (e.g. Word, WordPerfect, text files) were also sent to individuals requesting them.*

consultant who carried out the previous evaluation (Mr. Paul is also a status Mi'kmaq). A total of 86 responses were received, a response rate of 62.3%.

7. Case Studies of Collaboration and Leveraging

Numerous possible case studies presented themselves, based on suggestions of Industry Canada and SchoolNet officials, and those of the PAC representatives. The final selection of six cases represent a variety of different types of partnerships and leveraging, as well as those that allow identification of lessons learned for maximizing success.

8. Analysis of Second Information Technology in Education Study (SITES) Data

The SITES survey data were reviewed and some findings incorporated into this report.

II

Program Description

A. Background and Program Definition

The SchoolNet 1 (SN) initiative consists of a number of different programs and activities conducted through extensive partnerships, all of which are related to providing Canadian schools and libraries with increased computer access to the Internet (i.e., increased "connectedness"), and facilitating the use of this access for a variety of purposes.

Exhibit 1 details a list of key elements that were in existence during SchoolNet1. This evaluation study will deal primarily with those SchoolNet 1 programs that are focused on the original objectives of SchoolNet:

1) To help connect all of Canada's K-12 schools and public libraries to the Internet by March 31, 1999.

2) To connect all of Canada's First Nations' schools under federal jurisdiction to the Internet by March 31, 1999.

3) To contribute to enhanced educational opportunities and information technology skills development among K-12 students. (This was considered a longer-term objective than (1) and (2)).

For simplicity the programs which comprise the SchoolNet 1 initiative are referred to cumulatively as "SchoolNet" or "SN" in the remainder of this paper.

Exhibit 1
SchoolNet Programs

Considered in this Evaluation

Computers for Schools – the provision of donated refurbished surplus computers to schools and libraries

First Nations SchoolNet – provision of computers to First Nations schools (one computer and one DirecPC) and development of First Nations Internet content

DirecPC – provision of low cost access to the Internet through the use of DirecPC technologies and satellite channel donated from Stentor that makes fast and inexpensive access possible for schools and libraries in remote communities

LibraryNet – facilitation of Internet connectivity by libraries and support for the development of materials and resources relevant to libraries

Network to Savings – a site which provides information on computer equipment and software which is available to schools and libraries at a discount which has been negotiated with the federal government

SchoolNet Grassroots – support for classroom-based interactive learning projects on the Internet

SchoolNet Virtual Products – support for the development and mounting of educational materials and resources on the Internet. This program was discontinued in April 1998.

SkillNet.ca (earlier known as National Graduate Register) – an Internet database containing resumes of post-secondary students and recent graduates, with a custom-designed search engine which enables employers to search for qualified candidates

Not Considered in this Evaluation:

Office of International Partnerships – an office to respond to inquiries from other countries regarding SchoolNet and help Canadian organizations identify opportunities abroad.

SchoolNet Portal– development and maintenance of the SchoolNet website, which is the main point of access to Pan Canadian on-line learning resources and services and IHAB's other programs. (This is not actually a program, but a major SchoolNet activity that does not fall within any of the other programs.)

Programs funded by the Youth Employment Strategy (YES):

SchoolNet Digital Collections (now referred to as Canada's Digital Collections) – a Youth Employment Strategy program to support museums, libraries, and other organizations in hiring teams of young people to digitize text, images, and audio and video material for the Internet

The Computers for Schools Technical Work Experience program – a Youth Employment Strategy program which hires young information technology graduates and provides them with 13 weeks of experience repairing and refurbishing donated computers

The SchoolNet Youth Employment Initiative – a Youth Employment Strategy program which hires young university graduates to work for 16 weeks with school boards, schools, and libraries, assisting them with the integration of information technology into their programs

The original mandate of SchoolNet was articulated in 1994 under the Government's strategy, "Building a More Innovative Economy". Timing for the original goals of SchoolNet was March 31, 1999. SchoolNet was expanded in 1998 under the Government's new Connectedness Strategy. SchoolNet activities prior to the Connectedness Strategy are often referred to as SchoolNet 1, and the expanded SchoolNet as SchoolNet 2. The original mandate of SchoolNet, established in November 1994, was "to help connect all 16,500 schools and 3,400 libraries in Canada by the end of fiscal year 1998". This mandate has been considerably expanded since that time, partly because of the success of the program in fulfilling its original mandate, and partly because connectedness has become a much higher priority of the federal government. The program is now a key part of the government's Connectedness Strategy. This strategy is aimed ultimately at building the infrastructure and skills that are necessary for Canada to become and remain a leader as a knowledge-based economy.

The Industry Canada expenditures for SchoolNet from 1995/96 through 1999/2000 are approximately $82 million, of which roughly $18 million was spent on Computers for Schools. It should be noted that the total cost of the Computers for Schools program to the federal government is higher than shown above, since private sector donors of computer equipment are issued tax receipts for gifts-in-kind. This reduces the amount of federal income tax they would otherwise pay. [4]

There are six main categories of activities carried out within SchoolNet1:

1) Activities to facilitate the connectivity of schools and libraries.

2) Activities which involve the provision of computers to schools and libraries.

3) The development and operation of the SchoolNet website.

4) Support for the development of on-line educational materials and resources.

5) Activities intended to build partnerships.

6) Research and competency development.

These are described in the following sub-sections. At the outset it is important to emphasize that none of these activities are carried out by the federal government alone.

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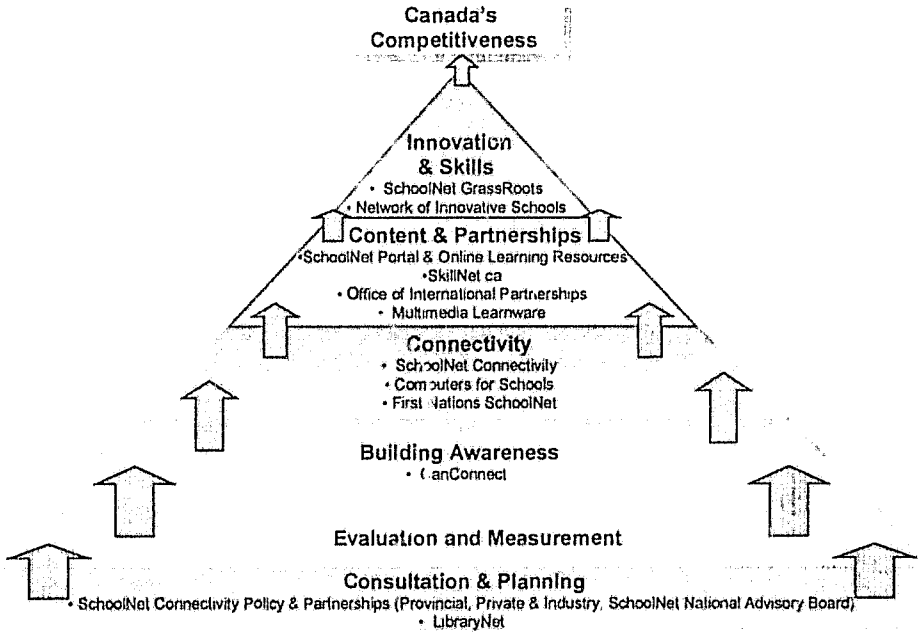
[4] *Note: Foregone tax revenue may not lead to a net loss to the government. In fact, . . is likely that the value of gifts-in-kind is greater than the loss in tax revenue, resulting in an overall net gain to the CFS program.*

They all involve partnerships between the federal government, provincial governments, the private sector, and non-profit organizations. SchoolNet's role has been to act as a catalyst and facilitator. The SchoolNet Advisory Board has provided the strategic directions for SchoolNet. The diagram below provides a depiction of the current SchoolNet 2 program. The "pyramid" leading to Canadian ICT competitiveness for a knowledge-based economy reveals that each level builds upon the one before it:

SchoolNet Strategy - How the Pieces Fit Together



Source: Industry Canada

The goals of SN have evolved over time.

B. Facilitating Connectivity

The term "connectivity" refers to the process of getting schools and libraries hooked up to the Internet.

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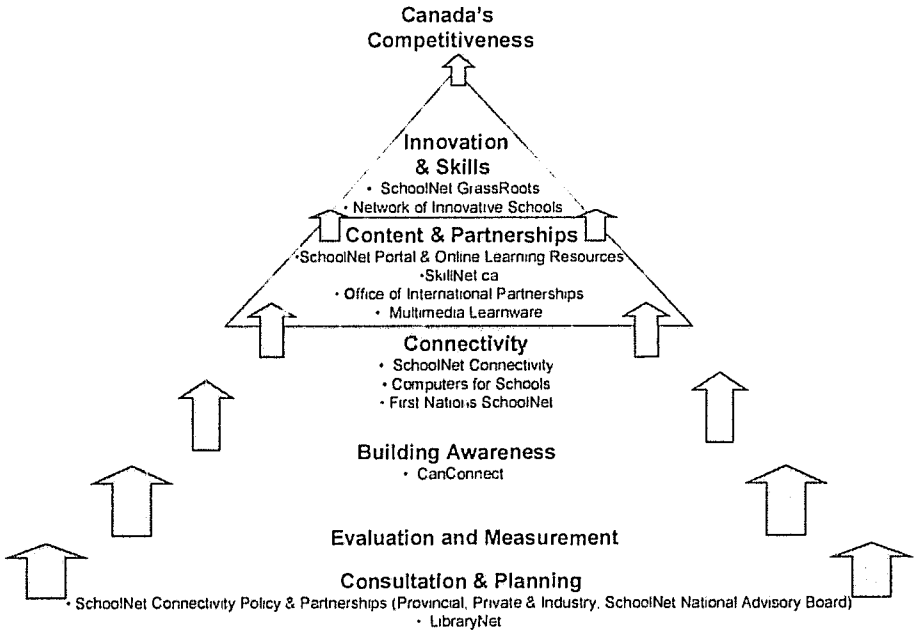

Source: Industry Canada

The goals of SN have evolved over time.

B. Facilitating Connectivity

The term "connectivity" refers to the process of getting schools and libraries hooked up to the Internet.

1. Promotion and Facilitation of Connectivity

Industry Canada has undertaken a number of measures in order to promote and facilitate the connectivity of schools and libraries. The Department's overall strategy has been to work with the education community in order to support and encourage the creation of useful educational resources and materials on the Internet that would encourage schools to become connected. This strategy of attracting schools on-line, rather than contributing to the enormous ongoing costs of connectivity for 20,000 schools and libraries, was recommended by SchoolNet's National Advisory Board.

First Nations schools, for which the federal government is responsible, were an exception to this strategy. SchoolNet assumed the costs of connectivity for First Nations schools.

The educational resources and materials, which SchoolNet has participated in developing, are described below. Other activities that have been undertaken to support the strategy of attracting schools on-line include:

- A National Help Desk to provide technical advice and assistance to First Nations schools, plus regional Help Desks.

- Support through the SchoolNet Youth Employment Initiative, which allows the hiring of young IT-skilled graduates to work with schools and libraries that want to connect to the Internet but need technical assistance.

- Negotiations with Bell Canada and other telephone companies regarding lower long distance phone rates for school and library use of the Internet.

- Provision of satellite technology, in partnership with Stentor, called DirecPC that makes fast and inexpensive Internet access possible in remote communities. This has been used for First Nations SchoolNet.

- The Network to Savings program, which helps schools obtain low prices for computer equipment, networking technologies, and software. In this program companies which have negotiated standing offer agreements with the federal government offer their products to schools at reduced prices.

- A variety of initiatives to promote the advantages of connectedness to schools, such as the SchoolNet magazine.

The degree of connectivity of schools and libraries as of March 31, 1999 (and April 20, 1999, for libraries), is very high. In fact, 98% and 97%, respectively, of the roughly 15,000 schools and 3,400 libraries in Canada were connected on those dates (i.e., have access to the Internet). This represents 100% of the schools and libraries that want to be connected.

2. Activities to Connect First Nations Schools

Achieving the connectivity of First Nations schools has been a major SchoolNet undertaking and has required considerable program resources. Approximately 81% of the 496 First Nations schools located across the country are now connected to the Internet. (The remaining First Nations schools have declined to participate.) The First Nations SchoolNet program provided each of these schools with a Pentium computer, a DirecPC terminal, and support for Internet and telecommunications costs, as well as technical support through a network of help desks located across the country in aboriginal businesses or organizations. Connectivity was accomplished through a partnership with the telephone companies that made up the former Stentor Alliance (valued at $12 million), whose commitment comprises free satellite channel capacity for DirecPC usage until 2003. The program also supported the development of the First Nations Homepage on SchoolNet.

C. The Provision of Computers to Schools and Libraries

These activities are carried out within the Computers for Schools (CFS) program, which involves collecting donated surplus computer equipment from the federal government and other organizations, testing and refurbishing this equipment, and delivering it to schools and libraries free of charge.

This program is a joint initiative of Industry Canada and the Telephone Pioneers, a volunteer organization of active and retired employees of Canada's telecommunications companies. The Telephone Pioneers support the program in a number of ways, the main ones being assisting with inspection and repair procedures and delivering and installing the equipment in schools. The repair and refurbishment of donated computers is carried out at over 50 repair centres throughout the country. The supervisors at these centres are drawn mainly from volunteer organizations (particularly the Telephone Pioneers), and the majority of the workers are young people employed under the Technical Work Experience program (funded as part of the Youth Employment Strategy program). This program hires young information technology graduates and provides them with 13 weeks of "first job" practical experience working as repair technicians.

The program also has a number of private sector supporters (the Computers for Schools website lists about 50 companies as supporters), which are involved in donating computer equipment and software and other goods and services required by the program, such as

transportation. There is currently a National Campaign underway to recruit additional private sector supporters because, as the program grows, additional computers, space, volunteers, and transportation services will be needed.

The allocation of computers to each province and territory is roughly in proportion to the number of students in the province/territory. Advisory committees, which operate at arms length from the federal government, have been set up in each province and territory to oversee the allocation process. Industry Canada has recently licensed the regional delivery of the program to these committees.

