STATE OF *E-learning* IN CANADA

MAY 2009

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E-learning: Some Key Terms

Below is a list of key terms used throughout this report. For a more detailed explanation of these terms, please refer to the report page numbers listed after each definition.

Computer literacy

A person's awareness of and skills in using the technology, operating systems and applications (e.g., internet browsers and search engines). *P. 68.*

Digital literacy

A person's ability to read and interpret information found on the computer and in digital media, and to perform tasks effectively in a digital environment. *P. 69.*

Distance education / distance learning

The provision of courses to learners who are separated physically from one another and from the instructor. The classroom is virtual and learners learn at their own pace, on their own time. *P. 32.*

E-learning

The application of computer technologies to education. E-learning can take many forms, whether it is used face-to-face in classrooms, as a required part of classroom activities or course work (e.g., online discussions), or to deliver a course fully online. E-learning can include distance education as well as traditional in-class instruction. *P. 32.*

ICTs

Information and communication technologies including computers, cell phones and the internet, MP3 players, hand-held gaming devices and laptop PCs. *P. 13.*

Information literacy

The knowledge and skills necessary to participate in an information-rich society (e.g., information analysis and assessment, knowledge of resources, interpretation of results). *P. 69.*

Mobile learning

Learning that occurs at a non-pre-determined location via mobile/wireless technologies such as cell phones, Smartphones, BlackBerrys, laptop computers and personal media players. *P. 34.*

EXECUTIVE SUMMARY

Technology and Learning: Embracing Continuous Change

It is remarkable to consider that technologies we take for granted, such as radio and electricity, were once considered to be highly innovative. Like many technological developments, radio (originally called wireless telegraphy) and electricity evolved over decades before they became standard and necessary features of modern life—in factories, businesses and homes.[1] These innovations paved the way for information and communication technologies (ICTs) such as the computer and the internet, which have likewise become a ubiquitous presence in our lives.

ICTs are broadening and redefining the learning landscape in unprecedented ways. Studies suggest that countries that foster ICTs' potential as learning tools are making an investment in their citizens' prosperity and well-being. Societies that fail to take advantage of their potential may well be left behind.

Canada is Well Positioned to Benefit from Learning Technologies

Canada—like other member countries of the Organisation for Economic Co-operation and Development (OECD)—has long recognized the importance of lifelong learning to social and economic development. However, the global economic downturn that commenced in 2008 underscores the need to re-examine how to help Canadians acquire the skills and knowledge required for success over the long term. Global economic uncertainty, rapid technological developments and the growing supply of information highlight the need for a flexible and adaptable workforce that can embrace continuous change.

This report suggests that a flexible approach to education and training is essential to prepare Canadians for the 21st century. This broadened paradigm will involve the full integration of learning technologies into education and training.

Despite the challenges that lie ahead, Canada, more so than most other countries, appears well positioned to reap the benefits of e-learning. Our telecommunications infrastructure, generally regarded as one of the finest in the world, provides a firm foundation for online learning initiatives.[2] Additionally, our population has widespread access to the internet.[3]

Indeed, Industry Canada describes Canada as an internationally "acknowledged leader" in the development of ICTs, including wireless technology, biometrics, security technology, software, and multimedia and digital entertainment.[4] Canada also introduced several innovative firsts such as the world's first personal computer, Javascript and the Blackberry.

Canada has another advantage—one of the most educated populations in the world. According to a 2007 study by the OECD, Canada placed second on an international list of countries comparing overall post-secondary attainment—ahead of Japan, the United States and Australia. The same study showed that in terms of the proportion of citizens having completed university, Canada placed seventh overall—behind top-ranked Norway, Israel and the United States.[5]

Canada's younger generation is primed to exploit the potential of learning technologies. Computers, multimedia programs, chat rooms and other manifestations of the digital age are now common throughout children's developmental years—as almost any parent or educator will attest. Young Canadians use the internet regularly to learn: in fact, a 2006 report suggests that 31% of 15-year-old students in Canada used a computer almost daily to search the internet for information, above the OECD average of 25%.[6] We need to evaluate how we can best harness the ICT interests of this group—the leaders, parents, and workers of tomorrow.

But…We are Falling Behind Other Countries

Over the last decade, Canada has played a leadership role and gained international recognition in e-learning—in infrastructure deployment, learning methodology, tools and practices, work on accessibility, and research on learning objects and repositories.

Yet, despite this strong foundation, evidence is mounting that Canada is starting to trail behind the efforts of other countries in this very important sector:[7]

• Countries such as Australia, the United Kingdom, France and South Korea are harnessing e-learning's potential contributions to economic and social development. Collaboration across jurisdictions and among public and private agencies and organizations is a hallmark of these countries' e-learning policy frameworks.

• A 2009 survey by the International Telecommunications Union[8] ranked Canada 19th out of 154 countries in the category of advanced use of ICTs, down from ninth place in 2002. This drop was largely due to gains made in Europe. Sweden ranked first, followed by South Korea, while the remaining eight countries in the top 10 were all from Western Europe.

• In 2008, the Economist Intelligence Unit (EIU), which has been assessing the e-readiness of the world's largest economies since 2001, ranked Canada 12th out of 70 countries. The assessment compares the quality of each country's ICT infrastructure and the ability of its consumers, businesses and governments to use ICTs to their economic and social benefit.

Adoption of e-learning in Canada slower than predicted

In Canada, levels of adoption of e-learning have been significantly slower than anticipated.

While the proportion of courses delivered online in Canada is one of the highest among countries studied, research suggests that Canadian post-secondary institutions have been slower than those in many other countries to incorporate significant online components into their programs.[9] Key barriers remain, including infrastructure, funding and staffing issues, and resistance by faculty (because of increased workload and intellectual property issues, among others).[10]

The growth of e-learning has not significantly altered the way in which Canada's institutions organize or deliver learning. As the OECD reported in 2005, "E-learning [worldwide] has not really revolutionized learning and teaching to date. Far-reaching, novel ways of teaching and learning, facilitated by ICTs, remain nascent or still to be invented."[11]

Likewise, e-learning has not become a standard feature of employee training. Various surveys show that by 2005, the percentage of workplace training delivered online ranged from 15% to 20%.[12]

Canada does not have a comprehensive plan for e-learning

In 2001, the report of the Advisory Committee on Online Learning (a committee established by the Council of Ministers of Education, Canada/CMEC and Industry Canada) provided recommendations designed to harness the tremendous potential of ICTs. The report set out an action plan to promote several key goals: significant expansion of e-learning in Canadian post-secondary education, improved economic competitiveness, and sustained health of civil society in this knowledge-intensive era.[13]

Although lifelong learning is a focus of policy discussions, and technology is transforming nearly all aspects of our lives—including education and training— response to the report has been muted at best.

To date, Canada does not have a comprehensive or coherent approach to align e-learning's vast potential with a clearly articulated and informed understanding of what it could or should accomplish. Instead, e-learning in Canada consists of loosely connected provincial, territorial and federal e-learning networks, educational providers (public and private) and targeted initiatives. The consequences of this approach include duplicated efforts, fragmented goals and objectives, and sporadic and short-term initiatives.

Many OECD countries, as well as the European Union, are implementing aggressive national/supranational e-learning strategies to support their policies and programs.[14] Indeed, e-learning strategies and action plans in most countries are government-initiated—through ministries/departments, public funding councils or multi-ministerial committees—and translate into initiatives with significant public funding.[15]

A coherent framework to shape e-learning's development—and its relevance to social and economic policy development and implementation—must be premised on certain conditions favourable to learning. Efforts are required in four key areas: generating multi-sectoral momentum; developing a shared vision for e-learning across Canada; harnessing the potential of technology to meet the needs of learners; and filling gaps in research.

Generating momentum: stakeholder collaboration and sharing of resources

ICTs such as the computer and the internet have created a platform for sharing information and educational resources. Canada's e-learning resources and expertise are significant. Despite these obvious advantages, further progress is hindered by a lack of co-ordination and communication among stakeholders.

A wide range of sectors—educational institutions, federal and provincial/ territorial governments, and business and community-based organizations and associations—need to collaborate, share resources and consider cost-sharing mechanisms that could create synergies and economies of scale. Clearly, achieving momentum will require strong leadership focused on establishing mechanisms for effective policy and program co-ordination.

A shared vision of e-learning

The concept of collaborative partnerships recognizes that the successful use of ICTs in support of learning does not rest on a simple "build-it-and-they-will-come" approach. A vision forged through collaborative partnerships would bring clarity to our understanding of what e-learning can and should do. Resolving complex issues such as open-source software, open access to research and scholarship, sharing/reducing of costs, investments in research, and appropriate e-learning resources and support can best be achieved if there is a coherent, comprehensive and shared conception of e-learning.

Harness the potential of technology to address the needs of learners

The Advisory Committee on Online Learning identified a need for initiatives to encourage innovation in post-secondary education that would place students at the centre of their learning. Such initiatives would include the creation of more high-quality e-learning materials, and investments in learning research and related product development designed to meet the needs of learners. Additionally, e-learning opportunities should be more accessible for individuals with disabilities. Institutions, the private sector and governments should ensure the appropriate adaptation of technology and associated resources to meet the differing requirements of people with disabilities.

Filling the gaps in research

E-learning holds tremendous promise and potential, yet it remains a largely unexplored field.[16] There is a lack of Canadian data related to e-learning—in particular, relevant empirical and longitudinal research on e-learning[17] that would shed light on the effectiveness of current Canadian e-learning initiatives.[18]

The research findings that do exist offer a variety of opinions and conclusions. Some research demonstrates the positive impact of technology on student learning. However, other research strongly suggests that there is little evidence, if any, to support the claim that the use of technology in learning justifies the resources it requires, such as computers, software and special training.[19]

We need to know more about e-learning in Canada if we are to build a common framework for its advancement. Numerous authors have identified the need for data that provide better understanding of how e-learning is used and implemented in Canada and on issues such as access, quality, cost and outcomes.

Moreover, a stronger understanding of learning—both traditional and online— would help to ensure that the highest quality of learning experience is available. Evidence-informed research will help us understand how to harness the full potential of ICTs and how e-learning experiences and outcomes can differ and complement traditional learning approaches.[20]

Research has identified the need for an e-learning data clearinghouse that would monitor trends, collect good-quality evidence on promising practices, and create awareness and build capacity among stakeholders. This entity would contribute to greater understanding of e-learning's impact on the development of essential competencies and skills.

Final Observations

Lifelong learning is our greatest safeguard against an uncertain future. Clearly, ICTs have the potential to broaden the scope of lifelong learning. By advancing new learning technologies, Canada can maximize its human capital and help foster a dynamic learning society prepared to meet the challenges ahead.

Each new technological era entails a period of adjustment and new ways of thinking, but the potential benefits are well worth the effort and commitment required to secure Canada's future prosperity.

Endnotes

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INTRODUCTION

"In 2008, the digital world is both ordinary—it affects all aspects of our lives—and extraordinary—it offers revolutionary possibilities in all areas."
—New Zealand Government, Digital Strategy 2.0 (2008)

Lifelong Learning and the Role of New Technologies

The importance of lifelong learning to social and economic development has long been recognized by member countries of the Organisation for Economic Co-operation and Development (OECD). Lifelong learning provides benefits such as better health, more job opportunities and a higher quality of life.

Canada's economic competitiveness, and the success of individual Canadians, depends on our capacity to provide the best possible education and access to lifelong learning opportunities.[1]* Lifelong learning is our greatest safeguard against an uncertain future as we face the challenges of increased globalization, including rapid advancements in new technologies and demand for innovation and higher productivity.

Recent research suggests that in times of economic instability, education and training are of particular relevance and benefit. A U.S. study, *Staying the Course: Online Education in the United States, 2008*,† concludes that difficult economic times actually benefit the education sector.‡ Based on responses from more than 2,500 colleges and universities, the report demonstrates that decreased availability of good jobs encourages more people to seek education instead of employment. Additionally, employed individuals attempt to improve their chances for advancement by upgrading their skills and knowledge.[2]

Opportunities to learn in new ways and in varied contexts have grown significantly over the last decade, particularly with the introduction of new learning technologies. Iiyohshi and Kumar (2008) note that as the number of individuals participating in education has increased, so has the number of ways in which we learn and teach.[3] More new learning technologies such as web-based courses and tutorials are becoming available for individuals enrolled in formal education.

However, Brown (2008) cautions that the "unrelenting velocity of change means that many of our skills have a shorter shelf-life, suggesting that much of our learning will need to take place outside of traditional school and university environments."[4]

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* As early as 2000, the CMEC/Industry Canada Advisory Committee for Online Learning, chaired by David Johnston, President of the University of Waterloo, provided comprehensive advice on ways to build on Canada's strength in the post-secondary sector.

† *Staying the Course* is the sixth annual report on the state of online learning in U.S. higher education. Findings are based on responses from more than 2,500 colleges and universities.

‡ The report suggests that specific aspects of an economic downturn resonate closely with increasing demand for online courses with specific types of schools. Higher fuel costs, for example, are associated with increased enrolment in online courses. Educational institutions, particularly those offering programs geared to working adults, anticipate that rising unemployment will drive overall enrolment growth.

Increasingly, learning opportunities are occurring beyond the realm of formal education. Computer technologies and the internet are enabling individuals to search for information and learn about topics of personal interest. Individuals are able to gain expert views on content and to communicate and collaborate with others who have similar interests or perspectives.[5]

The Potential of E-Learning

The term *e-learning* has become an all-encompassing catch-phrase for the application of computer technologies to education—whether it occurs in face-to-face classrooms, blended and hybrid courses, mediated distance-education contexts or in online learning environments.[6]

Numerous noteworthy studies have illustrated the importance and benefits of technology as a way to equip learners for the future.[7] Because e-learning provides needed flexibility—any time, any place, and quality contextual training content—it is recognized as a fundamental tool for fostering a lifelong learning society.

As this report describes, information and communication technologies (ICTs) bring advantages to the learning process that are not readily available in other ways. The most prominent of these are more access to learning; better allocation of teaching resources; shared learning content; deeper learning; and a social component to learning.[8]

The learning potential of technology and the internet is evident and can provide one solution to the growing demand for post-secondary education (PSE) and skills and training. As noted in the 2001 report of the Council of Ministers of Education,

The benefits of e-learning

E-learning can improve the flexibility and quality of learning by:
- providing access to a high-quality, evidence-based range of multimedia resources and interactive courseware;
- enabling students to control the timing, location and pace of their studies;
- supporting educators in providing high-quality instruction;
- tailoring the learning environment to the learning needs of individual students;
- supporting increased communications among educators and learners;
- providing frequent and timely individual feedback and assessment; and
- supporting reuse of high-quality learning resources.

Canada (CMEC)/Industry Canada Advisory Committee on Online Learning, e-learning has emerged as a "powerful and transformative means to meet the needs of learners, as well as to extend and enrich traditional modes of instruction, at the post-secondary level."[9]

Canada's telecommunications infrastructure is generally regarded as one of the finest in the world and provides a firm foundation for online learning initiatives.[10] More so than in most other countries, a large proportion of Canada's population is better positioned to take advantage of e-learning initiatives, largely because access to the internet in Canada is more widespread.[11]

As the Advisory Committee on Online Learning noted, e-learning "represents a means to build upon that foundation by enriching the quality of post-secondary learning, extending it beyond the campus to where Canadians live and work, and creating new synergies and greater critical mass within post-secondary education."[12]

Challenges that Limit E-Learning's Potential

E-learning holds tremendous promise and potential, yet it remains a largely unexplored area of learning beset with many challenges that need to be addressed.[13]

Numerous studies have identified a number of issues that constrain e-learning's potential:

• Canada's efforts in e-learning are trailing behind those of other countries.[14]

• Low levels of collaboration across and among jurisdictions are resulting in the duplication of efforts and in unnecessary costs.[15]

• There is a lack of Canadian data related to e-learning—in particular, relevant empirical and longitudinal research on e-learning[16] that details the effectiveness of current Canadian e-learning initiatives.[17]

• Key barriers remain at the university level, including infrastructure, funding and staffing issues, and resistance by faculty (e.g., because of added workload, intellectual property issues).[18]

• Although lifelong learning is at the forefront of policy discussions, and technology is transforming education in most instances, there is little planning for, or vision of, e-learning for the future.[19]

• Research findings reflect a variety of opinions and conclusions. Some research demonstrates the positive impact of technology on student learning. However, other research strongly suggests that there is little evidence, if any, to support the claim that the use of technology in learning justifies the resources it requires.[20]

• As Abrami et al. (2006) note, post-secondary education in particular would benefit from a national plan to assess the impact of e-learning initiatives.[21]

• To date, there appears to be no comprehensive or coherent approach in Canada to align e-learning's vast potential as a learning tool with a clearly articulated and informed understanding of what it could or should accomplish.

About This Report

The objective of this report is to improve Canadians' understanding of e-learning—particulary of the challenges, limitations and benefits—so that Canada may move forward in appropriate and relevant ways. Levels of adoption of e-learning have been significantly slower than predicted.[22] We also identify areas related to e-learning where greater research is required to support effective decision-making, whether by policy-makers, educators or individual learners. It should be noted that this document does not aim to provide an exhaustive review or analysis of e-learning initiatives or policies, or to compare or rank the efforts of governments, institutions or organizations.

This report builds on work undertaken by the Canadian Council on Learning (CCL) and other organizations over the last several years. Notably, studies sponsored by CCL were carried out by Rossiter Consulting (2006), Abrami et al. (2006), Fournier (2006) and Charpentier et al. (2006). These studies provide a rich picture of the scope and complexity of e-learning in Canada and the challenges that it faces. All of these studies can be found on CCL's web site at www.ccl-cca.ca.

Fournier (2006), Abrami et al. (2006) and Charpentier et al. (2006) have provided a comprehensive review of the e-learning literature. Their reviews, particularly the one conducted by Abrami et al., provide the analytical underpinning for this report.

Data and information for this report were also derived from a wide range of reliable sources. These include the OECD; Statistics Canada; Canadian federal and provincial government documents and websites; and academic and professional journals and articles. A full listing of sources is available in the bibliography included at the end of the report.

SECTION 1: THE TECHNOLOGICAL TRANSFORMATION OF EVERYDAY LIFE

Over the past two decades, information and communication technologies (ICTs) have become pervasive features of modern society and essential tools for business.[23] Households, too, have become reliant on ICTs (including computers, cell phones and the internet) for day-to-day activities such as entertainment and shopping, paying bills and searching for information.[24]

Whether at work, home or in school, these technologies have dramatically altered our daily routines.[25] As Statistics Canada (2005) notes, "The widespread diffusion of information and communications technologies (ICTs) has been a source of change on many fronts."[26]

Studies have suggested that consumer demand for ICTs—such as those mentioned above as well as MP3 players, hand-held gaming devices, laptop PCs and other technologies[27]—will continue to increase. Studies have also illustrated the entrenchment of ICTs, confirming that despite a tight economic market, consumers consider the internet and cell phones essential for everyday life. In fact, consumers are unwilling to reduce their spending on these items and will first consider cutting spending on other "essentials."[28]

ICTs hold significant potential to transform and inform our daily lives and can be particularly effective in the areas of education and learning. However, there is much we need to understand if the potential of ICTs is to be realized fully.[29]

In its 2001 report, the Advisory Committee on Online Learning recommended that Canada harness the tremendous potential of ICTs. This would ensure that Canadians have improved access "to the best possible education and lifelong learning opportunities."[30] In particular, post-secondary institutions would be well positioned "to secure the benefits and avoid the pitfalls of the move to e-learning."[31]

Increasing Need for a Skilled and Adaptable Workforce

The availability of a skilled and adaptable workforce is the cornerstone of a productive and prosperous country and is critical to Canada's success in an increasingly global economy. Rapid advances in technology demand that employees continuously acquire new skills that can help their firms compete internationally.

As in other countries, the labour market in Canada is continually changing. Canada's current labour force is diverse. It has adjusted to many factors over the past two decades including significant growth resulting from the increased participation of women and under-represented groups; an aging population; and shifting demands as some industries decline and others experience rapid growth.

Technology has permeated virtually all aspects of work. Organizations and employers are increasingly reliant on various technologies to carry out their day-to-day business activities. Demand has also increased for a highly-educated personnel who can advance research and innovation and respond to the needs of a knowledge-based economy.