D. Development and Operation of the SchoolNet Website

This category of activities involves the design of web pages and links to other services, the operation of the physical site and servers, the provision of applications maintenance, and the management of SchoolNet web pages. SchoolNet's English website has a similar site in French, Rescol. All menus are the same, but the resources have been developed in response to cultural differences. The website is the main vehicle by which SchoolNet's goals are achieved. It provides access to relevant learning resources and services, and it showcases the best practices and on-line resources and services. The site also provides news from across Canada regarding what is going on in education. The website provides access to many of IHAB's programs, some of which are hosted on the SchoolNet server, including those shown in Exhibit 1.

SchoolNet's current availability on the World Wide Web has greatly increased its use. The program has made a number of changes to the website operation recently. The main ones involved changing the operating system and making the site easier to use.

The second major change was to improve the ease of use of the SchoolNet website, particularly the ease of finding information contained in the site. This was done by establishing "meta-data", which is essentially a sophisticated on-line library index for all material that can be accessed from the SchoolNet site (currently at the alpha testing stage).

For the future, the program wishes to continue the widely-distributed model. Many of SchoolNet's services do not run on the SchoolNet servers. For example, the StemNet network in Newfoundland operates the SchoolNet News Network on their own server, but as a national service. (One difficulty with the widely-distributed model is that it is difficult for the program to know who the SchoolNet family is and how the system is used.) The program would also like to have school boards take over the management of SchoolNet pages in order to make the educational community "own" this network and get actual practitioners involved. However, this will require an extraordinary effort - for example, the meta-data system needs to be very powerful.

E. Support for the Development of Educational Materials and Resources

Industry Canada's main strategy for encouraging schools to become connected has been to create and/or make available educational resources and materials on the Internet, which educators will want to be able to access. The majority of the educational materials and resources have been made available through SchoolNet's Virtual Products program. Up until March, 1997, this program invited SchoolNet users to submit proposals for mounting suitable products and services onto the SchoolNet server. Proposal submissions came from educational associations, school boards, other non-profit organizations, and provincial ministries. The program assisted approved projects either to become sites on the SchoolNet server, or to become sites on other servers but linked to SchoolNet. The proposals were reviewed by the SchoolNet National Advisory Board or one of its sub-committees and, if successful, funds were provided to support the development process.[5] In addition to products developed by SchoolNet users, a number of products have been developed and/or organized by the Virtual Products Group at Industry Canada, generally working in partnership with other sponsors.

A second source of educational resources is the SchoolNet GrassRoots program. This program offers funding to schools to help cover the costs of creating and implementing interactive classroom learning projects on the Internet. Funding allocations are $300, $600, or $900 per project, depending on the type of project. There are also GrassRoots Block 2 projects funded at $5500 for a minimum of eight sub-projects. GrassRoots began as a pilot program in January, 1996, and it has been considerably expanded under the Connectedness Strategy. It is currently managed by the provinces. GrassRoots projects have been highly acclaimed -- there have been a total of 63 awards for GrassRoots sites and projects.

A number of educational materials and resources have also been provided by other SchoolNet programs. For example, a complete curriculum for First Nations people was put on-line as part of the First Nations SchoolNet program. Similarly, many of the websites created within the Canada's Digital Collections program have educational content.

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5 *After October, 1996 only projects requiring less than $10,000 in funding were able to be considered because of budget constraints and the funding for external proposals was terminated completely in March 1997.*

F. Building Partnerships

The vast majority of SchoolNet activities are carried out by means of partnerships between the federal government and one or more other organizations – provincial governments (particularly Ministries of Education), education associations, school boards, private sector companies, and other organizations. There are two main reasons for this:

- Education is a provincial responsibility, and the federal government cannot carry out activities in this area without being allowed to do so by the provinces.

- The total scope of activities carried out within the SchoolNet program outweighs program resources, making it necessary for the program to leverage additional resources (both funding and in-kind resources) from other organizations.

There are many examples of such partnerships; some are found in Appendices G and H. Most of the partnerships with private sector and non-profit organizations are designed to leverage additional resources for SchoolNet initiatives. SchoolNet's partnerships with provincial education ministries and education associations have most often been related to the joint development of educational materials and services. The program actively seeks out these kinds of partnerships and is also receptive to proposals from these organizations. These partnerships generally involve the provision of additional resources by the organizations for the development of materials, and SchoolNet also benefits from endorsements by the organizations that develop the materials. Good examples include:

- Telephone Pioneers, an association of active and retired employees of telecommunications companies. The Telephone Pioneers are co-founders of the Computers for Schools program, and the organization has been heavily involved in repairing, testing, packaging, and delivering computer equipment to schools and libraries.

- STEM-Net, the Newfoundland government's K-12 education network, is responsible for the operation of the SchoolNet News Network. This is done under a contract arrangement with Industry Canada through which funding is provided to STEM-Net, but STEM-Net contributes considerable in-kind resources.

- SchoolNet News Groups, which are delivered in partnership with the Education Network of Ontario. The Education Network of Ontario is providing this service under contract to SchoolNet, but, as in the previous example, the organization is contributing considerable in-kind resources.

G. Research and Competency Development

SchoolNet's research function involves supporting and disseminating research on the benefits of information technology in the learning process. The program has commissioned two projects on this subject by the TeleLearning Network of Centres of Excellence, one in 1996 and one in 1998, and the reports are published on the SchoolNet site. The program was also a major supporter of the SITES Survey. SchoolNet is currently involved in helping to organize a Canadian research agenda on the use and impacts of information technology in K-12 education.

The program's competency development activities primarily involve two Youth Employment Strategy programs - the CFS Technical Work Experience Project, described earlier, and the SchoolNet Youth Employment Initiative. GrassRoots is also important in this arena.

Other SchoolNet activities have included the development of a CD-ROM in partnership with Microsoft on how to use the Internet and the Support Parents Program (SSP). The SSP is a program to show parent volunteers basic Internet skills so that they, in turn, can assist teachers and students with Internet-based classroom activities. The SSP is another example of a SchoolNet partnership - it was first launched in Manitoba two years ago as a SchoolNet pilot initiative in partnership with the Manitoba Association of Parents Councils. It was very successful and it is currently being extended to Prince Edward Island.

Issue 1

Is this a legitimate activity and necessary role for the federal government

1.1 Conclusions

Our analysis shows that the role the federal government played in facilitating connectivity prior to SchoolNet (SN)/LibraryNet (LN) introduction was highly necessary. SchoolNet is a collaborative initiative between Canada's provincial, territorial and federal governments, educators, industry, and universities and colleges. The program is designed to promote the effective use of information technology among Canadians by helping all schools and libraries connect to the Internet. SN/LN helped provide the overall vision, and was viewed as having encouraged collaboration among schools, libraries, provinces and the private sector which ultimately increased the pace of connectedness. This co-ordination role was especially necessary given that the Internet was very little used in the education context at that time. Further, many of the issues being faced in increasing connectedness (e.g., access to the mobile communications spectrum, equity of access, professional development for teachers) were pan-Canadian in scope, rather than limited to regional or provincial concerns. SN was also considered to have played an important role in overcoming ICT barriers (e.g., access to spectrum, cost of connectivity, lack of appropriate models and training for using information and communication technology, etc.). Given the cross-jurisdictional nature of the program, these findings are viewed as being supportive of the legitimate federal involvement in SN. Our analysis suggests that without federal involvement, the pace of connectedness would have been substantially slowed.

One of the key lessons learned from the SN initiative is that tension between provincial and federal parties can be overcome when both are working towards a common goal, and when parties are willing to offer resources while foregoing program control at the delivery level.

1.2 Background

1.2.1 Legislative authority

In Canada, education is the responsibility of provincial governments. The face of Canadian education, however, is changing: more and more electronic educational products are available and the availability of such products is changing the way students are taught and potentially the way they learn. To deliver these innovative products and services nation-wide, Canada has already begun to exploit an established broadcast network for education. Most provinces have developed an infrastructure to support the delivery of education and training to all their citizens.

Telecommunications, however, is a federal responsibility. Industry Canada is responsible for Canada's telecommunications policy and spectrum management, as mandated under the *Telecommunications Act* that came into force on October 25, 1993. The Act consolidated and updated laws governing Canadian telecommunications, some of which dated from 1908. Key factors underlying the need to modernize Canadian law in this field included:

- Rapid developments in telecommunications technologies and accelerated introduction of new services.
- A global trend toward greater reliance on market forces and more competition in telecommunications services.
- A 1989 Supreme Court decision that recognized federal authority over all Canada's major telephone companies (Stentor).

The *Telecommunications Act* established a new legislative framework for all federally regulated common carriers. In so doing, it provides for an integrated Canadian market for telecommunications services. In addition, it allows the federal regulator, the CRTC, to put in place a more flexible regulatory framework that will facilitate innovation and the development of Canada's principle high-technology industry. As a result, there is an intrinsic federal involvement in matters relating to communications technology, including access issues such as those that played a key role in SN's push for connectivity.

1.2.2 Federal Interest in SchoolNet

In May 1996, the federal government unveiled a plan for building the Information Highway. The government outlined a number of initiatives, in partnership with other levels of government, private industry, labor and associations, to take full advantage of the enabling potential of the Information Highway to foster Canada's

economic, social and cultural development objectives. The government's strategy is made up of four thrusts that involve the following policies and initiatives:

- Building Canada's Information Highway by creating a competitive, consumer-driven policy and regulatory environment that is in accord with the Canadian public interest and that is conducive to innovation and investment by Canadian industry in new services on the Information Highway.

- Growing Canadian content on the Information Highway, thereby strengthening our ongoing national cultural dialogue and creating economic growth and jobs.

- Realizing the economic and social benefits for all Canadians of the Information Highway and allowing them to participate fully in the emerging information society.

- "Getting government right" by ensuring better services and a more affordable, accessible and responsive government and making government a model user and a catalyst for Information Highway development across Canada.

In essence, the federal government is hoping to make information and knowledge infrastructure accessible to all Canadians by the year 2000. The goal, as stated by the Prime Minister, is for Canada to become the most connected nation in the world by the year 2000. This knowledge infrastructure will provide individuals, schools, libraries, small and large businesses, rural and Aboriginal communities, public institutions, and all levels of government opportunities for learning, interacting, business transactions and developing their social and economic potential.

These activities (and SchoolNet2's goals) are strongly tied to the government's Connectedness Agenda, which had a goal to make Canada the most connected country in the world by the year 2000. This agenda essentially seeks to foster knowledge and information skills for all Canadians. Industry Canada believes that continuing federal involvement is generally important for economic development and Canadian culture. Issues being addressed are those such as: What are best practices? How best to implement technology? How best to disseminate research and ideas? The federal government can also bring tools from a policy perspective, for example, bringing issues of learning into the government agenda or dealing with the need for a knowledge-based population in the education system through development of knowledge-based education.

1.2 3 The International Dimension

SchoolNet activities and collaborations have not been solely within Canada—the SN model is also being actively marketed internationally through the Office of International Partnerships. As of March, 1999, there were nine international agreements signed, and as of the same time in 2000 there are 16 agreements in which other countries use the SN model. Canadian firms (e.g., telecom, wireless, cable, software, ICT design consultants) have benefited from these agreements, as they frequently participate in the negotiations. Such negotiations and agreements are a legitimate aspect of federal involvement.

1.2.4 Federal and Provincial Input into SchoolNet

The many types of activities undertaken by SN are described in some detail in the previous section describing the program, as well as in Appendices G, H, and I. In this section we discuss how these activities relate to the initial need for federal involvement.

When SchoolNet first began in 1993, the Internet was quite new and no one was looking for serious uses in education, and certainly not for K-12 schools. Even in universities it was used for research, not for teaching. Usage in K-12 was non-existent. Thus there was no educational content, and certainly little Canadian content on the web. There was some minor work being done in Newfoundland and BC, where some individuals were starting to experiment.

However, information technologies were considered by many government officials to be among the major drivers for the skills required for the new economy. Trying to use information technologies to generate these skills was of great interest across the system, including at the school and school board levels. However, provinces have the mandated authority for the education system (with the exception of First Nations education, which is a Federal responsibility and is dealt with later in this report), and thus Industry Canada's involvement was by no means a given.

Industry Canada saw its main role at this time as establishing the SN Advisory Board (1993). This board provided support for the SN vision promoted by the Director General of Industry Canada's Information Highway Applications Branch. (Many respondents, from many jurisdictions, commented about the crucial role played by the vision and energy of this individual. It seems clear that, without his efforts, SN would not likely exist.) Roughly 80 people were brought together in a series of meetings to shape the vision for using the Internet in K-12 schools. This led to small pilot projects at a few schools across Canada, which shared experiences through advisory boards across the provinces. The board recommended against directly connecting the schools, but instead looked at the barriers to connecting: e.g., lack of computers, teacher competency, Canadian and francophone content,

etc. In these early times, it was an experiment with a high degree of technical content. For example, it was not known whether it was physically and technically possible to create a network of schools.

Industry Canada's role then became a catalyst for provincial interest and involvement, with Federal involvement required because of its formal mandate in dealing with the telecommunications infrastructure. Many key infrastructure issues are decided at the federal level, and prior to SchoolNet provinces had little input into these decisions. Issues such as the following needed resolution:

- Access to mobile communications spectrum, bandwidth, and other infrastructure (Industry Canada ensured that bidders provided plans for educational access).
- Access to satellite technology, and sharing of satellite channels (Industry Canada worked with a national alliance of telecom companies, Stentor, to plan such sharing).
- Pricing—should schools pay at business or individual rates (schools used to pay business rates until the SchoolNet/Stentor Alliance partnership provided a substantial discount for schools and library Internet users).
- Long-term sustainability (this is being achieved, at least in part, through leveraging and partnerships).

As SchoolNet evolved, the concept of infrastructure broadened. In the early days, there were some tensions between federal and provincial/territorial partners, mainly related to jurisdictional issues. At one point, after much of the infrastructure was in place, some provinces questioned the need for ongoing federal involvement. However, as SchoolNet expanded, and especially as more and more content was introduced, this concern faded. This trend accelerated over time as more senior officials (e.g., directors) became involved, especially during planning for SchoolNet2 (for years 1998/99-2000/2001). However, Industry Canada has focused on creating collaborations, rather than trying to lead or manage within provincial jurisdiction. The result has been the effective removal of jurisdictional boundaries.