Canada has one of the most highly educated populations in the world. Nonetheless, not all Canadians are achieving reasonable levels of educational proficiency in basic competencies such as literacy (including information literacy, numeracy and scientific reasoning).[32] Nearly one-half (42%) of Canadians aged 16 to 65 do not have the literacy skills required to adjust to the rapidly changing demands of the workplace.[33]

As demand continues for increased skills and education, Canada's literacy situation will likely plateau or even worsen due to demographic shifts.[34] The number of seniors aged 66 and over with prose literacy skills below level 3 (*see text box below*) is projected to rise dramatically, from 3,059,000 in 2001 to 6,204,000 in 2031: an 88% increase, representing almost an additional three million low-skilled seniors.[35]

Such basic difficulties significantly affect the economic well-being of Canadians. These difficulties also jeopardize Canada's capacity to respond to the challenges of the global economy and to the transformative effects of ICTs.

Five levels of literacy

The Organisation for Economic Co-operation and Development (OECD)[36] defines the following five levels of literacy:

Level 1: Very poor literacy skills. An individual at this level may, for example, be unable to determine from a package label the correct amount of medicine to give a child.

Level 2: A capacity to deal only with simple, clear material involving uncomplicated tasks. Individuals at this level may develop everyday coping skills, but their poor literacy makes it hard to conquer challenges such as learning new job skills.

Level 3: Adequate to handle the demands of everyday life and work in an advanced society. This roughly denotes the skill level required for successful secondary-school completion and college entry.

Levels 4 and 5: Strong skills. An individual at these levels can process information of a complex and demanding nature.

The Role of Technology in Education and Training

As Statistics Canada (2003) notes, skills are becoming increasingly important in the knowledge economy, for individuals as well as for countries. The use of new technologies in everyday life, changing demands in the labour market, and participation in the globalization process significantly affect employment and workforce skills. Labour demand is shifting away from workers with lower skill levels to those with higher skills.[37]

ICTs can help us respond to these labour market challenges and create environments conducive to effective, high quality learning. Research suggests that, under the right circumstances, ICTs can improve educational outcomes and enable individuals to acquire skills needed to work in the knowledge-based economy.[38] These skills may be very specific or generic, and can be transferable. Arguably, ICTs may enable individuals to adapt to changes brought on by the digital economy.[39]

Use of ICTs—particularly the internet—substantially increases the knowledge and information available to us and, as studies suggest, increases access to education, learning and employment opportunities.[40] The OECD notes that information and communication technology has become "a ubiquitous part of our lives in OECD countries. As it is about information and communication, it is of central relevance for education."[41]

Increasingly, governments, educators and businesses have made use of ICTs a priority for providing individuals with the technological skills needed to succeed in today's workplace.[42] The role of technology in learning, however, is considerably more complex than simply assuming that the availability of ICTs will automatically result in learning. Undoubtedly the availability of ICTs is critical to learning, but individuals also need access to these technologies and require specific skills to use them effectively. Computer skills, basic literacy and analytical skills are prerequisites of successful learning outcomes.

Need for ICT Skills

Although individuals with ICT skills[43] are better able to participate fully in the digital economy, ICT skills such as basic literacy skills also enable various forms of participation in society.[44]

As noted by the Irish Information Society (2000), ICT skills are an integral part of an emerging concept of literacy and involve distinct skill sets and associated workplace competencies. These skills are often referred to as *foundation skills* because they are required across a range of activities and are the base upon which other skills are built.[45,46] In short, ICT skills are necessary for participation in society, the workplace and in the home.[47]

Workplace basic skills

The Conference Board of Canada notes that workplace basic skills include:[48]

- using computers, technology, tools and information systems effectively;
- understanding and ability to use prose (e.g., reports, letters, and equipment manuals);
- communicating effectively;
- understanding and ability to use documents (e.g., safety instructions, assembly directions, maps);
- understanding and ability to use numbers by themselves, or with charts and tables;
- thinking critically and acting logically to solve problems and make decisions;
- ability to build and work in teams;
- positive attitude toward change; and
- willingness and ability to learn for life.

ICTs have played an immense role in the Canadian workplace for many years. In 2000, almost six out of 10 Canadian workers used computers in their job; and among these workers, almost eight in 10 used a computer on a daily basis.[49] Similarly, in the U.S., most employed adults (62%) use the internet or e-mail at their job, and many have cell phones and BlackBerry* devices that keep them connected, even when they are not at work.[50]

Individuals who are skilled and experienced in the use of computers have, and will continue to have, a discernible advantage in educational and business opportunities.[51]

* A hand-held device with multiple functions, including those of a cellular phone, personal organizer, wireless internet browser, speakerphone and mini-laptop computer, capable of sending and receiving e-mail.

SECTION 2: BUILDING ON CANADA'S STRENGTHS

Canada has a long and proud history of innovation and has been the site of many world firsts—the long-distance telephone call, the transatlantic wireless message, the domestic digital microwave transmission network, the geostationary satellite communications network, and the world's longest fibre-optic communications network.[52]

Industry Canada describes Canada as an internationally "acknowledged leader" in the development of ICTs including wireless technology, biometrics, security technology, software, and multimedia and digital entertainment. Canadian advancements have also been noted in photonics, e-health technology, nanotechnology and artificial intelligence.[53]

Canada appears well positioned to benefit from the application of new technologies to learning and training. The rapid growth and penetration of ICTs in Canada—particularly the use of personal computers and internet for educational purposes—is broadening access to an ever-widening range of learning opportunities and options.

Innovation in Canada: A Strong Foundation for Success

Innovation—the development of new ideas and ways to function more efficiently—is critical to human progress. Expressions of human ingenuity such as the printing press, the steam engine, electricity and the internet have substantially altered our lives.[54] Indeed, innovation in modern times has become synonymous with the development of ICTs. ICT products and services have enhanced most daily activities and enabled us to live, work and relate to each other in ways previously thought impossible.

Canada's ICT sector includes over 30,000 companies within the manufacturing and service industries. These companies manufacture products and develop tools to capture, transmit and display data and information by electronic means.[55] While most of these companies are comparatively small in size—over 97% have fewer than 100 employees—their combined contribution to the Canadian economy is significant. In 2007, the ICT sector accounted for 4.7% of Canada's output and contributed $57 billion to the country's GDP. The ICT sector also accounts for a large share—$6 billion in 2006—of Canadian private-sector expenditures in research and development (R&D).[56]

With such a strong ICT sector, it is not surprising that Canada is home to many innovations in the field of ICTs including:

- the world's first personal computer;
- JavaScript and the XML programming languages;
- the world's first ultra-high-speed optical research network; and
- the BlackBerry.[57]

Although rapid advancements in technology may account for differing views about the full impact of these new ICTs, many sectors—including education—recognize the potential of ICTs to enhance certain aspects of life. ICTs have undeniably altered our mode of learning and teaching.[58] Given our strong ICT sector, Canada appears well positioned to use technology to enhance education and learning.[59]

Ranking countries' e-readiness

The Economist Intelligence Unit (EIU) has been assessing the world's largest economies' e-readiness since 2001. The EIU's E-readiness ranking measures the quality of a country's ICT infrastructure and the ability of its consumers, businesses and governments to use ICTs to their economic and social benefit.

Overall, the EIU's analysts evaluated each country using nearly 100 separate criteria, both qualitative and quantitative, to determine their E-readiness score. The EIU 2008 report ranked Canada 12th out of 70 countries, up from its position of 13th in 2007. Canada's ranking was particularly strong in the legal environment and consumers and business adoption categories.

For more information on the EIU's 2008 E-readiness rankings, visit www.eiu.com/sponsor/ibm/e-readinessrankings2008.

Rapid Growth of Information and Communication Technologies in Canada

ICTs encompass a wide range of electronic tools and devices including personal computers, personal digital assistants (PDAs), cell phones and MP3 players. As Statistics Canada (2006)[60] notes, ICTs are affecting behavioural patterns in the workplace, home and community.

Computers have become an integral part of society, transforming how we work, play and communicate, and how businesses and governments function and conduct research. The personal computer has undergone rapid transformations, becoming smaller, faster, cheaper and more powerful.[61] It is also now integrated into a wide variety of technologies—cars, phones and many other devices once considered "low-tech." Although several trends suggest that the rate of technological change will continue, uncertainty remains about the forms or directions this change may take.[62]

Evolution of ICT connectivity in Canada

In 1998, only one in four households had internet access.[63] Text messaging was unknown, and social networking sites—just introduced—had very few users. Mobile phones were used by less than 30% of Canadian households, and PDAs and MP3 players were not yet mainstream devices.[64]

In the last 10 years, there has been remarkable growth in the penetration and use of technologies such as the personal computer, broadband internet and mobile phones. In 2006, three-quarters of Canadian households had a personal computer, 68% had cell phones[65] and seven in 10 cell-phone users claimed to have their wireless device with them at all times.

Today, social networking sites are hugely popular in Canada: nearly eight million Canadians are connected to Facebook alone.[66] A comparable number of people use instant messaging daily. The average Canadian aged 12 to 24 sends and receives 90 text messages a week and logs on to Facebook approximately 2.8 times a day to connect with an average of 154 friends. Over two million Canadians used a BlackBerry or a Smartphone* in 2007—compared with only a small portion who used these devices four years prior.[67]

The social aspect of ICTs

From the workplace to the home, from how we make purchases to our wider participation in associations and groups, individuals are communicating more than ever before.

However, as Statistics Canada (2006) notes, the pattern of communication and interaction has changed. An individual may be talking to the person next door or to someone thousands of miles and several time zones away. Thus, "It is not that people are becoming anti-social; it is that people are becoming differently social."[68]

The complexity and adoption of online social networking has evolved in recent years. Students are building broader communities of interest and spheres of influence; many students use social networking sites (such as MySpace and Facebook) on a regular basis. Social networking sites are becoming so popular that parents, professors and even employers are starting to explore their communication potential. Modern e-learning technologies now recognize the importance of learning as a social process and are offering users opportunities to collaborate with other learners, interact with the learning content and to seek guidance from teachers, trainers and tutors.[69]

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* A cellular telephone with information access that provides digital voice service as well as any combination of e-mail, text messaging, pager, web access, voice recognition, still and/or video camera, MP3, TV or video player and organizer. Cited in PCMag.com, "Definition of: Smartphone," www.pcmag.com/encyclopedia (accessed Dec. 10, 2008).

In particular, the number of internet users worldwide has dramatically increased, commensurate with the growth in the number of websites. In 1995, there were an estimated 18,000 websites; by 2007, the number had grown to more than 100 million, with about 90% of the growth occurring since 2000.[70] The number of internet users worldwide has also grown substantially—from an estimated 16 million users in the mid-1990s to more than one billion (1,000 million) users by 2006.