1.3 Findings and Results from Interviews and Surveys

1.3.1 Provincial and Territorial Officials

The macro-level questions of program legitimacy and necessity can be answered in the affirmative: the Federal Government's SchoolNet (SN) and LibraryNet (LN)

initiatives are viewed by provincial and territorial respondents as being both legitimate and necessary programs. This conclusion is supported by the responses to questions 1 through 5 in Section A (Survey A).

There was general agreement that a high to very high need existed for federal government involvement in facilitating connectivity prior to SN/LN introduction in 1994, although SchoolNet was generally viewed as being more necessary than LibraryNet (A:1a). In addition, there was nearly unanimous consensus that had SchoolNet and LibraryNet never existed, the impact would have been negative or very negative (A:2). This was the response even though some friction was apparent due to federal involvement in areas usually considered under provincial jurisdiction (A:1b).

1.3.2 School and Library Purchasing Administrators

At the macro-level, school and library purchasing administrators have affirmed the necessity and the legitimacy of the SN program. Overwhelmingly, respondents have indicated that CFS has had a positive impact on the availability of computers in School Districts or provinces. While many of the CFS computers are considered 'low-end', with small hard-drives and low CPU speeds, they permit many schools to provide constant exposure to the technology for students at all grade levels. The older computers are considered useful in setting up word processing labs, or as elementary resource stations for running specific educational programs. One respondent had noted that " the original allocations of 386 computers were very useful in setting up word processing labs, business labs, elementary resource stations running programs such as Reader Rabbit, the Magic School Bus series, Broderbund Living Books, and the Accelerated Reader Program".

More advanced computers, such as Pentium's and 486's with greater hard drive space, are used differently by students in classroom settings. These computers enable students to browse the Internet, run more advanced software packages, etc. Overall, the majority of respondents (70%) stated that they were happy with the computers that they received from the CFS program. It is apparent from respondent comments that schools have found different and effective uses for both refurbished and high-end computers.

Appendix B:9 highlights that the absence of CFS would have a negative or very negative impact (80% of respondents) on School Districts/provinces. Respondents noted that the lack of additional funds will make it difficult to replace those computers currently obtained from CFS. As one respondent noted, "Schools would have to do without". Most schools would be unable to support new users, new initiatives, or replace obsolete computers.

1.4 Lessons Learned

- Federal and provincial/territorial tension can be effectively dealt with when both parties are working towards a common goal. The SN program has succeeded despite the friction which was apparent due to federal involvement in areas usually considered under provincial jurisdiction. The federal government was able to overcome this tension due to the role it played in encouraging collaboration among schools, libraries, provinces and the private sector which ultimately increased the pace of connectedness.

- The acceptance of federal involvement can likely be attributed to the willingness of Industry Canada to offer valuable resources and engage in vital partnerships, without a corresponding need for program control at the delivery level, coupled with the willingness of all provincial partners to engage in a national initiative with pan-Canadian implications. This allowed progress in several areas that are under Provincial/School District jurisdiction, but that benefitted from a national perspective (e.g., equity of access for remote/rural schools).

- The presence of an apparent champion and a well defined vision also ensures that the needed synergies are created and maintained.

Issue 2

Is there a continuing need for the federal government to invest in SchoolNet?

2.1 Conclusions

Our study shows that there is a high to very high continuing need for federal involvement to act as a champion in both SchoolNet (SN) and LibraryNet (LN) programs. Specifically, there exists a need to improve various aspects of the physical ICT infrastructure (e.g., reduce the current student-to-multimedia computer ratio of 24:1, improve access speed, etc.), deal with national policy issues (e.g., ongoing professional development), investigate best practices, and continue to foster partnerships. Our analysis shows that there is a continuing need for the federal government to invest in SchoolNet and Computers for Schools. The SchoolNet Advisory Board (SNAB) recommends that SN focus on activities that will help keep Canada "competitive" with other countries that are also in the process of investing large sums into school connectedness.

The CFS program should be continued, as it will continue to play an important role, especially for remote and rural areas. CFS computers improve the student-to-computer ratio, which permits students to improve their computer skills, thus promoting the development of employability skills which are required by Canadians to compete in today's knowledge-based economy.

A key lesson learned is that, while there is a continuing need for federal involvement to act as a champion in both SN and LN programs, the provinces must continue to be key partners, as they provide crucial funding and infrastructure, plus the private sector and not-for-profit organizations provide crucial in-kind support. The long-term sustainability and participatory decision-making processes depend on these partnerships.

2.2 Background

2.2.1 Current SchoolNet Activities

As noted in the section on program profile, the current program—SchoolNet2—is an expanded version of the original program. For example, while essentially all schools are now connected, all classrooms are not, nor has the education potential of the Internet been fully harnessed. Some specific problems to be addressed include[6]:

- Lack of useful computers, as the ratio[7] of Canadian students to multi-media capable computers is currently 24:1.
- There is unequal access to connected computers—roughly 3 times worse in remote and northern areas.
- Insufficient bandwidth—most schools have poor or slow Internet connections, especially for multiple computers.
- High cost of connectivity—annual charges in Newfoundland, for instance, run from $25,000 to $55,000 per year, per school, depending on type of access.
- Lack of ICT skills—mandatory ICT training is only required in 30% of schools.

Industry Canada continues to work with the provinces and the private sector to build collaboration in SchoolNet2. It is believed that there is still an ongoing and growing need for services coast to coast, and SN can play a brokerage role in helping to facilitate national development. For instance, the SNAB and sector councils, and other associations, have approached SkillNet.ca to develop orbit sites and career recruitment systems, and SN has assisted Atlantic provinces in developing a compendium of ways to connect that might not otherwise have existed. As well, there are continuing physical infrastructure issues including developing policies and goals for next generation satellite high-speed access for remote communities. Another is working with the CANARIE network to ensure

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6 Source for bullet information *Second International Technology in Education Study (SITES)*. October 12, 1999.

7 Roughly 1 in 5 Canadian computers is a 386 or better, and about 1 in 3 of these is multimedia capable. Source, Industry Canada.

high-speed access for rural and remote schools. Industry Canada recently ensured that this network's mandate specifically allows for connections to schools and school boards. (Although technically education is in CANARIE's mandate, the network is more focused on research centres, rather than education).

While demand is building, infrastructure is not being built fast enough, especially for rural and remote users. The SchoolNet partners are trying to build up this infrastructure as fast as possible; this includes attempts to improve various policy and content tools. There are many signs of success. For example, Canada is now acting as a model for the world, and the model is being sold (on a consultative basis) to other countries by the Office of International Partnerships. Another perspective is that when provinces provide education services, they naturally do so for their own jurisdictions. SchoolNet, on the other hand, is a platform for collaboration. Further, whil provincial programs end at provincial boundaries, many necessary services are naturally pan-Canadian. A good example is the Canadian Policy Administration Network (CEPAN), which provides on-line resources for school trustees and administrators.

For now, SchoolNet continues to facilitate national collaboration and communication and it has encouraged Ontario to provide newsgroups on a national basis. Industry Canada is making a conscious attempt to "decentralize" SN—to put the control into the hands of educators, students, and parents, and one can easily see the impact of this by searching the SchoolNet website for user-created content.

2.2.2 Future SchoolNet Programming

SchoolNet Advisory Board (SNAB) recommends that future programming focus on ensuring high-speed access for all Canadian schools and libraries. Program features have been negotiated through SNAB, including input from senior-level officials, and SN is again seen as a joint venture of federal and provincial entities.

2.2.3 The International Context

Future programming should be seen within the international context. It is felt by Industry Canada that while previously Canada was a world leader (being the first country to connect all its schools and libraries), many other nations have caught up or even passed Canada in terms of infrastructure. These international initiatives have focused not just on connectivity, but on high-speed access, multimedia capability, etc. (This has partially driven Canada's involvement with the CANARIE network.) For example, see the chart below.

Country	Activity	Budgets
United States Department of Education	All 2 million classrooms on-line by the end of year 2000 50% of classrooms will use ICT 5 1 student multimedia computer ratio 60% of teachers, administrators, librarians trained in ICT	About US$9 billion over 1998-2000
Country	**Activity**	**Budgets**
Other programs within the United States	Other initiatives by Universal Service Administrative Company, Technology Literacy Challenge Fund, Next Generation Technology Innovation program, Regional Technology in Education Consortia, Technology Leadership Activities, etc These support access, use of ICT in classrooms, professional development, etc	Total relevant expenditures (these programs plus those of the Dept. of Education) will be roughly US$17 billion through year 2000
Sweden	Fiber optics have been put into all schools in Sweden to allow broad band access	Ministry of Education invested roughly CDN$342 million since 1999
Australia	Two federal government initiatives Department of Communications, and Department of Education, Training, and Youth Affairs Every Australian to have ICT access World-class ICT infrastructure, high-speed access All government services on-line by 2001 All business aware of e-commerce benefits Global leader in applying ICT to vocational education and training by 2004	Combined federal initiative expenditures roughly CDN$347 million
Australia	Decentralized approach through individual state and territories, aimed at supplying computers, connectedness, professional development, etc	At least $500 million in total

2.2.4 Concerns

There have been some recent sensitivities with respect to federal involvement, for example, from the Council of Ministers of Education (CMEC). This appears to be more a question of process than jurisdictional difficulty. However, SchoolNet is sometimes perceived as being too hurried in devolving activities to the provinces (especially if the provinces didn't ask for the responsibility and don't have the resources). As a result, there may be room for more consideration of transition plans, bridge financing, etc.

2.3 Findings and Results from Interviews and Surveys

2.3.1 Provincial and Territorial Officials

There is general consensus that a high to very high need exists for continuing federal involvement in both the SchoolNet and LibraryNet programs (A:6a). This is also evidenced by respondents' understanding of the negative to very negative impact that would result if funding was terminated (A:7), even given acknowledged jurisdictional tensions (A:7).

There is a consistent sense of the important to very important role that both SN and LN will play in helping to foster connectedness among schools and libraries in the future. In fact, all SN/LN characteristics were rated highly (A:8). The same conclusion can be drawn with regards to the future role in helping to develop on-line educational and library resources (A:9).

For both SN and LN, technical or infrastructure concerns were seen as the main current barriers to ICT development, including issues such as computers being too old and slow, Internet connections being too slow; a lack of high-speed, high data rate communications and not enough access to technical ICT support (A:10). In general, SN/LN was seen to have had an important role to play in overcoming all barriers (A:10). In terms of future funding priorities, both SN and LN respondents identified key areas as being those related to consultation and strategic planning with stakeholders, fostering innovation and skills, evaluation and measurement of impact and performance, and helping to develop education and library content partnerships (A:11).

2.3.2 School and Library Purchasing Administrators

A current need exists for additional computers to be supplied by CFS. Appendix B:10a reveals that, regardless of area, the majority of School Districts require additional computers. Specifically, all respondents believed that Schools Districts in remote areas have a high need (a rating of 4 or 5, on a needs-based rating scale)

for additional computers, followed by School Districts in rural areas (86% of respondents), and urban areas (60%).

Respondents indicated that CFS has had a high impact (a rating of 4 or 5, on a 5-point impact scale) on two-thirds (66.6%) of School Districts in remote areas (B:3). School and Library Purchasing Administrators noted a lesser impact on urban (16.7%) and rural (22.2%) School Districts.

The majority of respondents (80%) did indicate that discontinued funding to CFS would have a negative impact on the availability of computers for schools and libraries. The majority of School Districts lack the budget to supplement the computers received from this program. As one respondent noted " it would have a negative impact because we are now receiving very little funding for computer technology, except for special projects. We would not be able to support new users, new initiatives, or replace obsolete computers."

The number of upgraded computers, reported by School and Library Purchasing Administrators, that an individual School District would require over the next 3 years ranged from 0 computers to 1000 computers (B:10b). The total number of Internet-capable computers that individual School Districts require ranged from 0 to over 600 computers. The demand for computers varies significantly by School District. It is apparent from the comments that the need is greater than current allocations for some schools, while for others, they are able to be more selective and will no longer accept computers that do not meet the needs of the curriculum.

In general, an increased number of computers within each School District will help to decrease current student-to-computer ratios. The obvious benefit to a decrease in this ratio is that students would be able to increase their exposure to computers. CFS supplies both refurbished and high-end computers which satisfies the specific needs (e.g., word processing, Internet research, etc.) of School Districts.

2.4 Sustainable Development

The long-term success of SN is clearly tied to the joint efforts of federal, provincial, and private sector and not-for-profit organizations. Without all parties being involved, SN could not survive. Further, SN is run with respect for participatory decision-making processes through very broad representation of interests right down to the classroom level.

2.5 Lessons Learned

- There is a perceived need for continued federal involvement, which is viewed as providing needed stability. The success of this program is also indicative of improved federal/provincial relations.

- While there is a continuing need for federal involvement to act as a champion in both SN and LN programs, one can not ignore that it is the province who is providing the needed funding and infrastructure for the program.

Issue 3

What has been the impact of SchoolNet under the Computers for Schools program on increasing the availability of computers for use in schools and libraries?

3.1 Conclusions

The analysis demonstrates that Computers for Schools (CFS) has had a high impact on the number of computers available at schools. To date, the program has delivered approximately 200,000 computers. Provincial technology purchasers thought about half the schools and libraries would have obtained no additional computers in the absence of CFS. For the other half, these respondents believed the number of computers obtained (mainly through donations) would have been roughly half as many as CFS supplied. The CFS computers have also generally had high usage: e.g., for developing familiarity with software, as a curriculum resource, etc. Many were also used as a source of "spare parts", or to "tear down" for students learning about computers. CFS has helped narrow the gap between the number of computers available in urban areas, and those in rural and remote areas. Overall, our analysis shows that CFS machines met the schools' needs moderately well, although many of the machines were dated and unable to run current software or be easily connected to the Internet or with existing systems.

School and library purchasing administrators indicated that there continues to exist a need for CFS computers. However, many respondents noted that future CFS computers should meet minimum configuration standards (e.g., Pentium processor, Windows 95 or newer, 32 MB RAM, 1 GB hard drive, CD-ROM, etc.), so that the increasingly advanced technologieal needs of School Districts are met. (Note that such capabilities were not part of the original CFS mandate.)

Another issue is that many librarians believe that SN has focused heavily on school and School Board/District issues, with relatively little thought and effort being put into LibraryNet issues and concerns: this should be addressed for the future.

3.2 Background

3.2.1 Program History

Established in 1993, CFS complements the SchoolNet program and contributes to the federal *Connecting Canadians* initiative by providing schools and libraries with used computers donated by government and private sector sources. This has been done in partnership with dozens of organizations and hundreds of volunteers. Industry Canada's direct contribution to CFS over 1995/1996 through 1999/2000 was approximately $18 million

The CFS goal is to deliver 250,000 computers to Canadian schools and libraries by March 31, 2001[8]. As of the end of March, 2000, over 200,000 computers have been supplied, roughly 6,000 computers are being delivered per month, and the program is ahead of its milestone targets. Technical support has also been provided at 52 sites across Canada to assist users to set up and use the technology. Provincial governments also contribute, by donating surplus computers and/or providing financial resources for the operation of CFS within their provinces. Allocations within each province are made through the CFS Provincial Advisory Committee (PAC), although the exact mechanism varies by jurisdiction. However, program policies included criteria to ensure that the allocation was equitable and according to need. See the program profile section, or Appendices G, H, and I for more details on some of the partnerships and programs through which CFS operates, and the discussion of Issue 8 has details on financial leveraging.

3.2.2 Future Directions

A variety of options are being considered as the SchoolNet Advisory Board (SNAB) has identified a gap or weakness to the degree of available/appropriate computers. Due to the rapid expansion of material available on the Internet, and the increasingly complex nature of this material (thus requiring high speed file transfers), the computers required in classrooms will need to be correspondingly more sophisticated. In particular, they will need to support high-speed Internet access, and multimedia presentation. Some SNAB recommendations included[9] that CFS be continued, but that computers be first upgraded to help meet current requirements (including multimedia capability, Internet capability, and upgraded hardware and software), with provincial and School Boards assistance; that

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8 Canada's Computers for Schools National Program Policies, Regional Operations *Industry Canada Undated, Version 2.0*

9 Final Report and Recommendations to the SchoolNet Advisory Board *Computers for Schools Working Group, October 14, 1999*

computer use and technical needs be documented and reported; and that increased technical support be made available.

3.3 Findings and Results from Surveys

3.3.1 Provincial and Territorial Officials

With regards to the Computers for Schools (CFS) program, LibraryNet (LN) respondents provided a higher rating of both the success that had been met to date, and of the future importance of the program, than did SN respondents (A:3; A:8), although both were generally happy with CFS. A similar finding for the importance of future funding of CFS was also noted, with LN respondents being more favourable than SN respondents (A:11). Respondents indicated that the provision of computers also helped considerably in the connectedness agenda (particularly for rural and remote schools and libraries) (A:3, A:5), and that this help is considered to be necessary and desired in the future, especially as it relates to accelerating the pace of connectedness (A:8).

3.3.2 School and Library Purchasing Administrators

Appendix B:1 provides a breakdown of the number of computers that were present in schools and libraries prior to the CFS program versus the current total. It is apparent from this table that schools have been able to increase the number of computers as a result of the CFS program. The number of computers provided to each School District ranged from 77 to 1121, with the average number supplied at approximately 361 computers.

Only about one-half (54.5%) of school and library purchasing administrators mentioned that the school district would have been able to obtain some computers from other sources if CFS had never existed (B:2a). Respondents estimated that these would have been roughly half the number supplied by CFS. The most common source for these replacement computers (B:2b) would have been from donations — with one-third (36.4%) of respondents stating that the donations would likely come from private individuals or not-for-profit organizations, and another one-third (36.4%) of respondents stating that the donations would come from the private sector. While some schools might have been able to obtain computers from other sources, many would have had difficulty locating the needed funding, and School Districts would have struggled to provide the needed technological infrastructure to its students.

Respondents have noted that the computers supplied by CFS are needed. Regardless of whether the school was urban, rural, or remote, the majority of respondents gave a rating of moderate to high when noting the degree of usage for

the computers provided by CFS. (See Appendix B:5) Only a small percentage (12.5%) of respondents noted a low usage of CFS computers in rural areas.

While CFS computers were well-used, and a majority of respondents were happy (or very happy) to get them, these computers did not meet all of the needs of the School Districts, and roughly a third of these respondents were not especially taken with the CFS machines (B:7). Appendix B:6 reveals that school and library purchasing administrators noted that the needs of urban areas in particular are poorly met (a rating of 1 or 2, on a 5-point rating scale). Some of the computers supplied by CFS are old and require significant maintenance and numerous service calls. Many of the upgrades are costly and strain School Board budgets. One respondent noted that some schools are no longer accepting CFS computers as "they are not satisfactory to the needs of the curriculum". Many respondents believed the minimum CFS standard should be raised. Respondents suggested that the minimum useful configuration for CFS computers be a Pentium processor with Windows 95 or 98, 32 MB of RAM, 1 GB Hard-drive, and include a CD-ROM and Sound card.

3.3.3 Teachers, Principals, and Library Administrators

The SchoolNet program is designed to promote the effective use of information technology amongst Canadians by helping all schools and libraries connect to the Internet. One-half (51.8%) of respondents regarded SchoolNet's role in fostering connectedness through the delivery of computers via Computers For Schools (CFS) as being important (receiving a rating of either a 4 or 5 on a 5-point importance scale). A slightly smaller percentage (36.[illegible]%) agreed that LibraryNet played an important role in increasing connectedness through the delivery of computers via CFS.

Appendix C:5 provides a breakdown of the number of respondents that have received CFS computers and their ability to identify which ones they received through this program.[10] Only about one-half (51.8%) of respondents were aware if their school had received computers from CFS. This may indicate some potential for increased marketing of the CFS program. Of the respondents that were aware, approximately 91% knew which computers came from the CFS program.

Those respondents who could identify the number of computers in their school prior to, and after CFS, revealed that their school had received an average of 12.4 CFS computers. Further analysis reveals that schools in remote areas received on

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10 *This question was asked in order to determine the specific usefulness of CFS computers, as opposed to the schools' computers in general*

average fewer computers — only 6.5 CFS computers. Schools in rural and urban areas received on average the same number of computers from CFS — approximately 14 computers. Appendix C:6 also reveals that most respondents had an average of 44.3 computers at their school prior to CFS.

CFS provides schools with greater access to computer technology. However, only a small percentage of teacher/principal/library respondents (10.9%) stated that they would not have been able to obtain any additional computers had CFS never existed. Appendix C:7a reveals that a larger percentage of respondents (45.5%) believe that their school could in fact have obtained computers from other sources. The most common source cited was from the re-allocation of normal School Board budgets (C:7b—57.4% of respondents). Note that the provincial technology purchasers (cited earlier) thought about half the schools and libraries would have obtained **no** additional computers in the absence of CFS. For the other half, these respondents typically believed that additional computers would be obtained mainly through donations, **not** through School Board budgets. Given that the technology purchasers are probably in a better position to know the pressures on the School Board budgets, we believe that the teachers were probably mistaken in their optimism.

Although few respondents mentioned that their school would have been unable to obtain additional computers from sources other than CFS, close to three-quarters (72%) stated that the impact of CFS has been high or very high on the availability of computers in their school (C:8). Open-ended comments reveal that many respondents relied on CFS computers for parts that permitted the repair/upgrade of aging equipment. These computer parts enabled schools to direct financial resources towards other areas. CFS computers that were operational permitted schools to offer students public Internet access and other capabilities (CD-ROM, word processing) on a greater number of workstations.

Appendix C:10 provides a breakdown of how CFS computers have been used for teaching and or/administrative purposes. Computers supplied by CFS are most often used (at least several days a week) as a curriculum resource for students (65.7% of respondents), to permit teachers/principals/librarians and students to develop a greater familiarity with software programs (63.4%), and to help develop keyboard skills (53.7%), but also for other reasons such as a resource for preparing lessons, for students' non-curriculum purposes, and (much more rarely) as a resource for administrative staff. On the other hand, over one-half (56.9%) of respondents stated that CFS computers were seldom or never used as a resource for administrative staff. However, respondents did note that the main reason that CFS computers did not meet administrative needs was the result of where the computers were placed in the school. Computers located in libraries are not easily accessible for administrative purposes. Some typical comments included:

"The 286 computers . . .from CFS were used to develop web pages for about half the schools in the board. This would have been impossible without them. These computers are now being used by the new Computer Engineering Technology classes so that students can disassemble, learn about, and reassemble computers and learn how to troubleshoot them."

"Computers for Schools is a great program that has had a tremendous impact here. Students use the computers all the time and now can participate in a variety of other things such as tele-collaborative projects and other curricular needs. Here . . ., it is great to get donated computers that work so well. Of all SchoolNet related things, CFS has been the most useful. Grassroots funding is a close second."

"Each student in my Grade Two class has truly benefited from the enhancement of computer literacy gained through the availability of computers in the classroom. Oh, for a laptop on each student's desk! My class would have viewed paper and pencil as relics of the past."

In a library setting (C:11), computers supplied by CFS were most often used for access by library patrons (34.4% of respondents), and by library staff (30.9%). Less common uses for computers located in the library included training member librarians and for Internet courses.

"Without this program, our library would have not been able to offer the public Internet access and other (CD-ROM, word processing) capabilities as early or in as great a number of workstations."

Overall, respondents noted (C:12) that the computers supplied by CFS met the needs of their school as a student resource well or very well (60.6% of respondents), followed at a distant second as a teaching resource (49.2%). The computers were least likely to be viewed as a good administrative resource (15.2%) or library resource (40.7%).

Overall, however, there were negative comments about the dated nature of the machines supplied, making them difficult or impossible to connect to the Internet or existing systems. Typical comments included:

"None of the six [computers] that this school has received have been used - to this day, none work. They do not have the hardware required to be useful, they have broken, and so on. Overall, a waste of time, and they have resulted in a loss of access to usable technology. Throw-away machines do not help students."

"Some of these computers are stripped or have different configurations and software than we need. With minimal technical support we are left to "fool around" with these in the evenings in our spare time . . . in addition to all the other jobs we have to do."

"Needed upgrading as soon as we got them. Time and efforts and funds into second-hand computers."

3.4 Sustainable Development

The CFS program has contributed to social equity, in that it has helped narrow the gap between the numbers of computers available in urban areas, and those in rural and remote areas.

3.5 Lessons Learned

- Respondents of the various surveys have commented on the 'difficulty with logging on to the Internet' or to the slowness of the connection. These problems are related to the configuration standards of the computers, as well as other factors such as the speed of DirecPC connection and the bandwidth available. This is due to the rapid expansion of material available on the Internet, and the increasingly complex nature of this material (requiring high speed file transfers), the computers required will need to be correspondingly more sophisticated. CFS should consider monitoring its environment in terms of setting configuration goals. (Note that Internet connectivity was not a goal of CFS during SN1.)

- If CFS is to have a goal related to Internet connectedness in the future then computers with minimum configuration standards need to be distributed.

- Perceived limited resources invested in LibraryNet — less effort has been put into determining the programmatic and resource needs of libraries, librarians, and library users.

Issue 4

What role has SchoolNet played in increasing connectedness among Canada's schools and libraries?

4.1 Conclusions

Our analysis shows that SchoolNet has been successful in numerous areas with respect to increasing connectedness, including helping craft a national vision, building awareness of information and communication technologies (ICT) in learning; helping find ways to use the Internet effectively in the classroom and library; encouraging collaboration among stakeholders; and generally ensuring connectedness for schools and libraries. In fact, all aspects reviewed were rated relatively highly, with the single exception of helping solve technical ICT infrastructure problems, which was rated lower in importance. Respondents from First Nations (FN) schools revealed that SchoolNet has substantially augmented the total number of computers connected to the Internet. Without FNSN, most respondents noted that the total number of computers connected to the Internet would have halved — from an average of 12.8 computers to only 6.1 computers per school. Overall, our analysis suggests that the program has provided the impetus for schools to become connected, and to ensure that students are provided with the means to become more technically adept with computers. It has also helped improve equity of access to the Internet, regardless of geographic location.

4.2 Background

For SchoolNet1, Industry Canada's goals were to (1) support connectivity and provide technical and policy support; (2) share best practices through partnerships; and (3) investigate barriers to ICT connectivity[11]. (Note that SN did not attempt to pay for connectivity, but instead to address barriers to achieving it.) The first goal has been

11 In terms of investigating ICT barriers, this can be thought of in terms of Industry Canada providing "supply push" in removing impediments and improving technical infrastructure

described in detail in earlier sections. The Deputy Ministers of Education from all provinces have submitted letters confirming that all schools have been connected. A general summary of SN timeline and goals is found in the following table.

Program	SN 1 1995-96 to 1998-99	SN 2 * 1999-00 to 2000-01	Proposed SN 3 2001-02 to 2003-04
1. SchoolNet Connectivity Policy & Partnerships	• 1 internet connection in all schools and libraries	• Equivalent of 1 connected computer per classroom	• High speed connectivity & access to multimedia
2. SN Portal & Online Learning Resources	• International leader • 1000 authorized education resources available for use	• Availability of infrastructure e.g. metadata access registry to support and facilitate connectivity and use	
3. Computers for Schools	• Delivered 125,000 computers	• Deliver 250 000 computers	
4. First Nations SchoolNet	• 1 internet connection in all FN schools wishing to be connected	• Connect 610 First Nations communities (654 total including remote non-FN communities)	
5. LibraryNet	• 1 internet connection in all libraries	• Public access terminal in every library	
6. SchoolNet GrassRoots	• Complete 3 000 classroom projects	• 17 000 more projects in progress	
7. SkillNet.ca	• Campus Worklink created 6 SkillNet.ca orbit sites, includes 170 000 job seekers and 40,000 employers	• Additional SkillNet.ca Career and Recruitment sites built and interconnected under SkillNet.ca	
8. CanConnect	• Launch of CanConnect • Prime Ministers Awards for Teaching Excellence to recognize outstanding contributions within the teaching profession	• Development of CanConnect Youth ICT Skills Certificate • Securement of 45 signatories • Launch of Canada's IT Week	
9. Office of International Partnerships	• Expected to raise $10M in agreements, but achieved $14M	• Projected to achieve $20M in agreements	
10. Multimedia Learnware	"	• Support the development of world class Canadian learnware and internet applications • Expand the market for Canadian PSE on-line learnware • Facilitate improved connections between learnware supply and demand • Ensure Canadian contribution to international standards for learnware	
11. Network of Innovative Schools	"	• Up to 54 NIS schools: 60 honour role schools • 270 mentored schools	

* Only SchoolNet Connectivity, CFS, FNSN, and GrassRoots were official goals of SN 2. Other aspects of the SchoolNet Portfolio are part of the overall strategy as detailed in the SchoolNet Pyramid.