Figure 2.1
Historical diffusion of selected goods, Canada
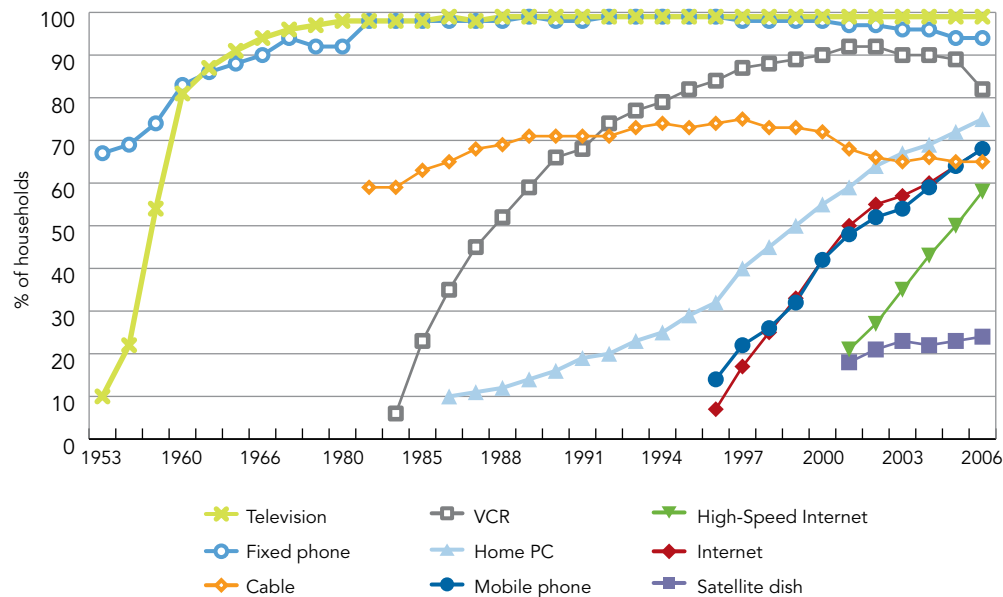
Source: OECD, "The future of the internet economy: a statistical profile," presented at the OECD Ministerial Meeting on the Future of the Internet Economy, Seoul, Korea, June 17–18, 2008.

Canadian households among the most frequent users of the internet

Since the internet's introduction, its use has grown more quickly compared with that of most other technologies. Canadians are using the internet more and increasingly, for different purposes. The 2007 Canadian Internet Use Survey notes that almost three-quarters (73%) of Canadians aged 16 and older—19.2 million individuals—used the internet during 2007, many on a daily basis.[71] Most internet users reported using it at home during 2007, while 41% used it at work, 20% at school and 15% at a library.[72]

In a 2006 study, Canada ranked among the top 10 countries in the number of internet users (including those using it at home and work). Canada led the G7 countries and ranked slightly ahead of the U.S.[73] A 2008 OECD study (*see Figure 2.2, p. 24*) showed that the percentage of Canadian households with home access to the internet was higher than the OECD average of 58%.[74]

Figure 2.2
Households with home access to the internet, OECD countries, 2007
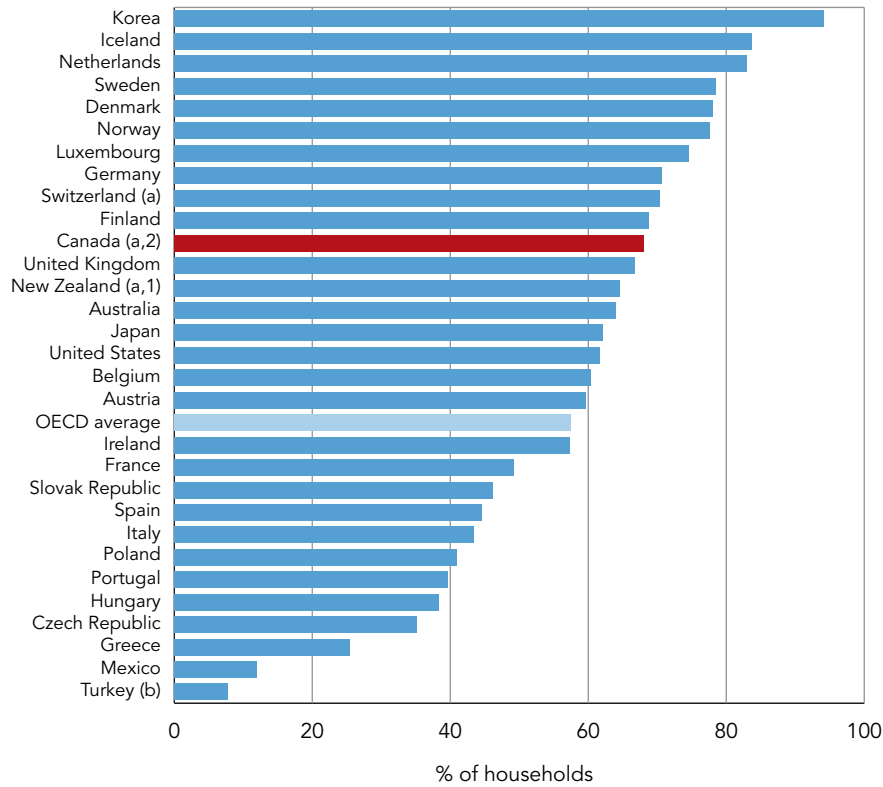
% of households

Internet access is via any device (e.g., desktop computer, portable computer, TV, mobile phone). Generally, data from the EU Community Survey on household use of ICT—which covers EU countries plus Iceland, Norway and Turkey—relate to the first quarter of the reference year. For the Czech Republic, data relate to the fourth quarter of the reference year.

Figure notes:
a. 2006; b. 2005
Country notes:
(1) The information is based on households in private occupied dwellings with access to the internet. Visitor-only dwellings, such as hotels, are excluded.
(2) Statistics for 2001 and every other year thereafter include the territories (Northwest Territories, Yukon Territory and Nunavut). For the even years, statistics include the ten provinces only.

Source: OECD, "The future of the internet economy: a statistical profile," presented at the OECD Ministerial Meeting on the Future of the Internet Economy, Seoul, Korea, June 17–18, 2008.
Data source: OECD, ICT database and Eurostat, Community Survey on ICT usage in households and by individuals (Paris: Jan. 2008).

The majority (96%) of individuals aged 16 to 24 went online in 2007—more than three times the rate of those aged 65 and older (29%).

Young people in Canada use the internet regularly. According to Statistics Canada (2000), 82% of parents reported that their school-age children used the internet, and that school provided the most common access point (71%) compared with home (45%).[75] PISA 2006 reports that 31% of 15-year-old students in Canada used a computer almost daily to search the internet for information, above the OECD average of 25%.[76] More than one-quarter (26%) of students used a computer almost every day to collaborate online with a group or team, and 62% used a computer almost every day to communicate through e-mail or chat rooms.[77]

Wikipedia: a web-based encyclopedia

"Wikipedia is a multilingual, web-based, free content encyclopedia project.... Wikipedia's articles provide links to guide the user to related web pages with additional information.... Since its creation in 2001, Wikipedia has grown rapidly into one of the largest reference websites, attracting at least 684 million visitors yearly by 2008." Over 75,000 active contributors work on approximately 10 million articles in more than 260 languages. Every day, hundreds of thousands of visitors from around the world "make tens of thousands of edits and create thousands of new articles" to enhance the knowledge held by the Wikipedia encyclopedia.

Source: Wikipedia, "Wikipedia," www.wikipedia.org (accessed Nov. 5, 2008).

While internet use has become more common in Canada, findings from the 2007 Canadian Internet Use Survey indicate that a digital divide still exists. Important factors such as age, income and education continue to influence internet use.

Internet access rises with income level. Most individuals (91%) in the top income group (earning more than $95,000) used the internet in 2007—representing almost twice the proportion (47%) of individuals in the lowest income group (earning less than $24,000)[78] who accessed the internet in 2007.

Internet access also rises with education level: 84% of individuals with at least some post-secondary education used the internet in the year prior to the survey, compared with 58% of those with less education.[79]

Reasons for internet use

Canadians went online for a number of reasons in 2007. While most used the internet for e-mail (92%) and general browsing (76%), Canadians' participation is increasing in new and emerging online activities ranging from content contributions and "blogging" to discussion groups.

One-fifth (20%) of users who went online from home reported making content contributions such as posting images, writing blogs or participating in discussion groups. These activities were especially popular among young people; individuals under 30 accounted for over one-half of those who reported contributing online content.[80] As Tapscott (2008) notes, the internet is not just a passive medium that provides information: "The New Web enables people to create their own content, collaborate with others and build communities. It has become a tool for ordinary people to organize themselves, instead of waiting for orders from the authorities."[81]

Understanding Web 2.0

The phrase "Web 2.0," originally coined in 2004 by O'Reilly Media, reflects internet users' attempts to foster creativity and communications, and to secure information-sharing, collaboration and functionality of the internet. Web 2.0 concepts have led to the development and evolution of web culture communities and hosted services, such as social networking sites, video-sharing sites, wikis, blogs and folksonomies.[82]

Table 2.1: Online activities of home internet users, aged 16 and older, 2007	
	%
E-mail	92
General browsing for fun or leisure	76
Research other matters (family history, parenting)	70
Obtain weather or road conditions	70
Travel information or making travel arrangements	66
View news or sports	64
Electronic banking or bill payment	63
Window shopping	60
Search for medical or health-related information	59
Search for information about governments	51
Education, training or school work	50
Use an instant messenger	50
Ordering personal goods or services	45
Obtain or save music (free or paid downloads)	45
Research community events	44
Play games	39
Obtain or save software (free or paid downloads)	33
Job search	32
Listen to the radio over the internet	28
Communicate with governments	26
Research investments	25
Download or watch TV or a movie over the internet	20
Contribute content (blogs, photos, discussion groups)	20
Make telephone calls	9
Sell goods or services (auction sites)	9

Source: Statistics Canada, "Canadian internet use survey: 2007," *The Daily* (June 12, 2008),
www.statcan.ca/english/dai-quo/.

Household access to broadband services

As the OECD (2008) notes, broadband access increased sharply over this decade. Almost 25% of the population in Canada had broadband access by 2006, compared with an OECD average of approximately 17%.[83]

High-speed connections have become prevalent in Canada. In 2007, an estimated 88% of individuals who accessed the internet from home did so with a high-speed connection, up eight percentage points from two years earlier.[84] Much of the growth has been attributed to new users, and to existing users switching from a slower connection.

High-speed connections are more widespread in urban than in rural homes. More than nine in 10 urban-home users reported using a high-speed connection in 2007, compared with approximately seven in 10 home users in rural areas.[85] More than one-half of internet users in rural and small towns who reported using a slower connection cited lack of high-speed access—through a telephone or cable connection—in their area.

Private and public sector use of ICTs, the internet and broadband services

In 2007, most employees in Canada's private sector had on-the-job access to personal computers (62%), the internet (57%) and e-mail (49%), compared with more than 80% of public sector workers.[86] Access to these technologies has increased considerably: since 2000, access to the internet has accounted for most of this growth—an increase of 18 percentage points among private sector employees, and 35 percentage points among public sector employees.

Private and public sector internet use has also increased. In 2007, 87% of organizations in the private sector reported using the internet and 81% reported using e-mail.[87] In comparison, an average of 95% of medium-sized and large businesses in OECD countries were using the internet in 2007.[88] Use of the internet and e-mail was nearly universal in Canada's public sector.

Less than one-half (41%) of organizations in the private sector reported having a website in 2007,[89] up slightly from the previous year when the majority of firms reported that they used their site primarily to provide information about their company and product and service offerings.[90]

Over three-quarters of private sector firms used wireless communication in 2007, up from 51% in 2000. More than nine in 10 public sector organizations reported using wireless communications in 2007.[91]

In Canada, private sector use of broadband internet continues to spread widely. In 2007, 88% of firms used a high-speed connection, up from 81% in 2005.[92] Close to 99% of public sector organizations used a high-speed connection in 2007. As Statistics Canada (2007) notes, the proportion of organizations within the Canadian market that use a high-speed connection is reaching a saturation point.[93]

Table 2.2: Use of information and communications technologies (ICTs)					
	2003	2004	2005	2006	2007
	% of enterprises that reported using ICTs				
E-mail					
Private sector	74	77	76	78	81
Public sector	100	100	100	100	100
Wireless communications					
Private sector	57	57	60	74	77
Public sector	74	77	82	91	91
Internet					
Private sector	78	82	82	83	87
Public sector	100	100	100	100	100
Having a website					
Private sector	34	37	38	40	41
Public sector	93	92	95	94	93

Source: Statistics Canada, "Electronic commerce and technology: 2007," *The Daily* (April 24, 2008), www.statcan.ca/english/dai-quo.

SECTION 3: UNDERSTANDING E-LEARNING

Canada's hopes for future prosperity will depend on the strength of its educational system, but also on its capacity to engage all groups of Canadians, across all ages and stages of life, in all types of learning.

While the learning outcomes of e-learning are similar to those of traditional learning,[94] e-learning offers several distinct advantages:

- It is self-directed, enabling students to choose content and tools appropriate to their differing interests, needs, and skill levels.
- It reduces geographical barriers, thus broadening educational options.
- It is delivered "just in time"—when desired or necessary.
- Finally, e-learning encourages learners to think and learn independently and collaboratively, which can foster positive attitudes about the value of lifelong learning.[95]

Defining E-Learning

The term *e-learning* often slips effortlessly into discussions about education and learning. However, the definition of the term itself can vary widely. As Fournier (2006) and others have observed, there is no standard definition for e-learning. Rather, e-learning has become an all-encompassing catch-phrase for the application of computer technologies to education—whether it occurs face-to-face in classrooms, in blended and hybrid courses, in mediated distance-education contexts, or in e-learning environments.[96]

For the purposes of this report, e-learning is defined as the following: "the development of knowledge and skills through the use of information and communication technologies (ICTs), particularly to support interactions for learning—interactions with content, with learning activities and tools, and with other people."[97]

elearn.ca, a collaborative venture between Algonquin College, Industry Canada and SmartCapital, offers further clarification: e-learning can be described as the use of online technologies (such as e-mail, websites, multimedia, information from the internet, discussion groups or chat groups) in learning and teaching. It can entail an online course, participation in face-to-face or hybrid courses enhanced with online activities and materials, and the use of the internet to acquire new skills and information.[98]

Many Forms of E-Learning

Rossiter Consulting (2006) notes the following about e-learning: it involves more than the delivery of content, is not limited to a particular technology, and can be a component of blended or hybrid learning.[99]

For example, e-learning does not require use of the internet. It can occur through many stand-alone applications and local networks. It can take place at any time, anywhere—in educational settings, the workplace, and in home environments. It can be formal, informal, or a combination of both.

E-learning can take many forms and, as the OECD notes, can include a range of online applications, including:[100]

• *Web-dependent:* Students use the internet for key "active" elements of the program—online discussions, assessment and project/collaborative work—but without significant reduction in classroom time.

• *Web-supplemented:* This could include online components such as course outlines, lecture notes, use of e-mail, and links to external online resources.

• *Mixed-mode:* Students are required to participate in online activities such as discussions, assessment and project/collaborative work, as part of course work. These online activities partially replace face-to-face teaching/learning. Campus attendance remains significant to the course.

• *Fully online:* Students can follow courses offered in one location from another town, country or time zone.

Types of learning

Formal learning refers to knowledge and skills acquired in a structured setting—such as a school, college or university—that lead to a recognized credential.[101] This type of learning is primarily intended for personal or work-related purposes. About 49% of Canadian adults between the ages of 16 and 65 were involved in some form of adult education and training course or program in 2003.[102] Some programs in Canada are delivered primarily through e-learning, while others use a blend of methods such as classroom teaching combined with an e-learning module.

Informal learning, also referred to as experiential learning, can be unplanned or unintentional learning that occurs during everyday activities (e.g., work, family life, leisure). It can also be planned or intentional learning, as when individuals participate in short lectures, read books or journals, or use information technology and communications tools including e-learning.[103]

In many types of informal learning situations for children and adults, the use of technology is an integral part of the learning process. Indeed, the use of educational technologies is most prevalent in these informal, non-credit learning opportunities. For example, many children use interactive software at home to develop math or reading skills; families use the internet to locate travel and weather information; and workers use spreadsheets in their daily work.

E-learning versus distance education

The terms *e-learning* and *distance education* share many attributes and are often used synonymously. However, there are distinct differences between these two types of learning technologies.[104]

Distance education often refers to the provision of courses to learners who are separated physically from one another and from the instructor. The classroom is virtual, and learners learn at their own pace and on their own time.

Historically, distance education included correspondence courses and courses delivered over the radio *(see text box, p. 33)* or television. It was also geared primarily to post-secondary education and adult learning. With advancements in computerized technologies, these older methods of course delivery are being replaced and distance learning is increasing its reach to other audiences and contexts—such as secondary students and informal learning.

In contrast to distance education, *e-learning* is more inclusive and can include both distance and traditional in-class instruction. This blended approach (e.g., web-supplemented or mixed-mode e-learning) is often referred to as "hybrid" learning. In this sense, e-learning is used for several purposes: to enhance traditional classroom methods; to present course-related materials online; as a communication tool between students and instructors; and as an interactive device between students and course content.

New technologies have permeated traditional forms of distance education. Most institutions that provide distance education now have e-learning components such as the inclusion of internet, e-mail or online services.*

* Canadian Association for Distance Education (CADE) became the Canadian Network for Innovations in Education (CNIE). For more information, see www.cnie-rcie.ca.

Early efforts in distance education

School Cars

In the 1920s, railway cars were used as a way of reaching and teaching isolated children and adults in remote areas of Northern Ontario. Learners had limited educational opportunities in these scattered settlements.

The first of these schools was a converted coach, donated by Canadian National Railways (CNR) in 1926. The experimental school was considered very successful and soon thereafter seven schools on wheels traversed more than 4,500 miles (7,241 km) of railway line throughout the province's hinterland. Each week, a CNR freight train moved the school car to particular sites between Capreol and Foleyet, where it would remain for five days. Pupils would then be left with sufficient homework to last until their school returned to them from a full tour of its 149-mile (240 km) schoolyard. More than 1,000 children graduated from this unique school.[105]

Radio

Radio was initially used as a form of entertainment for railway passengers and railway hotel guests. Guests seated in parlour cars were equipped with headphones. As early as 1925, educational programs intended for young children were being broadcast network-wide and locally. Educational programs were also offered to adults during evening hours, such as the series of music lectures and performances entitled *An Introduction to the Gilbert and Sullivan Operas.*

In 1933, the Canadian Broadcast Corporation (CBC) took over the network. Other programs for adult learners were devised, such as the National Farm Forum that began in 1941 and ran until 1964. In the late 1920s, universities and governments in several provinces also began promoting and investing in radio education, in part because of the successful example of the CNR network.[106]

Mobile learning

Some researchers suggest that mobile learning is the next generation of e-learning,[107] while others describe it as one of the many varieties of e-learning.[108]

As O'Malley et al. (2003) note, mobile learning occurs "when the learner is not at a fixed, pre-determined location, or when the learner takes advantage of learning opportunities offered by mobile technologies."[109] Mobile devices include cell phones, Smartphones, BlackBerrys, laptop computers and personal media players. When mobile devices are combined with wireless connectivity, learning opportunities increase and can be monitored or co-ordinated between locations.[110]

These portable, lightweight devices open up new advantages and possibilities, impacting teaching and learning, and the connections between formal and informal learning, and work and leisure.[111]

Growth of E-Learning in Canada

Over the past decade, e-learning has made a remarkable transition into Canadian schools and businesses. As Human Resources and Social (now Skills) Development Canada (2003)[112] notes, the growth of e-learning can be attributed to several factors including:

- advancements in digital technology that are enriching interactivity and the media content of the web;

- increasing global reach of the knowledge-based economy and society;

- increasing bandwidth and better delivery platforms and repositories;

- increased availability of a growing selection of high-quality e-learning products and services—such as content providers, authoring tools, training management systems, portals, delivery systems and integrated solutions;

- emerging technology standards that facilitate compatibility and usability of e-learning products;

- integration of knowledge management and e-learning into a more unified vision for enterprises whose goal is to increase their learning productivity; and

- increased sophistication of e-learning users—citizens, lifelong learners, students in K–12 (kindergarten to grade 12, or elementary and secondary school) and post-secondary education, workplace managers and human resources specialists, etc.