Partnerships have been crucial to SN's success. Examples of partnerships that supported connectivity include creating pilot projects with private sector companies at the beginning of SN (e.g., working with Rogers on bi-directional cables), and the very successful partnerships with about 60 companies for provision of technology, service or software, including working with the telecom companies to abolish long-distance Internet rates for schools and obtaining toll-free access from Bell Canada in Ontario. SchoolNet also actively looked at new technologies to obtain more bandwidth at lower cost, worked with the francophone communities to get French characters into the Internet, and, provided CFS computers. The SchoolNet partners worked with educational groups to build Canadian content for the Internet and built the SN website. Further work linked educators to each other, built new projects, showcased ICT technology, and monitored the status of connectivity across the country and abroad. Originally, SchoolNet hosted the majority of SN websites centrally, however, it has devolved as groups are building their own resources and hosting them on their own websites (although content is

reviewed to ensure quality control and support is received from SN[12]). Further details on financial implications of partnering are discussed relative to Issues 8.

A significant barrier addressed was that of professional development. Initially, some teachers saw the Internet as a threat, rather than an opportunity, in that some parties believed teaching could be done using fewer staff and more technology. Considerable effort was made both to educate teachers on the use of ICT (e.g., the professional development mentioned earlier, SchoolNet sponsored a literature review regarding best practices in the use of ICT technology for pedagogical purposes, a CD was obtained from Microsoft on using the Internet, etc.), and to allay these concerns (e.g., emphasizing that resources were teacher-mediated, such as the teacher-lead GrassRoots projects). Many other barriers to ICT use were addressed by SchoolNet, and these are discussed in more detail in the following sections discussing survey results.

4.3 Findings and Results of Surveys

4.3.1 Provincial and Territorial Officials

There was an overall sense of SN having an important role in helping to foster connectedness among schools and libraries (A:3). This was particularly true in helping to accelerate the pace of connectedness and in crafting a vision, and to a lesser degree in encouraging collaboration among schools, libraries, provinces and the private sector; and in helping to promote and support professional development for teachers and administrators for using the Internet. There was less importance placed on SN helping to support the development of on-line learnware and the growth of learnware suppliers, in helping to solve technical hardware, software, and IT infrastructure problems, and in helping to obtain access to low-cost, high-speed telecommunications, software and hardware. Overall, provincial and territorial officials viewed SN's role, as a leader in creating and maintaining cross-jurisdictional dialogue, as being very important.

4.3.2 Teachers, Principals, and Library Administrators

Responses from teacher/principal and librarian users regarding the importance of SchoolNet's and LibraryNet's role in helping to foster connectedness among schools and libraries are presented in Appendix C:1. The table presents a high-level

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12 For some parties, the Internet is not perceived as a safe place to be. Certainly there is considerable material that is inaccurate, pornographic, etc. SN provides a guaranteed safe site, and discussion groups are monitored. There are still issues to be addressed as it is difficult to restrict general Internet access without losing the Internet's usefulness as a research tool.

breakdown of user responses. At first glance, it is apparent that respondents viewed the role of SchoolNet as being more important overall when compared to the role of LibraryNet in fostering connectedness.

Specifically, SchoolNet was viewed as having played an important role (receiving a rating of either a 4 or 5 on a 5-point importance scale) in:

- building awareness of information and communication (ICT) technologies in learning (67.6% of respondents);
- helping find ways to use the Internet effectively in the classroom and library (65.4%);
- and in encouraging collaboration among schools, libraries, provinces and the private sector (65.2%).

LibraryNet was viewed as having played an important role in:

- helping to ensure connectedness for rural and remote schools and libraries (58.8%);
- building awareness of ICT technologies in learning (51.2%);
- and in helping to accelerate the pace of connectedness (50.6%).

Both SchoolNet and LibraryNet were considered to have played a lesser role in helping to solve technical, software, and IT infrastructure problems, and in helping to support the development of on-line learnware and the growth of learnware suppliers. However, it should be noted that learnware is a SN2 goal and was not a SN1 goal.

Teachers and principals are more likely to view the role of SchoolNet in fostering connectedness favourably than were librarians. Conversely, librarians were consistently more likely to rate the importance of LibraryNet's role favourably than were teachers/principals. Respondents' familiarity with either LibraryNet or SchoolNet is likely to account for the difference in ratings.

There are differences in responses according to the location of the respondent. Only one-third (33.3%) of respondents in remote areas viewed the overall role of SchoolNet as being important in fostering connectedness among schools and libraries, while respondents in urban (56.7%) and rural (61.5%) schools gave a more favourable assessment. In general, urban and rural respondents assessed the role of SN favourably and rated it well in the following areas: building awareness of ICT technologies in learning (68.7%); helping to find ways to use the Internet

effectively in the classroom and library (66.7%), and in encouraging collaboration among schools, libraries, etc. (66.7%). Respondents in remote areas viewed SN as playing an important role in: helping to accelerate the pace of connectedness (60%); building awareness of ICT technologies in learning (42.9%), and in crafting a vision which will help promote and support federal and provincial interests (40%). Overall, responses from respondents in remote areas are significantly lower than those in urban/rural areas with regards to their assessment on SchoolNet.

On the other hand, respondents in remote areas were more likely to view the overall role of LN as having played an important role (80%) in increasing connectedness. Specifically, it was noted that LN played an important role in: helping to ensure connectedness for rural and remote schools and libraries (83.3%); accelerating the pace of connectedness (80%); providing computers through CFS (80%); and supporting the development of on-line learnware and the growth of learnware suppliers (80%).

4.3.3 Survey of First Nations Schools

First Nations SchoolNet has helped to connect First Nations schools, under federal jurisdiction, to the Internet through DirecPC satellite technology. On average, respondents mentioned that their schools had 1.9 computers connected to the Internet prior to FNSN and the DirecPC connection. Today, the number of FN Schools with computers connected to the Internet ranges from 0 to 60 computers, with the average number of computers connected to the Internet at 12.8. Rural schools, on average, had fewer computers (average of 12.4 computers) connected to the Internet than remote schools (average of 14 computers).

The average number of computers connected to the Internet has increased significantly with the involvement of the FNSN program. Respondents assessment of the total number of computers that would be connected had FNSN never existed reveals that the level of connection would have decreased (likely halved). Most schools would estimate that an average of 6.1 computers would be connected to the Internet, which is a significant decline to the average 12.8 that are currently connected.

Appendix D:7 reveals that one-half (53%) of respondents stated that their school/library would be connected to the Internet even if FNSN had not existed. (Given the financial and technical problems found in D:6, these respondents may have been overly optimistic.) Approximately 18.1% of respondents were definitive in their belief that their school/library would not be connected, and the remaining 28.9% did not know. Although many respondents are confident that their school/library would be connected to the Internet, many acknowledged that FNSN enabled the Internet connection to occur at an earlier date (D:8—72.9%). Two-thirds (64.6%) of respondents stated that a delay of at least 6 months would have

resulted had FNSN not spearheaded connection of schools via the Internet. The funding provided by FNSN created an incentive that kick-started this initiative. Typical comments included:

> *"FNSN created the incentives and support to increase the capacity of our educational system to advance our technology opportunities."*
>
> *"We would not have Internet access available for student/community without the SN program."*

The main reasons that schools/libraries were not connected to the Internet prior to FNSN was due to the lack of computers and the lack of funds to enable connection. Respondents acknowledged that lack of financial funding and technical know-how prevented the installation of computers, and the connection of these computers to the Internet. The location of many schools also inhibited the degree of connection, as some lines were still being laid in some communities. Some respondents also noted their lack of familiarity with the Internet and its many uses. Lack of community awareness contributed to the slow response, on the part of many schools, of Internet connection.

Prior to FNSN the most common Internet connection that schools/libraries possessed was achieved via land line connection (27%). Appendix D:4 highlights the current most common Internet connections — with two-thirds (68.5%) citing DirecPC connections, followed closely by land line connections (42.7%). While the majority of respondents are currently connected with DirecPC, respondents acknowledged that if FNSN had never existed that few (3.4%) schools/libraries would be connected via this type of Internet connection.

4.5 Sustainable Development

SN has helped contribute to equity in terms of the connectedness of all schools to the Internet, regardless of geographic location.

4.4 Lessons Learned

- A clear and specific educational campaign is needed for stakeholders (e.g. teachers) conveying the benefits of connecting all classrooms. Considerable effort was needed to allay teachers concerns of having the Internet result in fewer staff teaching as a direct result of an increase in technology. Effective educational efforts that were used to educate teachers included distribution of CD's on the use

of the Internet, literature review on the best practices in the use of ICT technology for pedagogical purposes, etc.

Issue 5

What has been the role of the program in providing educational resources?

5.1 Conclusions

In general, our study shows that SchoolNet was viewed as having played an important role in developing on-line educational and library resources. Its ability to develop resources of interest to users on a national scale, and to identify resources useful for many different types of users (teachers, students, administrators, parents, etc.) has been significant.

There is a very wide variety of resources available through SchoolNet. Virtually all have been developed through partnerships, and control over these resources is deliberately decentralized, with broad participation consistent with sustainable development. It has been a learning process to develop content that is actually used and useful. A key lesson is that the resource must be designed with knowledge of how it will actually be used in the field; this is especially true for resources designed to be used in classroom settings. For instance, a classroom resource that loads quickly is probably more useful than one that is "glitzy". The GrassRoots program stood out as being both useful and most often used by respondents. This program, which showcases and sponsors teacher-designed Internet-based classroom projects, was considered the most useful and most often used on-line educational resource. The other programs were less frequently used as resources by students and teachers, and were rated as lower in usefulness, *on average*, than GrassRoots. In our opinion, this is not necessarily a negative result—a resource which is highly useful, but for a relatively small sub-set of users, will have a modest *average* rating of usefulness. It does mean, however, that careful attention should be paid to ensure that products/activities meet the needs of current classroom curricula and settings, and that they are highly useful for at least some parties.

5.2 Background

5.2.1 Development process and products

When SchoolNet first started, there was close to no Canadian content on the Internet. Furthermore, French language characters were considered "illegal" and Internet gopher-based tools could not interpret these characters. Through the advice of the SchoolNet Advisory Board, SchoolNet decided to run a Virtual Products program to support the development of educational resources. This was part of SchoolNet's strategy of "content pull" rather than 'technology push' to facilitate the connectivity of schools and libraries.

SchoolNet has since been heavily involved in supporting the development of educational resources available on-line. These resources include material of use to teachers in creating curricula content; material of use for students both for curriculum purposes and for personal interest (such as finding post-secondary employment using SkillNet.ca); material useful for parents; and material of use to school and library staff for administrative purposes. Specific examples of educational resources available on-line are described in more detail in Appendix G. As individual schools and associations set up their own pages on the SN website, the number of resources has grown immensely[13].

Development of formal material is done by provincial educational networks, using input down to the classroom level. The content usually reflects information that School Boards/Districts or schools want developed, as determined by provincial or district user surveys (e.g., through the Canadian Teachers Federation for content relevant to teachers, or through provincial Principals' and Vice-Principals' associations for these individuals). Control of resources is often being decentralized. For example, SN has transferred GrassRoots back to the provinces and schools. The federal involvement is focused more on global infrastructure resources (e.g., development of metadata), rather than the educational material itself.

5.2.2 Lessons learned

The resources themselves have evolved over time. Some have had good reviews and have expanded (e.g., the First Nations website was selected as the best

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13 In fact, SN is quite unlike the typical program, in that the sheer number of sub-programs and resources is so large. This results from the decentralized nature of the program—all partners, including individual provinces, education and library associations, schools, and even classrooms have input into content. The result is beyond the capability of the printed page to easily display, and we suggest the reader visit the website (http: www.schoolnet.ca) to see the range of products and services available.

aboriginal site by Yahoo); others have been less successful and have disappeared. This is a normal feature of Internet-based content. Some of the lessons learned about content have included:

- It is difficult to predict what will be successful and what won't. On the successful side, for example, Canada's Digital Collections (digitized text, images, and audio/video for heritage museums and libraries) was originally considered to be of limited interest, but traffic on the site "exploded". The enormous appetite for seeing Canadian heritage on a screen was unanticipated, probably because it was much easier to use than the typical heritage "paper products" that were under severely restricted access for typical users.

- "Treevia", on the other hand, didn't work. This was a joint project with Forestry that tested the users' knowledge of forestry. It enjoyed very little traffic, as it did not fit well into the classroom situation.

- Sites do not have to be "glitzy". (In fact, products must download quickly to avoid pupil unrest. This implies that sites with lots of images and motion are to be avoided.) The Learning for Sustainable Future site is not very interactive, but the substance is good, and has proven to be a good research resource. WetNet (about sustainable wetlands), on the other hand, had lots of "glitz" to it, but did not properly address how it would be used in the classroom.

- It is necessary to understand how a product will be used in the school system and by individual teachers in a teaching setting. This may vary depending on how the school was connected. For example, if there is only one computer in the library, a product that required full class participation will not work well. It is important to note, however, that the nature of use is a "moving target" as educators become more familiar with web-based learning and as the infrastructure improves.

5.3 Findings and Results of Surveys

5.3.1 Provincial and Territorial Officials

There was general agreement that SN had had a moderately high to high role in various aspects of on-line education and library resource development (A:4). There was some difference in the understanding of the overall importance among SN and LN, with LibraryNet's role being regarded more highly than SchoolNet's. Still, there was general agreement about the importance of many pan-Canadian SN services, including developing Internet content, content relevant to teachers and

librarians, helping with student career placement, and in acting as a central node for new ideas, communications, and collaboration. Other aspects were rated slightly lower; e.g., the importance of empowering teachers to help develop educational content, in helping to identify and address the needs of teachers, librarians, and administrators, in helping bring suppliers and developers together with individuals and organizations that use and purchase learnware, and in helping to develop Francophone Internet content. However, it is useful to note that most of the items listed in A:4 were rated as moderate in importance or higher.