Dimensions of E-Learning

As Wagner, Hassanien and Head (2008) note, the extent of e-learning technology use in course delivery can vary widely and be characterized by a number of dimensions.[113]

Table 3.1: The dimensions of e-learning			
Dimension	Attribute	Process	Example
Synchronicity	Asynchronous	Content delivery occurs at a different time than receipt by the student.	Lecture module delivered via e-mail
	Synchronous	Content delivery occurs at the same time as receipt by the student.	Lecture delivery via webcast
Location	Same place	Students use an application at the same physical location as other students and/or the instructor.	Using particular technologies to solve a problem in a classroom
	Distributed	Students use an application at various physical locations, separate from other students and the instructor.	Using particular technologies to solve a problem from distributed locations
Independence	Individual	Students work independently from one another to complete learning tasks.	Students complete e-learning modules autonomously
	Collaborative	Students work collaboratively with one another to complete learning tasks.	Students participate in discussion forums to share ideas
Mode	Electronically only	All content is delivered via technology; there is no face-to-face component.	An electronically-enabled distance-learning course
	Blended	E-learning is used to supplement traditional classroom learning.	In-class lectures are enhanced with hands-on computer exercises

Adapted from source: Nicole Wagner, Khaled Hassanein and Milena Head, "Who is responsible for e-learning success in higher education? A stakeholders' analysis," *Educational Technology & Society* 11, no. 3 (2008): 26–36.

New times, new learners

Over the past decade, the proliferation of e-learning resources—such as online courses and programs, and virtual schools—has rapidly changed the learning environment within Canada and other countries.

Most students today are well accustomed to using a computer and internet technologies.[114] As Frand (2000) notes, "most students entering our colleges and universities today are younger than the microcomputer, are more comfortable working on a keyboard than writing in a spiral notebook and are happier reading from a computer screen than from paper in hand."[115]

However, not all students possess the same level of comfort. As Shank (2008) suggests, among learners in the digital age, there are substantial and identifiable differences between learners who were raised with digital technologies ("Net-gens") and those who were not. Levels of comfort with learning informally can also be distinctly different.[116]

Although student satisfaction surveys contain limited evidence, they suggest that e-learning has positively affected the quality of teaching and learning.[117] ICTs have altered the overall learning experience of students by relaxing time and space constraints and by providing easier access to information and materials—an achievement that should not be downplayed.[118]

E-Learning Stakeholders in Canada

Effective use of e-learning addresses the varying interests, motivations, concerns and demands of stakeholders.[119]

As Wagner, Hassanein and Head (2008) note, when all stakeholders "fulfil their responsibilities to create effective and meaningful e-learning experiences, positive outcomes extend beyond success in specific courses and programs to facilitate lifelong learning and discovery."[120] Each stakeholder group has an important role to play in enhancing the overall learning experience.[121]

- *Students and instructors* should participate as proactively as possible, provide feedback to improve future experiences, and communicate the learning possibilities that e-learning creates.

- *Institutions* should provide the technical infrastructure and support needed to enable comprehensive solutions.

- *Content and technology providers* should provide high-quality, practical solutions that consider learning principles.

- *Accreditation bodies* should provide and enforce clear guidelines for this new form of learning delivery.

- *Employers* need to recognize the validity of this form of education, and work with other stakeholders to ensure that graduates' skills meet the needs of the job market.

Table 3.2: Key stakeholders in e-learning						
	Student	Instructor	Institution	Content Provider	Technology Provider	Accreditation Body	Employer
Student	- participation in collaborative exercises to enhance learning - share experiences and encourage use	- participate proactively in exercises - provide feedback regarding overall effectiveness	- use e-learning technologies according to institutional policies	- provide feedback regarding the appropriateness of content for e-learning	- provide feedback regarding the effectiveness of technologies	- demand accreditation for e-learning programs - provide feedback	- promote the validity of e-learning during interviews
Instructor	- provide effectively designed courses incorporating e-learning content - provide technical and motivational support to encourage use	- share experiences and encourage use - promote standardization	- use e-learning technologies according to institutional policies and standards	- ensure protection of copyrights - provide feedback regarding the level of effectiveness experienced by students collectively	- provide feedback regarding the effectiveness of technologies	- adhere to accreditation standards	- educate on the validity of e-learning
Institution	- standardize the e-learning experience across courses - provide technical support - protect sensitive student information	- provide training in instructional design and technology - provide technical support - provide incentives - enforce standardization	- recognize e-learning credits - share e-learning experiences and courses - encourage standardization	- ensure protection of copyrights - provide funding for content development	- provide feedback to improve future versions - supply appropriate infrastructure to support technology	- adhere to accreditation standards - provide evidence for quality assurance	- seek course accreditation to provide evidence for quality assurance - educate on the validity of e-learning
Content Provider	- select appropriate content and media for e-learning - comply with usability standards	- provide content that meets course & program needs - comply with learning & usability standards	- provide content that meets institutional needs - comply with learning standards	- comply with standards for interoperability	- comply with standards for interoperability	-adhere to accreditation standards	- provide content relevant to work environment
Technology Provider	- consider learning principles when designing - allow adjustments for individual learning styles - comply with usability standards	- consider usability and teaching principles when designing - comply with learning & usability standards	- comply with standards for interoperability - provide technical support and training	- comply with standards for interoperability - provide technical support	- comply with existing standards, and collaborate to develop new standards when necessary	- adhere to accreditation standards	- provide an effective learning environment to maximize learning of potential employees
Accreditation Body	- enforce standards to ensure quality of accredited courses	- provide clear guidelines for requirements	- provide clear guidelines and timely services	- provide clear guidelines for requirements	- provide clear guidelines for requirements	- collaborate to ensure consistency	- enforce effective standards to ensure quality of graduates
Employer	- recognize the validity of e-learning	- provide feedback regarding success of graduates	- provide feedback regarding success of graduates	- provide feedback regarding relevance in workplace	- provide feedback regarding success of graduates	- ensure that standards provide appropriate measures	- share experiences and encourage acceptance of e-learning

Source: Nicole Wagner, Khaled Hassanein and Milena Head, "Who is responsible for e-learning success in higher education? A stakeholders' analysis," *Educational Technology & Society* 11, no. 3 (2008): 26–36.

The importance of stakeholders was also noted in a 2006 report on project barriers and success factors of a large-scale e-learning project (Learn@WU) at the Vienna University of Economics and Business Administration. The report concluded that:

• continuous stakeholder alignment and process synchronization throughout the entire project life cycle is critical to success;

• this approach links the strategy and connections of the company/organization with customers, vendors, and suppliers, which in turn need to be connected to project schedules, resources, quality assurance procedures, and expected functionality; and

• managing trade-offs among stakeholder priorities is crucial—projects can "affect an entire company/organization (Yourdon, 2000), demanding alignment or even reengineering of affected business processes and models."[122]

Use of the Internet for Educational Purposes

In 1999, Cisco Systems, Inc. CEO John Chambers remarked that "[e]ducation over the Internet is going to be so big it is going to make e-mail usage look like a rounding error."[123] Indeed, the internet appears to offer abundant learning opportunities.

The internet is an endless source of information that can be used for numerous purposes: worldwide broadcasting; dissemination of vast amounts of information; and as a medium for collaboration and interaction between individuals and their computers, regardless of geographic location.[124,125]

Many Canadians use the internet to pursue learning opportunities. Over one-quarter (26%) of Canadians aged 18 and older—an estimated 6.4 million individuals—logged on to the internet for education, training or school work in 2005.[126] In 2007, one-half (50%) of all home users (16 and older) went online for the purposes of education, training or school work.[127]

Research suggests that individuals who use the internet for education *(see Figure 3.1 for examples of types of use, p. 39)* tend to be younger, better educated, and more likely to be employed. Those using the internet for education-related reasons are also more likely (than those who do not use it for this reason) to report accessing the internet daily and spend an average of five hours or more online.[128]

Over one-quarter (26%) of those who went online for education-related reasons reported doing so for distance education, self-directed learning or for correspondence courses. Indeed, most Canadians who went online for education-related reasons were students. Nearly 80% of all full- and part-time students reported going online in 2005 for education, training or school work.[129]

Most Canadians who used the internet for education (approximately 4.2 million adults aged 18 and over) did so to research project assignments or to solve academic problems. This represented two-thirds (66%) of those who went online for education, training and school work.[130]

Figure 3.1
Proportion of education users by type of use
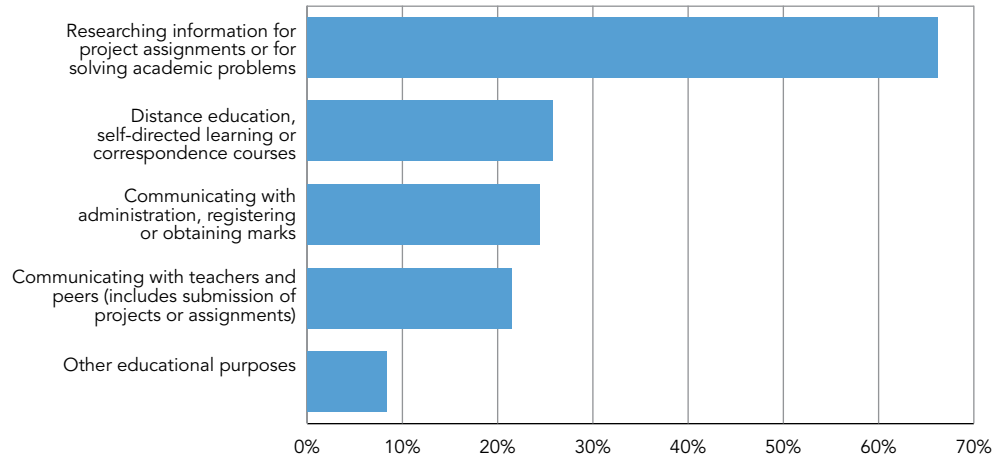
Source: Statistics Canada, Internet Use at Home, by Sex and Specific Educational Purposes, Every 2 Years (Percent) *Terminated, Canadian Internet Use Survey, CANSIM Table 358-0133.

Education users who lived in urban areas were more likely than respondents from rural and small towns to report going online to research information for assignments (66% versus 62%).[131] However, rural Canadians were more likely than those from urban areas to report using the internet for distance education, self-directed learning or correspondence courses (29% versus 25%). The higher proportion of Canadians from rural and small towns who used the internet for electronic distance learning suggests that despite the barriers of geographic location, rural youth may be using the internet to improve their access to post-secondary education.

SECTION 4: TECHNOLOGY AND LIFELONG LEARNING

As a 2008 U.K. report notes, technology is a central driver of lifelong learning—particularly as information and knowledge are central to individual and economic well-being in the knowledge economy.[132] Rapid technological change and global competitive pressures are demanding new forms of learning and training.

E-learning—the use of ICTs in education and training delivery—is viewed as an effective approach to improving human capital in various environments and learning domains.[133] It can help upgrade the skills of adults, educate students within the K–12 and post-secondary education sectors, provide people with disabilities access to learning opportunities, offer communities culturally appropriate learning materials, and enable employers to deliver employee training.[134] As a learning enabler, e-learning has significant potential to help Canadians acquire the skills and knowledge they need to meet the demands of the future.

E-learning offers quality contextual training content and needed flexibility (any time, any place) and is recognized as a fundamental tool that can foster a lifelong learning society.

E-learning Across the Life Course: The Formal School Years

E-learning is a powerful tool with the potential to expand the educational opportunities of all students. Canadian educational authorities and governments recognize the importance of integrating ICTs into learning and teaching—particularly for preparing students for the needs of today's economy and reaping the benefits from the most recent learning tools.[135] Canada has been a leader in the establishment of e-learning opportunities for students during their formal school years.[136]

Education and training systems have an important role to play in promoting equity among Canadian students. However, the OECD (2001) warns that despite steady improvements in overall education levels over the past few decades, "educational opportunities continue to be unevenly distributed" and "new risks" are apparent: "As jobs expand in high-skilled occupations, new skills-based inequalities may emerge. Unequal access to, and use of, ICTs may be reinforcing existing inequities through a new 'digital divide.'"[137]

Effect of socio-economic status and gender on high-school students' use of computers

As an article by Lowe, Krahn and Sosteric (2003)[138] notes, the use of computers and the acquisition of computer skills is a complex issue that is yet to be explored fully. In particular, socio-economic status and gender play a key role in computer usage.

Home computers are an educational resource and are seen by many as a new and necessary form of cultural capital in a knowledge-based economy. Computer literacy is also widely recognized as a crucial employability skill.

Student computer use is influenced by parental income and education levels. Students from more-advantaged backgrounds are more likely to have a computer at home. Parents with higher levels of income and education tend to treat home computers as a form of essential cultural capital, because computers may give their children an educational and economic advantage.

Research also suggests that students who use home computers may have more-positive attitudes towards computers.[139]

Less-advantaged students are more likely to use a computer at school (than at home). This may be explained in part because students from more-advantaged households have a reduced need to use school computers.

The issue of whether computer use reduces or reproduces inequalities is an ongoing debate. However, research suggests that although school computers are becoming widespread, their ability to reduce existing inequalities is minimal.[140]

Gender also plays a key role in the use of computers. Boys tend to have better access to computers, and are socialized to have positive attitudes towards computers; as a result, boys tend to exhibit greater interest in and use of ICTs than their female counterparts.[141] This gendered socialization to technology occurs primarily in the home, and schools as a result cannot fully control technology-based learning outcomes.[142]

ICT use in elementary and secondary schools

Access to learning technologies in schools can open up a wide range of opportunities and enable more effective learning and teaching. The educational use of computers and the internet can provide enriched learning opportunities for students and are a useful pedagogical resource for teachers.[143]

At the elementary- and secondary-school (K–12) levels, considerable effort has been devoted to acquiring computer hardware and software for schools, connecting them to the internet, and helping educators improve their own ICT-related skills and knowledge.[144]

Computers are now widely available for teacher and student use in Canadian schools. During the 2003–2004 academic year, more than one million computers were available for use by 5.3 million students in elementary and secondary schools across Canada—representing an estimated ratio of one computer for every five students. This ratio was better than the average among OECD countries, where one computer was available for every 13 students. The estimated median student-to-internet-connected-computer ratio in Canada was somewhat higher, with one computer for every 5.5 students.[145]

The number of computers available per student in Canada depends on the size of the school and its grade level(s). More computers are available per student in smaller schools (smaller, in terms of student numbers) and secondary schools. The 1999 Second International Technology in Education Survey (SITES) confirmed that computers were generally more readily available to students in higher grades (such as in secondary school) and were more likely to be located in computer labs (45%) than in classrooms (41%).[146]

Other studies, however, have suggested that regardless of where computers are located, teachers are using computer technology—most commonly, word processing software and the internet/intranet as a tool for disseminating information. Teachers also make frequent use of software applications for special-needs students.[147]

Table 4.1: Technology applications frequently incorporated into teaching practices, school year 2003–2004				
	All schools	Elementary	Secondary	Mixed elementary and secondary
			% of schools	
Use of word processing	78.2	77.3	82.1	75.7
Use of internet/intranet to disseminate information	34.4	32.5	40.5	33.5
Use of software for special-needs students and/or remedial progams providing individualized learning	29.1	30.4	28.7	22.9
Use of internet for online learning	28.8	27	32.7	30.5
Use of software for specific subject areas	28.3	28.1	30.9	25
Use of desktop publishing	24.1	23.5	26.1	23.6
Use of presentation software	21.4	16	35.5	23.8
Use of spreadsheets and database software for simple data manipulation and statistical analysis	15.3	10.3	27.4	19.5
Use of software supporting creative works	10.8	8.9	17.1	9.5

Source: Johanne Plante and David Beattie, *Connectivity and ICT Integration in Canadian Elementary and Secondary Schools: First Results from the Information and Communications Technologies in Schools Survey, 2003-2004* (Ottawa: Statistics Canada, June 2004), Catalogue no. 81-595-MIE20040017.

Virtual schools and online courses

Virtual schooling* in Canada first began in 1994–1995, and advancements in K–12 e-learning continue to develop across the country.[148] According to the 2008 report by the North American Council for Online Learning (NACOL), Canada has differing jurisdictional approaches to K–12 e-learning—often consisting of varied combinations of province-wide and district-based programs.

In 2003–2004, more than one-third (36%) of secondary schools across Canada had students participating in electronic or online courses. The curriculum of most online courses was developed by the school board, district, jurisdiction or province/territory.[149] The proportion of students enrolled in online courses differed according to the instructional level, type and size of school, and geographic location. More rural schools than urban schools reported having students who participated in online courses. Close to 40% of rural secondary schools reported offering online courses to their students, compared with 35% of urban secondary schools.[150] Only 3% of elementary schools had students participating in online courses in 2003–2004.

Table 4.2: Proportion (percentage) of schools with students participating in online courses

	All schools	Instructional level of school			Location of school		Type of school		Size of school		
		Elementary	Secondary	Mixed	Urban	Rural	Public	Private	Small	Medium	Large
Proportion of schools with students participating in online courses	14.2	3.3	36.1	30.4	12.9	17.7	14.6	10.7	12.2	13.6	16.5
Through a virtual school	4	1.5	9	7.6	3.8	4.6	4	3.5†	2.9	3.7	5.2
Through electronic or online courses developed by the school board/ district/ jurisdiction/ province or territory	8.5	1.3	24.2	17.7	7.6	11.2	9.2	3.5†	7.1	8	10.4
Through electronic or online courses developed by another school board/ district/ jurisdiction/ province or territory	4.3	1	10.1	10.7	3.7	6.2	4.4	3.2†	4	4.8	4.2
Other	1.8	1	4	2.2†	1.9	1.7	1.8	1.7‡	1.9	1.6	1.9

Adapted from source: Johanne Plante and David Beattie, *Connectivity and ICT Integration in Canadian Elementary and Secondary Schools: First Results from the Information and Communications Technologies in Schools Survey, 2003-2004* (Ottawa: Statistics Canada, June 2004), Catalogue no. 81-595-MIE20040017.

† This symbol reflects a coefficient of variation between 16.6% and 25% and is less reliable than unmarked numbers.

‡ This symbol reflects a coefficient of variation greater than 25% and less or equal to 33.3% and is very unreliable.

A coefficient of variation is a measure of data quality—how much certainty there is that, if the survey was to be conducted 100 times with different samples, you would get the same results. High coefficients of variation (CVs) indicate that there is less certainty in the results.

* Virtual schools do not have a building or physical location; they are operated and managed online.

Online courses often supplement the curriculum, particularly when a course is either unavailable within a school or cannot be offered due to limited resources or teachers.[151] Such course offerings can prepare students for post-secondary education, particularly if the school cannot offer the necessary prerequisites for a university or college program.

Keewaytinook Internet High School: increasing access to high-school completion

Keewaytinook Internet High School (KiHS) enables students to remain in their home communities while taking a variety of Ontario Ministry of Education-inspected courses toward their Ontario high-school diploma. Students attend school all day at their KiHS community classroom, as arranged by their Local Education Authority and Chief and Council. In 2008, 11 communities were involved—the First Nations of Bearskin Lake, Deer Lake, Fort Severn, Fort William, Keewaywin, Mishkeegogamag, North Spirit Lake, Poplar Hill, Sachigo Lake, Saugeen and Weagamow.[152]

E-learning in Canadian post-secondary education (PSE)

ICTs were part of higher (post-secondary) education long before the widespread use of the internet. Through the application of print, audio-visual and broadcast media to distance education, ICTs have, on a mass scale, enabled those with adult roles and responsibilities to continue formal study leading to higher educational qualifications.

Years later, the growth of e-learning has considerably impacted the PSE sector by increasing access to education for people with disabilities and for those living in remote rural areas, and by allowing people who work full-time to fit courses around their work schedules. This improved access is making positive changes for Canadians who want to pursue higher education for the purpose of career development or lifelong learning.

Canada had an early lead in the burgeoning field of using ICTs to learn. Indeed, in 2001 the Council of Ministers of Education, Canada (CMEC)/Industry Canada Advisory Committee on Online Learning* provided comprehensive advice on ways to build on Canada's strength in the post-secondary sector. The committee's report, *The E-learning E-volution in Colleges and Universities*,[153] set out an action plan that included the following overarching objectives: significant expansion of e-learning in Canadian post-secondary education to meet the learning needs of individual Canadians; improved economic competitiveness; and sustainable health of civil society in this knowledge-intensive era.

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* This CMEC/Industry Canada Advisory Committee for Online Learning was chaired by David
  Johnston, President of the University of Waterloo.