5.3.2 Teachers, Principals, and Library Administrators

Responses from teacher, principal and librarian users regarding SchoolNet's and LibraryNet's role to date in helping develop on-line educational and library resources are presented in Appendix C:2. These are roughly consistent with the views of the provincial and territorial officials. However, it is apparent that respondents viewed the role of SchoolNet as being more important overall when compared to the role of LibraryNet in the development of on-line educational and library resources.

Specifically, SchoolNet was viewed as having played an important role (receiving a rating of either a 4 or 5 on a 5-point importance scale) in: developing Canadian Internet content (72% of respondents); empowering teachers in the development of educational content (64.7%); and developing content for teachers and librarians (61.4%). LibraryNet was viewed as having played an important role in: developing Canadian Internet content (46.9%); acting as a central node for new ideas/communications among different stakeholders (44.7%); and in developing pan-Canadian services (44.6%).

Both SchoolNet and LibraryNet were considered to have played a relatively weak role in: bringing suppliers and developers of learnware into better contact with individuals and organizations that use and purchase learnware; helping with student career placement and development needs; and in identifying/addressing the needs of education and library administrators.

Teachers/principals and librarians roughly agree about SchoolNet's role in providing on-line education and library resources. However, teachers/principals rated SchoolNet's role more favourably than librarians in the following areas:

- Helping with student career placement and development needs.
- Fostering the establishment of international partnerships and collaboration in the learnware, education, and ICT markets.
- Empowering teachers to help develop educational content.

- Helping bring suppliers and developers of learnware into better contact with individuals and organizations that use and purchase learnware.

The difference in ratings may reflect that teachers/principals are more familiar with SchoolNet and its importance in helping develop education resources that are of assistance to teachers and students.

In general, librarians rated the role of LibraryNet in providing on-line education and library resources as being more important than did teachers and principals. However, areas where teachers/principals gave a higher rating are presented below:

- Helping develop Francophone Internet content.
- Helping develop content for teachers and librarians.
- Empowering teachers to help develop educational content.
- Helping develop content for education and library administrators.

A breakdown by location of school reveals that respondents in remote areas consistently gave a higher importance rating regarding the role of LibraryNet than respondents in rural and urban areas. Even greater variation in responses occurred in the assessment of SchoolNet's role in providing on-line education and library resources.

Appendix C:3 provides a breakdown on the use and usefulness of on-line educational resources. Over one-third (37.3%) of the respondents stated that there was a high degree of use (a rating on 4 or 5 on a 5-point degree of use scale) for the resources overall on the SchoolNet website. Specifically, the resources on the SchoolNet website which were used the most often included: GrassRoots (69.2% or respondents rated it as 4 or 5), the Canadian Education Research Information System (CERIS) (25%), and the Special Needs Education Network (25%). The least used resources were: Composers in Electronic Residence (8.5%), Network to Savings (10.3%), and Virtuoso (12.8%).

Even resources that are not highly used may be highly useful for a subset of students and teachers. Hence, respondents were asked about usefulness. According to respondents, the most useful SchoolNet on-line educational resources were: GrassRoots (78.3% of respondents rating it as 4 or 5), Media Awareness Network (43.7%), and SN News Network (40.7%). The GrassRoots program was viewed very favourably, with some respondents noting that the program provided enabling resources to various schools for the purchase of new hardware. Typical comments about the GrassRoots program included:

"I love the GrassRoots Program – it has helped motivate my class and has rewarded us with prize money, enabling us to purchase much needed new hardware."

"The GrassRoots program was an excellent learning experience for both staff and students. It also gave us an opportunity to offer an authentic learning opportunity to our students that mirrors the expectations of the world of work."

"We have made extensive use of the GrassRoots programs and have been able to set our school vastly ahead of others in our area through the use of Telecollaborative funding and Internet projects."

"GrassRoots projects – excellent initiative for publishing students work on the web and enhance students' technological skills."

Note that the rating for usefulness is higher than the rating for the degree of use for all resources in C:3. This may reflect high usefulness for some, but not all, students and teachers (an entirely understandable outcome), so that the *average* ratings of usefulness are modest, or perhaps that some respondents have not applied these resources in their work, yet have viewed these sites and are aware of their potential application. It is difficult to tell from survey results which is the case—the various resources should be carefully monitored to ensure that each is highly useful for at least some users.

5.5 Sustainable Development

The key area in which SN has contributed to sustainable development is in terms of creating a very decentralized and effective decision-making process. There is very broad participation in creation of policy and products for on-line services, right down to the classroom level.

5.4 Other Lessons Learned

- It is crucial to incorporate input from the classroom level, to ensure that content reflects curriculum and addresses the interest/needs of teachers and students.
- The wide variety of resources available through SN resulted from the successful establishment of partnerships. A key element of this success is that the control of these resources were deliberately decentralized.

Issue 6

To what Extent has SchoolNet helped to address some of the main barriers to increased ICT use in schools and libraries?

6.1 Conclusions

Our analysis demonstrates that SchoolNet has had an important role in addressing past ICT barriers, and will have an important continuing role in this area. When SchoolNet began, using the Internet for education was almost never done, and there was little information on how to best go about it. The program addressed many important barriers to increased use of ICT in the classroom. These included availability of connectivity, professional development for teachers, poor ICT infrastructure (including old, slow computers), not enough computers connected and networked, slow Internet access, etc. SN/LN helped develop on-line education and library support tools (including on-line learnware), content for teachers and librarians, employment resources for students through SkillNet.ca, and content through the SN Portal and Tools program. An important aspect is that computers supplied by CFS have helped to decrease the student-to-computer ratio. The lower this ratio, the greater the opportunity for student's to work on a computer and improve their general computer skills.

There are many barriers still remaining to effective and inexpensive ICT use in the classroom and library. These problems appear more acute in First Nations schools. According to teachers, principals, and librarians, the top five barriers that SN can play an important role in overcoming in the future include providing more up-to-date computers, providing sufficient professional development in computer/Internet use, obtaining higher-speed and lower cost communications infrastructure (e.g., for multi-media), providing better ICT technical support, and obtaining faster Internet connections. However, there was relatively little difference among the ratings of importance of most barriers listed, and it is safe to say that many barriers still remain. By overcoming these barriers, the student-to-computer ratio will improve, and students will be working with relevant technology, instructed by teachers/librarians that are more familiar with this technology.

While SN is not responsible for addressing all barriers to ICT use, misconception of SN's role and its objectives has resulted in the program occasionally being viewed as being

responsible for supplying high-end computers to School Districts that enable connection to the Internet. The program purpose must be clearly articulated to all stakeholders (teachers/purchasing officers) to ensure that the program is not viewed as failing to meet an appropriate level of standard. Alternately, the standard should be raised.

6.2 Background

Remembering that use of the Internet for education was almost unheard-of when SN was initiated, it is not surprising that there were substantial barriers to connectivity, and to using the Internet once connected. Barriers included distrust of web-based learning, unfamiliarity of educators in using ICT technology, lack of understanding of using Internet content in teaching, lack of technical infrastructure and support, and simple lack of computers and associated hardware and software. A great deal of effort was expended by the SN Advisory Board and SN officials in identifying these early barriers and providing solutions. (Many provincial educational systems did not provide such information or support for teachers or schools). SNAB is still actively involved in identifying current barriers to ICT use and has made recommendations with respect to infrastructure and content issues such as connectivity (e.g., high speed access, affordability, external and internal connectivity options, all of which are seen as key issues to address), CFS, learnware, professional development, research and measurement, and community involvement. Specific data on which barriers were most important, and for which SN was instrumental in resolving, are found in the survey results presented later in this section. ICT infrastructure has also been discussed in earlier sections.

One of the most important barriers was professional development for teachers. Several approaches were taken at both national and regional levels:

- SchoolNet Youth Employment Program sends young people into schools to set up ICT infrastructure and to assist teachers in acquiring a better understanding of the infrastructure.
- The CD-ROM mentioned earlier.
- SN developed a paper-based *SN Offline* tool (available in *Teach* magazine) to assist in training.
- The very important GrassRoots program (see appendix material), which supports classroom-based interactive web-based learning and resource development.
- Alberta's School Integration Resource, one of the first ICT courses, allowing both grade 12 credit and adult education.

It is estimated by Industry Canada that roughly 30% of teachers are now knowledgeable about ICT in the classroom (with much training through the SchoolNet Youth Employment Initiative in the schools, or through SN teacher training seminars which were adopted by some provinces, or even by using volunteer parents knowledgeable in ICT as was done in Manitoba). Further, SN now has the support of teachers' unions now that its utility seems clear, and so long as increased ICT support does not imply fewer resources for other crucial needs.

Over time, demand for effective and efficient connectivity has increased. Industry Canada considers there is now need for more content, available at higher speeds (and lower costs), as well as a continuing need to train more teachers, and on the research front to know more best practices for using the Internet in classroom situations. SchoolNet is using promotional tools to showcase how teachers are using it, and how best to integrate it into the classroom, in order to raise ICT awareness.

All of these activities required the strong support of the GrassRoots education community; in the words of one respondent, *"The client is boiling it up from the bottom."*

6.3 Findings from the SITES Study

The Second Information Technology in Education Study (SITES) was initiated to assist countries estimate their current positions with respect to ICT in education. SITES is an effort of the International Association for the Evaluation of Educational Achievement (IEA), and builds upon a number of other IEA studies on ICT dating back to the late 1980s. Data are currently available from Module 1 of SITES, offering a snapshot picture of ICT in education in the years 1998/99 for 24 countries, including Canada. Some preliminary Canadian data related to ICT barriers are summarized in the table below for "lower secondary schools"[14].

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14 *IEA.* SITES Press Release Module-1. *Undated (probably 1999 or 2000). Only lower secondary schools are discussed in the press release due to space limitations, and because this is the core level at which most countries participated.*

Selected SITES Findings for Canadian Lower Secondary Schools	
ICT Barrier (1998/99)	**Finding**
Percentage of schools using Internet/WWW in pedagogical situations	85% of lower secondary schools (72% for primary education; and 92% for upper secondary education) (60% of lower secondary schools offer this for 50% or more of their students)
Percentage of schools that have adopted policies for norms/values in using Internet and WWW	90%
Median student:computer ratio	5:1 (1998) 15:1 (1995)
Average percent of multimedia computers	45% of computers
Percent of principals reporting that teachers lack ICT knowledge	61%
Percent of principals reporting that all teachers have received training in use of ICT	17%
Percent of respondents* technically-competent at general applications (e.g., word processing), and in using ICT for instructional purposes (e.g., for teaching or subject-specific purposes)	75% for general applications 50% for instructional purposes
Percent of principals with positive attitude to ICT for life-long learning	80%

* Respondents to the technical portions of the SITES survey were assumed to be the most technically-proficient in the school, and thus able to transfer ICT knowledge within the school. This question obtained the self-ratings of the respondent on technical competence.

In general, the SITES data are consistent with the findings of the present study:

- The types of ICT barriers discussed in SITES are generally consistent with those addressed by SN, although some are being addressed in SN2 or being recommended for SN3 (e.g., multimedia computers) rather than in SN1.
- ICT infrastructure is rapidly improving in Canadian schools, and the Internet/WWW is widely used, but the availability of multimedia computers is still only moderate, and 40% of schools offered ICT access (in 1998) to fewer than half their students.

- Although ICT has the support of a large majority of school principals, and although professional development for teachers remains a high policy priority at many schools, few schools have offered ICT training for all teachers.

- Even for ICT technically-competent teachers, there remains considerable scope for professional development, particularly for use of ICT in instructional situations.

6.4 Findings and Results of Surveys

6.4.1 Provincial and Territorial Officials

In sum, SchoolNet is seen as having had an important role in addressing past ICT barriers, and to have an important continuing role in this area. At the time SN/LN were initiated, there was general consensus that the availability of connectivity (especially in remote areas), the costs of connectivity, and the lack of appropriate models and training for using information and communications technology (ICT), were all seen as major barriers to increased ICT use (A:5). In terms of overcoming these barriers SN ranked more highly than LN, although both programs received a generally favourable response in terms of helping to overcome barriers (A:5). Part of this favourable response can be attributed to the role that SN/LN played in helping to develop on-line educational and library support tools, including on-line learnware, content for teachers and librarians, content through the SkillNet.ca program, and content through the SN Portal and Tools program (A:8, A:9, A:11).

6.4.2 Teachers, Principals and Library Administrators

Appendix C:4 identifies the key barriers that currently influence ICT use in schools and libraries, and the barriers that SchoolNet can play an important role in overcoming. The current top five barriers identified by teacher/principal/library respondents were::

- Computers too old, slow, etc. (71.5% of all respondents).

- Lack of professional development in computer/Internet use for educators and administrators (66%).

- Not enough computers networked within school, or LAN is too slow (64.8%).

- Lack of high-speed, high data rate communications systems (e.g., bandwidth for multi-media), at a low enough cost (62.3%).

- Not enough technical ICT support (61.4%).

However, many of the other barriers shown in C:4 were rated as almost equal in importance—it is safe to say that there are still many factors that inhibit effective ICT use in the classroom and library. The data in C:4 also shows that teachers believe SN can have a moderate to high role in addressing virtually all ICT barriers listed.

Further analysis by category of respondent reveals that teachers/principals view the barriers above as key to inhibiting the use of information and communications technologies. However, librarians were more likely to consider lack of bandwidth (71%), old and slow computers (63.6%) and Internet connections that are too slow (62.5%) as the key barriers affecting the use of information and ICT. Librarians were also more likely than teachers/principals to consider unresolved issues concerning copyright, privacy and inappropriate content as an important barrier.

According to respondents, the barriers that SchoolNet could play the most important role in overcoming (a rating of 4 or 5 on a 5-point importance scale) were: building awareness of the ICT (66.7% of respondents), ensuring that there are better models for using the Internet effectively in the classroom and library (66.1%), and ensuring access to affordable, high-quality on-line learning resources (61.3%). These were also the highest-rated barriers noted by teachers and principals. Conversely, librarians noted that SchoolNet could play an important role in: ensuring greater Francophone content (91.7%) and Canadian content (80%) in the SchoolNet website, as well as resolving issues concerning copyright, privacy, and inappropriate content (80%).

Appendix C:4 reveals that while most respondents are able to identify barriers that are important in preventing increased information and ICT use in schools and libraries, most are cognizant of the fact that the SchoolNet program cannot address, or should be responsible for dealing with, all problems noted.

6.4.3 Survey of First Nations Schools

Many respondents have noted numerous technical problems with the computers set-up in their schools/libraries. Typical comments included:

"Improperly installed satellite software."

"The one supplied died, we have not yet received the one promised early Spring 2000."

"(CFS computer) wouldn't work and then when repaired, did not have as much memory as other faster computers."

Appendix D:9 reveals that had FNSN and Help Desks not existed, the technical support for DirecPC would be poorer or much poorer (a rating of 1 or 2, on a 5-point rating scale) (60% of respondents). By providing technical support, CFS has played a key role in overcoming one of the key barriers to ICT use. As well, as noted earlier, CFS has also increased the total number of computers connected to the Internet, therefore, addressing another key barrier to ICT use. As one respondent stated:

> *"FNSN created the incentives and support to increase the capacity of our* educational *system* to *advance our technology opportunities."*

6.5 Lessons Learned

- While respondents acknowledged that SN is not responsible for addressing all barriers to ICT use, misconception of SN's role and its objectives has resulted in the program being viewed as being responsible for supplying high-end computers to School Districts that enable connection to the Internet.

- Many ICT barriers fall within provincial mandates but involve issues that are pan-Canadian in scope (e.g., professional development). Careful thought should be placed on areas that SN can provide the most benefit.

Issue 7

What has been the impact of SchoolNet on the availability of computers and on connectedness in First Nations Schools?

7.1 Conclusions

The evaluation shows that First Nations SchoolNet program (FNSN) has successfully connected all First Nations schools that indicated a desire to be connected. Survey results from both the 1999 evaluation and the current assessment of FNSN reveal that the program has had a positive impact on the connectedness of First Nations schools. The number of connected computers has roughly doubled compared to the situation if FNSN had never existed. Further, virtually none of the computers were linked with a satellite connection prior to FNSN—or were likely to obtain one without FNSN. Thus the program is highly incremental with respect to both numbers of computers, and connectedness. The technical support offered by the FNSN Help Desks was important throughout this process. These computers did, in fact, meet the needs of the schools reasonably well. Close to two-thirds (61%) of current respondents indicated that their schools are still connected to the Internet. Overall, FNSN has clearly helped address equity of access to computers, the Internet, and technical advice for First Nations schools, no matter how remote.

However, a substantial number of First Nations schools have experienced technical problems with their computers, and the quality and speed of the DirecPC connection has recently been declining, sometimes substantially, and respondents also commented about the dated technology in the FNSN computers. A substantial number of schools that received FNSN computers are not currently connected to the Internet (about a third overall, and 40% of remote schools), for a wide variety of reasons.

7.2 Background

First Nations schools are under federal jurisdiction. Unlike the situation at other schools, SchoolNet assumed the costs of connectivity for First Nations schools; these were roughly $7.3 million from 1993/94 through 1998/99. This was done by providing each

school with a computer connected to satellite technology called DirecPC. The latter was provided through the year 2003 in partnership with Stentor. DirecPC makes fast and inexpensive Internet access possible in remote communities that have poor access to land lines. Five Regional Help Desks were also supported to help install, trouble-shoot, and explain the technology. At this time, SN has connected 100% of First Nations schools that wished to be connected (representing about 81% of First Nations schools overall). SN has also supported the creation of the First Nations home page.

An important factor to remember with respect to this program is that there is often a lack of staff continuity at the First Nations schools. In many cases, the staff of the school, including the principal, turn over frequently due to their remote locations. This poses several problems, including difficulty creating and retaining technical ICT knowledge in the communities, and difficulty obtaining information on historical trends in ICT usage and usefulness. The students themselves often travel long distances to go to school, and this may mean that computers are available only at the schools, not in the homes.

7.3 Data from the 1999 Evaluation of First Nations SchoolNet (FNSN)

An evaluation was carried out in early 1999 of this SN component[15]. This study surveyed 138 of the roughly 420 schools participating in FNSN, and also analyzed responses to progress reports completed by FNSN schools. Generally positive results were found in terms of the impact of FNSN on the connectedness of First Nations schools, although some technical problems (not surprisingly) surfaced[16]. A brief summary of the key results at that time were that:

- The large majority of participating schools had the DirecPC working.
- About half the schools had DirecPC working immediately after installation, about a quarter experienced a delay of a month or less, and most of the remaining quarter had a delay of over three months. Most problems were related to the satellite dish and/or the connection to the computer, and were resolved either by the Help Desks or internally.

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15 Kenneth W. Paul. *...tions SchoolNet Program Evaluation Final Report.* March 31, 1999. Mr. Paul also served as a consultant to the present study.

16 The issue of incrementality of the computers and connections was not explored explicitly in the 1999 study, but was investigated more fully in the present study.

- For schools with DirecPC working, 95% were satisfied or very satisfied with it. About 85% of schools overall were satisfied or very satisfied with the FNSN program.

- The average school had roughly 19 computers, though the data do not show how many were connected.

- DirecPC continued to work well in about two-thirds of the FNSN schools. A small percentage had never had it working properly.

- The Help Desks had been used heavily—by more than two-thirds of the schools—mainly for installation or networking advice.

Since the 1999 study was completed, there have been reports of DirecPC operating more poorly than when first installed, essentially because heavier use has filled its channels to capacity which has slowed data transfer. Schools with access to 56K land lines may have higher speed connections than through the satellite (but of course many remote schools do not have this option).

7.4 Findings and Results of Surveys

7.4.1 Survey of First Nations (FN) Schools

Since 1994, the total number of computers at FN schools/libraries (i.e., including those not connected to the Internet) has increased (D:1). The average number of computers at respondent schools/libraries prior to the FNSN program was approximately 11.6 computers. Today, there are approximately 28.6 computers on average as reported by respondents, with the range varying significantly from 0 to 100 computers.

FNSN has helped to connect First Nations schools under federal jurisdiction to the Internet through DirecPC satellite technology. Appendix D:3 shows that FNSN has roughly doubled the number of connected computers compared to what the situation would be if the program had never existed. Data in D:6 shows that the main problem prior to FNSN was lack of financial and technical resources to connect. Thus the program has had a substantial incremental impact on connectivity, by addressing the key problems in the communities.

Approximately 61.4% of schools that received computers from FNSN are still connected to the Internet (D:2). Rural schools were more likely (68.8%) to be connected, while only 55% of remote schools were still connected. Those respondents that are no longer connected to the Internet mentioned various problems, including:

- technical problems with their computer(s);
- Internet connections breaking down;
- problems with connecting the computer(s) to the Internet;
- disconnecting the computer(s) for supervision reasons.

Appendix D:10 provides a summary of how well FNSN computers have met the needs of respondents. Close to two-thirds (63%) of respondents viewed the computers as having met well, or very well, the needs of the school as a student resource. The computers enabled students to learn basic Internet surfing skills, use of search engines, basic downloading skills, Windows 95 procedures, and basic correspondence skills. As one respondent noted:

> *"The access to the Internet has been an incredible learning tool for our students. In two years we have amazing growth in our students technological abilities and interest in technology. Our students are seeing the potential that technology can provide. In addition students are seeing outside our community."*

The computers were also considered to have met the needs of the school as a teaching resource (62% of respondents), library resource (58%), and as an administrative resource (54%). Some respondents have noted that the computers did not always meet the needs of the school as they were unreliable. Teachers could not rely on the computers availability. As well, many schools have a limited number of computers which prevents teachers from being able to plan class activities.

As noted earlier, the main type of Internet connection adopted by respondents was DirecPC. The exhibit below presents a high level breakdown of how well the DirecPC connection has been working. This exhibit excludes the responses of those respondents who did not know how well the connection was working or whose school was not connected (these results can be found in Appendix D:5).

How Well DirecPC Has Been Working*					
Year	Very Poorly	Poorly	Moderately	Well	Very Well
In 1995	29.2%	12.5%	12.5%	29.2%	16.7%
In 1996	14.3%	17.1%	25.7%	28.6%	14.3%
In 1997	12.2%	9.8%	26.8%	26.8%	24.4%
In 1998	6.0%	14.0%	20.0%	38.0%	22.0%
In 1999	7.7%	18.5%	27.7%	20.0%	26.2%
In 2000	19.0%	9.5%	25.4%	20.6%	25.4%

* Data only for respondents with an opinion

In 1995, a year after the introduction of the FNSN program, the respondents' assessment of how well their DirecPC connection has been working was quite positive, with 46% of respondents indicating that their connection worked well or very well. Respondents assessment of DirecPC reached its peak in 1998, when about 60% of respondents indicated that their connection worked well. However, since 1999, there has been a decrease in respondent's assessment of how well DirecPC connection has been working. Many respondents have reported that their DirecPC connection is slow, and that downloading content from the Internet is getting progressively slower. Many very critical comments were made about the current quality and speed of the DirecPC connection. However, many of these problems can not be addressed by FNSN, as they are the responsibility of the Internet service provider. As well, many schools may be connecting more computers than is permitted, which results in delays when using the Internet. This is evident by one of the comments made by a respondent:

> *"Downloading has improved slightly lately, but only at a certain times of the day. I also notice the more workstations open to the Internet, the slower the Internet server gets."*

7.5 Sustainable Development

FNSN has clearly contributed to social equity through provision of computers, Internet connectivity, and technical advice for First Nations schools, regardless of how remote.

7.5 Lessons Learned

- First Nations schools are now experiencing substantial problems with poor quality and speed in the DirecPC connection as the number of users increases. FNSN should clearly distinguish its role and that of the Internet Service provider.

- Currently a number of FN schools (approximately 40% of FN schools respondents) that wish to be connected are now unconnected, and the number is growing. Special effort needs to be made by FNSN to ensure that the connectivity gains already realized do not disappear.

Issue 8

What has been the role of the program in promoting and facilitating collaboration between different participants both within the educational system, and with outside partners?

8.1 Conclusions

We believe that the wide range of SN partnerships represents one of the key successes of the program SchoolNet has played a key role in promoting and facilitating collaboration between different participants both within the educational system and with outside partners. SN initiatives have also successfully leveraged key resources—both cash and crucial in-kind support — from various levels of governments, private financial resources, individual community members, and/or from the transfer of in-kind expertise and support. It is fair to say, in fact, that without this collaboration, partnerships, and leveraging, SchoolNet would simply not exist at all. There are virtually too many examples of collaboration and leveraging to list, and the range of partners and activities is vast.

As there exists a continuing need for SN services coast to coast, it is important to continue to develop collaborations in order to share ideas, resources and build upon synergies to achieve common goals. This is especially true as several highly-visible partnerships are currently in danger of collapse due to a lack of sufficient program funding, and a lack of co-ordination and vision. These partnerships require continuing direction and resources from Industry Canada and or SN to be sustainable over the medium to long-term.

8.2 Background

The nature of SN is essentially one of a huge, distributed collective of organizations and individuals all working towards common global—but highly diverse individual—goals. Although certain individuals and organizations (e.g., Industry Canada's Information Highway Applications Branch (IHAB), the SN and CFS Provincial Advisory

Committees, Provincial Ministries of education, the Stentor Alliance) are clearly crucial to the program, equally clearly the program would be dramatically smaller and less effective without the enthusiasm, support, and hard work of the many formal and informal partners in the program, not to mention the efforts of individual school boards/districts, schools, classrooms, teachers, students, parents, and community organizations and firms. SN is not a program in the traditional sense of a discrete set of activities carried out by a discrete set of players, often housing in a limited number of physical settings, and working on a limited set of goals. The simple "organizational chart" so useful in describing traditional programs is almost completely useless for SN. We hope that this report provides some idea of the diversity and complexity of the SN "program", as well as the multitude of actors involved in it. We invite the reader to refer to Appendices G and H for details on individual collaborations.

Networking programs and projects do not have to flow "outwards" from a central SchoolNet to provinces, and thus to schools. Rather, initiation, collaboration and implementation can flow in any direction. For example, the GrassRoots program, supported by SchoolNet and national in its scope, was based on a student-project model developed in two rural school districts in Newfoundland. As a second example, the national "Writers in Electronic Residence" (WIER) program originated in a secondary school in Ontario with support from a university in British Columbia.

8.3 Findings from interviews

8.3.1 Provincial and Territorial Officials

The following comments were typical of these offered by respondents:

> *"I think private sector partnerships can be over-promoted. Public: public sector partnerships and public:non-profit organization sector partnerships can be just as productive. It is difficult to justify the exclusivity frequently demanded by private sector sponsors in public policy. Certainly, the Community Access Program (CAP) has stimulated private sector activity. There are times when the CAP initiative seems to be in an unnecessary or inadvisable straightjacket, in policy terms. If access is a priority in this society, government has a role and responsibility. LibraryNet is a significant contributor to connectivity in Canada, in access and equity. An excellent start. Let's get to the sustainability challenge now, and engage government across ministries. This is 'cheap local presence' for government. Greater replication of the Canada Service Centres model, for example, would be an appropriate next step."*

> *"Partnership with CFS has been a great asset to facilitating connectivity in our libraries."*

"British Columbia public libraries have enjoyed a fruitful relationship with LN/SN in a variety of collaborative projects. Notable of these are Youth@BC, development of our Community Library Training Program online courses."

"SchoolNet brought together four national education organizations to work on ICT in education (CSBA, CEA, Canadian Association of School Administrators, Community Access Program). One product has been the www.cepan.ca website. SchoolNet has been instrumental in bringing these organizations together for joint action. In addition, a private sector company is now beginning to work with the organizations."

"Consortium for networking – lobbying the CRTC for equalization of rates and preferred rates for telecommunications for schools and libraries."

"District and provincial technology conferences and standards picked up by SchoolNet for national distribution."

"Microsoft has through the Commitment to Learning Initiative which it sponsors as part of the GrassRoots Program."

"Which came first – the chicken or the egg? Youth@BC - provincial funding of $450,000; federal funding $125,000."

"CFS program has seen the province increase funding significantly."

"Parlaying provincial competitiveness toward equalization."

"SchoolNet helped leverage additional resources through the Youth Employment Initiative. This enabled schools to hire youth to provide ICT support and training for teachers/students."

"SchoolNet has leveraged School Board and Department of Education funding towards ICT. Compare 1990 and 2000 school board expenditures – while SchoolNet was not the only force, it was the major force for change. As this 'revolution' is relatively new, the transition has not been well documented."

"York University hosted the YES I CAN! Project. The project continues to be successful because of the direct SchoolNet connection."

"In Québec, AQUOPS has leveraged resources through Village Prologue and Cyberscol."

"LibraryNet still has a significant role to play in Canada."

"From the perspective of a huge (geographically) but small (population), SchoolNet's challenge is to recognize the huge costs to achieve some sort of equity with respect to connectivity and bandwidth. It has to be seen more as an essential service than a cost/benefit. I also think that in setting itself up to be a leader, SchoolNet has to be careful not to trample on or overlook leadership in other areas and jurisdictions."

"SchoolNet has been very effective in filling the federal gap for education – SNAB should continue and serve to direct national efforts of SchoolNet."

"Please don't undervalue or underestimate [the Director General] of Information Highway Application Branch's role as visionary, agent provocateur, and statesperson. He **IS** *SchoolNet."*

8.4 Executive Case Studies

The executive case studies (Appendix I) uncover two important factors in the overall assessment of SchoolNet (and LibraryNet) – the ability for SN to leverage resources from outside partners, or from partners within the educational system, and the extent to which SN programming is sustainable into the future. Indeed, there is a key linkage between these factors.

In an overall sense, the various SN initiatives reviewed in the case studies all leverage key resources, either in the form of private financial resources (e.g., the former STENTOR Alliance, Microsoft and Corel involvement in GrassRoots, and private sector partners in SkillNet.ca and the Media Awareness Network), matching public funds (e.g., Quebec's support of Réseau d'Adaptation Scolaire, provincial support for GrassRoots), or the transfer of in-kind expertise and support (e.g., server access for the Canadian Educational Policy Administration Network [CEPAN]). And whereas the level of support varies from the significant involvement of private monies in STENTOR and GrassRoots, to lesser valued leveraging for Réseau and CEPAN, in each case the partnerships forged represent key success factors to SchoolNet programming. This is true not only for current and past experiences, but also for the sustainability issues that will be addressed in the future.

With direct reference to sustainability, there is one general conclusion that can be drawn: the continued viability of many SN programs (and partnerships) rests directly on the extent to which funding is available, and guaranteed.

Note additional examples of leveraging arrangements are described at a high level in Appendix G and H.

8.5 Lessons Learned

- Several highly-visible partnerships are currently in danger of collapse due to a lack of sufficient program funding, and lack of co-ordination and vision.
- SchoolNet's partnerships require continuing direction and resources from Industry Canada and/or SN to be sustainable over the medium to long term.

III

Conclusions and Recommendations

A. Key Conclusions

Our conclusion is that SchoolNet has played a strong role in establishing connectivity between Canadian schools and libraries. Moreover, it has done this in an environment where jurisdictional sensitivity is of paramount concern, and resource availability is scarce. This has resulted in an interesting and important mix of partnerships between federal, provincial, organizational and private sector actors that, given the constantly changing nature of knowledge and technology in the modern context, will require continual renewal into the future. Some specific findings are discussed below.

1) **Collaboration and leveraging.** Collaboration and leveraging arrangements played a key role in the overall SN initiative. SchoolNet has been, in our opinion, outstandingly successful in this arena. In fact, it is not unreasonable to suggest that the wide range of SN partnerships represents one of the key successes of the program, and that SN would not exist without them. Not only do these partnerships allow for increased resources, they also lead to the sort of shared management practices that has framed the SN approach. And while many partners feel the partnerships would benefit from an increased level of overall funding, in their own right they have been instrumental in facilitating substantial additional resource generation and deployment amongst the variety of actors in the educational system.

2) **Federal involvement.** There is a clear sense that federal involvement in the form of a national connectivity strategy was both necessary and legitimate in the eyes of affected parties in the educational system. This is not to say that jurisdictional tensions have been absent, but rather that, when evident, they have been resolved with relative ease. In large part, this a reflection of the common desire held by all actors to facilitate the use of information and communications technology in Canadian schools — a desire that transcends jurisdictional boundaries. Federal-provincial cooperation was enabled through a healthy mix of decentralized administration (all the way down to the school and even classroom level), combined with a federal role that was more that of *agent provocateur*, than that of micro-manager. It is clear that Industry Canada is but one player: the active participation of provinces and School Boards/Districts has been crucial. Having said this, there are several specific examples where the federal role has been

valuable, especially in the areas of acting as a focal point to develop a collaborative national vision, and in addressing some technical ICT issues that are within the federal mandate. Our conclusion is that achievement of SN goals would not have been sustainable without federal involvement.

3) Impact on connectivity and ICT use. Specific examples of SN programming have resulted in increased connectivity and use of ICT in Canadian schools and libraries. At a general level, the answer is a simple 'yes' – SN has resulted in more computers (through CFS), increased connectivity, and increased provision of educational resources (e.g., through GrassRoots). In fact, 100% of schools and libraries that wish to be connected, now are connected. For First Nations schools, this is particularly relevant because of the remote settings for many of these schools—here FNSN has provided satellite connections to schools that almost certainly would not have them otherwise.

4) Computers for Schools (CFS). The CFS program has played an important role in increasing the availability of computers for use in schools and libraries. As of the end of March 2000, over 200,000 computers had been supplied by SN to schools and libraries. While the total number of computers at schools/libraries has increased because of CFS, some respondents have commented on the quality of the computers supplied. Many CFS computers are 'low-end' and do not meet minimum configuration standards for modern software, or for effective Internet connection. Consequently, in order for the CFS computers to be of use to schools/libraries significant expenditures (or effort) have been required on the part of the School District to upgrade the computers to meet current standards which permit connection to the Internet. Should such resources be devoted towards bringing older computers to the basic level needed to permit connectivity, or should these resources be devoted towards the purchase of fewer computers but with superior technology? The response to this question may vary depending upon the educational levels taught at the schools. Older computers can be used as simple resource stations for running specific educational programs, thus appropriate for younger school levels, and may even be used for "spare parts" or to help students learn how to "tear them down". One of the computer purchaser respondents had mentioned: " The main use in this area has often been at the high school level where students want a machine they can 'hack apart'". More advanced computers, with greater hard drive space will enable students to 'surf' the Internet and become familiar with more advanced software packages, thus appropriate for higher school levels and libraries.

5) ICT Barriers. Several steps were taken by SN to overcome barriers to increased ICT use in schools. Those pertaining to a key barrier—professional development of teachers—included creation of the SN Youth Employment Initiative, the development of a paper-based SN Offline tool, and Alberta's School Integration Resource. While these steps, and others, have been undertaken by SN, many teachers, principals, and librarians acknowledge their lack of professional development in computer/Internet use. SITES data also confirms that few schools have offered ICT training for all teachers. Failure to instruct teachers/librarians in the used of information and communications technology

limits the promotion of the Internet and other web-based educational resources. It is unclear whether the responsibility for ensuring that teachers/principals/librarians are properly instructed falls upon the shoulder of the SN program, or whether it should remain mainly a provincial responsibility. Having said this, there is a wide variety of barriers to effective ICT use that will be important in the near future, including technical issues related to high-speed access to the Internet, lack of ICT technical support, and so on. SchoolNet is considered to have a moderately important future role in addressing virtually all of them.

6) On-line resources. SN on-line resources and initiatives, and especially GrassRoots, has attracted numerous schools. GrassRoots is considered by many educators as an effective program as it offers funding to schools which helps cover the costs of creating and implementing classroom learning projects on the Internet. Developing useful on-line resources is an effective strategy that encourages librarians and teachers to access the Internet and meet Industry Canada objectives, while limiting the costs to the program of ensuring that all 20,000 schools and libraries across Canada are connected. While the GrassRoots initiative was considered useful and successfully encouraged teacher and student involvement in Internet-based activities, few other SN initiatives are as highly used by as many respondents, or as highly useful (on average). This may simply mean that fewer users exist for each individual initiative, but the situation warrants careful attention to ensure the development of educational materials and resources that meet the curriculum needs of School Districts and individual schools and teachers. An important lesson learned is that every on-line resource must be designed with careful attention to how it is to be used in the field.

7) Sustainable Development. SN, LN, and FNSN are clearly not programs for which the major portion of sustainable development (SD) goals are relevant, in that they have few environmental implications. However, they do contribute to some portions of the government's SD objectives, as they have helped improve social equity through provision of computers, Internet access, and technical advice to all Canadian communities, no matter how remote. Further, all programs demonstrate a clear commitment to broad, participatory decision-making, in which both policies and products are designed and delivered through working groups at all levels of government, the K-12 school system, and the private sector. Finally, the federal involvement was crucial to the long-term sustainability of the program, and will continue to be in the future.

8) LibraryNet. While it was not specifically addressed in this evaluation, there are several indications that the library community feels that LibraryNet has received limited attention in the program — with much less thinking about the needs of this community, and interaction with it, than is necessary.

B. Recommendations

1. Maintain the SchoolNet, Computers for Schools, and LibraryNet programs — These programs have been important catalysts and facilitators, bringing together the complementary needs and resources of federal, provincial, and private sector partners. It is clear that the majority of tasks addressed in the past—as well as those that must be addressed in the future—have broad cross-jurisdictional implications, and would be impossible for individual partners to effectively tackle alone. SN has shown that it is an effective instrument to meet these challenges, both in terms of policy and in terms of operational matters. LN has been less successful, but has equally good potential. It would be valuable to create a more fully defined strategic context for both programs that deals with issues such as infrastructure funding, maintenance of partnerships, etc..

2. Provide ongoing ICT infrastructure investment. Continued and continuing investment is necessary for maintaining and improving the quality of ICT infrastructure., which is rapidly becoming inadequate to serve current needs. This involved providing increased bandwidth (taking into account that future demand will likely continue to grow, in remote and rural communities as well as urban ones), and supplying and maintaining higher numbers of higher-quality computers and their associated hardware/software. A further one-time investment is not sufficient because of the rapid pace of ICT development, the rapid deterioration and outdating of current stock, and the strong "competing" efforts being made by other countries in these areas. This investment must be a joint effort of all SN partners as this is a cross-jurisdictional issue.

3. Continue to address other ICT barriers. There remain many other ICT barriers for which SN can help find solutions. Many clearly fall within provincial mandates but involve issues that are pan-Canadian in scope (e.g., professional development). Because of the jurisdictional aspects, careful thought needs to be paid to where SN can provide the most incremental impact. In which areas would SN be able to provide impacts that are clearly preferable compared to what would be achieved by individual partners acting alone?

4. Address First Nations SchoolNet problems. Special effort needs to be made by First Nations SchoolNet to ensure that the connectivity gains already realized do not disappear. Roughly 40% of FN schools that wish to be connected are now **un**connected, and the number is growing. The problems typically arise because FN computers are either inadequate or have become non-operational (and cannot be repaired); the DirecPC connection is slow and/or unreliable (partly because of changes to the service providers, and/or because the schools are expecting too much of the connection); and it is difficult to maintain long-term technical capabilities in the communities. Although some of these problems fall into "grey areas" of the mandates of Industry Canada and SN, these organizations can have substantial influence in solving them, especially through their partnerships. DirecPC is a key component that needs attention, but the quality of

computers supplied is also important, as is some way to provide either ongoing professional development or more technical support.

5. Nurture important existing partnerships and collaborations. SchoolNet's partnerships and collaborative efforts require continuing direction and resources from Industry Canada and/or SN to be sustainable over the medium to long term. Several highly-visible partnerships are currently in danger of collapse due to a lack of sufficient program funding, and lack of co-ordination and vision. Industry Canada originally acted as the "hub of the wheel" during creation of these partnerships. The department is now perceived as having withdrawn from some partnerships, and having hurried unduly in devolving some activities, leaving the wheel to collapse. Note that this is not necessarily the case for all partnerships, nor is it the case that Industry Canada need be the hub for all partnerships. We recommend that a "snapshot inventory" be carried out which investigates, for each partnership, the partnership model being used (e.g., Industry Canada as the hub? A provincial agency as the hub?), its usefulness and importance, perceived problems, short-term needs in terms of resources and co-ordination, and the expected roles of Industry Canada and SN. This inventory might be done through the SN Advisory Board.

6. Continue to design educational and administrative resources for "real world" relevance. The on-line SN resources have had mixed success—GrassRoots is highly used and highly useful, but most others enjoy more limited use and usefulness. This is not entirely unexpected, as many resources will necessarily be of interest to relatively small user groups. However, the key lesson learned to date is that tailoring the resource to how it is used "in the field" (e.g., in the classroom or library) is crucial. There is still much to learn about how best to design these resources. It is vital that existing resources be monitored closely to ensure their continued relevance, and that new ones be designed to maximize their effectiveness. Although simple access to on-line resources is valuable in the first instance, very rapidly the content and usability of the resources become the most important aspect.

7. Analyze future programming in terms of incremental impact. There are many possible areas in which SN could put effort. Because of the many complex cross-jurisdictional aspects, as well as the actions of various partnerships, it is vital that SN's activities be directed towards areas where they can lever the most additional impact. "What would happen without SN's involvement?" is the key question. A good example is CFS. This program supplies computers that are useful for certain schools in certain situations (e.g., remote schools that use them as "starters", or schools that use them as sources of spare parts), but not nearly as useful for other schools (e.g., those that wish to use them for high-speed Internet connection, regardless of the fact that this was not a CFS goal). It does not seem sensible to put high levels of effort into obtaining and refurbishing older machines that will be mainly used as parts inventory, and it may not be necessary to supply so many "starter computers" in future as more used computers become available in the schools themselves. Would it be better to supply schools with fewer multi-media machines or more refurbished older computers? Should CFS supply "starters" to some schools, multi-media computers to others? What, exactly, can CFS

supply that is important and cannot be obtained by schools or School Districts themselves?

8. Put more resources into LibraryNet. Limited data suggest that LibraryNet is the "poor relation" in the SN program. It has had considerably less effort put into determining the programmatic and resource needs of libraries, librarians, and library users, and in finding ways to address these needs. If there are still important library needs that are unresolved, and if SN can play a role, then this lack should be addressed.