The action plan's initiatives were intended to accomplish the following goals:

- encourage innovation in post-secondary education;
- place learners at the centre of their own education;
- enhance the quality of the PSE learning experience through new institutional strategies;
- support the creation of more high-quality e-learning materials and investments in learning research and relevant product development; and
- create a critical mass to take advantage of coast-to-coast pan-Canadian synergies.

Response to this report has been muted at best. Already, a number of countries—including the U.S., Australia and the U.K.—are implementing aggressive national/supranational e-learning strategies. Canada and its PSE community would be well advised to revisit the proposed action plan and to consider action that would help restore the country's leadership role in e-learning.

Despite the fact that e-learning has not achieved expectations in Canada's PSE sector, there is growing evidence that existing e-learning initiatives are impacting the lives and learning of Canadian post-secondary students.[154] Learners are already experiencing enhanced learning through internet access, student portals, digital libraries, and wireless networks that support laptops, handheld and other portable devices.

To assess the impact of e-learning on instruction, curriculum development and enrolments in the tertiary sector, the OECD Centre for Education Research and Innovation (CERI)[155] undertook a survey in 2005 of practices in 19 tertiary educational institutions across 13 countries, including Canada. This study supplemented a 2004 survey of e-learning conducted by the Observatory on Borderless Higher Education.*

The OECD-CERI findings[156] indicate that the extent to which e-learning activities were adopted was diverse across the 19 institutions (*see Table 4.3, p. 47*). They ranged from having very little or no online components in courses; to courses that were fully web-dependent (where students were required to use the internet for key elements of their program such as online discussions, assessments, or project/collaborative work); to courses that were conducted entirely online. The survey found that most campus-based institutions offered relatively few courses that were fully online.

The OECD-CERI survey also found that students enthusiastically incorporated the internet into their day-to-day learning activities such as research, scheduling, report preparation and project development. However, the growth of e-learning has not significantly altered the ways in which institutions organize or deliver learning. As the report notes, "e-learning has not really revolutionized learning and teaching to date. Far-reaching novel ways of teaching and learning, facilitated by ICT, remain nascent or still to be invented."[157]

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* The Observatory was originally a collaborative initiative with the Association of Commonwealth Universities (ACU) and Universities UK. Today its membership is comprised of 180 organizations from over 55 countries. Source: Observatory on Borderless Higher Education. Available at: www.obhe.ac.uk/home (accessed Oct. 14, 2008).

Although Canada was once considered a pioneer in this area, the OECD-CERI study suggests that Canadian post-secondary institutions (PSIs) have been slower than PSIs in many other countries to incorporate significant online components into their programs. Canada also provides a lower proportion of web-dependent courses than many other countries. On the other hand, the proportion of courses largely delivered online in Canada is one of the highest among countries studied—possibly a reflection of Canada's long history of providing distance education, a sector that has eagerly adopted online technology.

Most e-learning activities are limited to modules or segments of a course, reflecting the practice of using e-learning as a supplement to on-campus delivery. However, the intensity of e-learning does vary across disciplines.[158] The OECD-CERI cited the disciplines of business/management, education, humanities, and IT/computer science as having made significant use of some form of e-learning—particularly mixed-mode or fully online—in Canadian universities and colleges. Similarly, most other countries reported that the business/management and IT/computer science disciplines were more often provided online than other disciplines.

Table 4.3: Estimated proportion (percentage) of current programs/courses offering various online components

2004	None or trivial (%)	Modest (%)[1]	Significant (%)[2]	Web-dependent (%)[3]	Conducted online (%)[4]
U.K.	41	34.8	15.5	5.8	2.8
Canada	43.4	32	14.5	3.7	6.4
Australia	36.5	29	18.4	11.7	4.5
South Africa	52.5	32.5	7.4	4.7	2.9
Asia-Pacific	33.4	31.8	21.8	9.5	3.5

Note: *Web-dependent* refers to the requirement of students to use the internet for key active elements of the program such as online discussion, assessment, etc.

1. For example, course outline/lecture.

2. Key "active" elements of the program are online but no significant reduction in face-to-face classroom time.

3. As "significant," but face-to-face classroom time is significantly reduced.

4. Wholly or very largely.

Adapted from source: OECD, *E-Learning in Tertiary Education: Where do we Stand?* (Paris: 2005).

While limited data is available regarding the use of e-learning in Canada, in the U.S. the Sloan Commission (2006) has reported that the growth in student participation in e-learning continues to rise.[159] In 2002, 1.6 million PSE students in the U.S. had taken at least one e-learning course. In 2006, that number had risen to 3.5 million, or nearly 20% of all American higher-education students. Increasingly, educational leaders in the U.S. (62%) consider e-learning to be as effective as, or better than, traditional forms of teaching.[160]

A 2008 study[161] on undergraduate students and information technology —conducted by the EDUCAUSE Centre for Applied Research (ECAR)—suggests that although most students in the U.S. are enthusiastic users of ICTs, the majority (59.3%) prefer their courses to include a "moderate" amount of information technology. This finding is consistent with findings from previous years, despite the rapid change in technologies used by students. However, the 2008 study found that for the first time, preferences in e-learning were consistent across age categories—unlike in previous years, when younger students preferred a stronger focus on e-learning and older students preferred less of it in their courses. Some analysts have speculated that this change may stem from the pervasiveness of technology in the everyday lives of learners of all ages.[162]

Synchronous and asynchronous e-learning

- E-learning can be synchronous (real time) or asynchronous (flexible time).[163]

- *Synchronous* e-learning involves technology such as video conferencing and electronic white boards. Students are required to be present at the time of content delivery.[164]

- Most courses available on the internet are based on the *asynchronous* model. Applications include programmed instruction and tutorials that enable students to work through the screens at their own pace and at their own time.[165]

The EDUCAUSE study[166] also found that one-half (50.8%) of students reported enjoying learning from programs they could control, such as simulations and video games. More than one-third (35.5%) enjoyed learning through content contributions to websites, blogs and wikis. Moreover, 44.3% liked learning through technology based on text communications such as e-mail, instant messaging and text messaging.

Findings on the need for mandatory online courses were mixed: 23% of students thought that it would be beneficial if their educational institution required students to take an online course; 22.6% disagreed; and 23.4% strongly disagreed.[167]

Increases in virtual universities and online programs

Some evidence suggests that the provision of and registration in e-learning is gaining momentum within Canadian post-secondary institutions. For example, enrolment at Athabasca University, an open distance-education university, doubled over the period 2002–2008, to about 32,000 students. Quebec's Télé-université (TÉLUQ), part of the Université du Québec à Montréal, experienced a 35% increase in students over the same period, and in 2008 had an enrolment of about 20,000 students. Most students enrolled at either institution are taking only one or two e-learning courses.[168]

Canadian Virtual University (CVU)[169] is a group of Canadian universities specializing in online and distance programs. CVU offers more than 300 degrees, diplomas or certificates, and 2,500 individual courses completely online or through distance education. CVU estimates that registrations have increased by 10% each year since the consortium's launch in 2000, reaching approximately 150,000 course registrations in 2006.[170]

In Canada, considerable research and policy attention continue to focus on issues of access to higher education. For instance, there are concerns that rising tuition fees impede individuals from lower-income households from pursuing post-secondary education. Similarly, geographical proximity appears to influence post-secondary participation. Individuals living close to a university or college can reduce their costs by living at home while going to school. However, students who live further away from a university or college do not have this option, and their costs of pursuing a post-secondary education are higher. An important question is whether online education reduces or reinforces these existing gaps in access to higher education.

Overall, e-learning is perceived as having the potential to address these concerns by increasing accessibility, affordability, flexibility and quality of post-secondary education and learning. In addition, e-learning is considered of benefit to the world of work through its support of new opportunities for lifelong learning.[171]

Technology and Work-Related Learning

In a knowledge-based economy, the performance of business organizations depends on ensuring that all categories of employees possess current and up-to-date knowledge and skills.[172] Most forms of work today use some aspect of technology. As new technologies are introduced in the workplace, workers are required to keep pace with the change.

Computer technologies and the internet play a considerable role in the Canadian workplace, and employers and employees can benefit from ICTs.[173]

Detailed studies show the use of ICTs may help employers expand their product range, customize their services, demonstrate greater efficiencies, provide stronger customer service, and enhance capacity to reach new markets.

E-learning can provide employees with a wide range of skills—from technical to administrative and management skills. In particular, e-learning is appropriate for literacy and essential skills training.

Employees who do not or cannot continue to upgrade their skills risk becoming obsolete to employers. Rapid and significant changes in technology and intensifying international competition have substantially increased the importance of innovation for economic growth.

A 2005 U.K. report notes the impact of renewed focus on equipping people with the skills required for today's business: "[M]any companies are now concentrating on providing opportunities for their workforces to learn new skills. However, for those companies which are not focusing on skill development, sections of their workforces are in danger of being left behind."[174]

Most developed countries face demographic trends over the next few decades which will restrict the supply of skills acquired through initial education, making a trained workforce even more important as a source of new skills. Training within the firm helps workers to acquire new knowledge and to renew or adapt previously acquired skills, enabling workers to contribute fully to enhanced productivity and innovation.

However, the adoption of a new technology typically requires substantial investments to upgrade workers' skills. To be innovative and productive, countries must invest in the continuous learning, skills updating and training of their populations. Such countries, studies suggest, will reap enormous benefits in terms of growth. Increased labour productivity has been the most important driver of economic growth among most industrialized countries over the past decade. Studies have found that higher levels of productivity in firms are closely related to the knowledge and skills of their workforce.

Employer-supported training fosters innovation on all business levels, including the application of new technologies or software.[175] Training also significantly influences corporate culture and morale, and strengthens a company's ability to attract and retain high-quality staff.[176]

As a 2003 Human Resources and Social (now Skills) Development Canada report points out, "in terms of corporate training budgets, there has been significant growth for the use of learning technology."[177]

Many large and small employers have recognized that e-learning can be used to improve business operations and to deliver necessary training to staff.[178] And with decreases in costs related to both hardware and software, more small- and medium-sized enterprises (SMEs) are adopting e-learning approaches to support their training needs. As the Canadian Federation of Independent Business (CFIB) notes, the potential market for e-learning is about one-third of all SMEs using the internet. The case for e-learning's potential penetration into SMEs is perhaps strengthened by findings from a 2005 U.K. study, which shows that SMEs who did not use e-learning or training did not cite technical problems or high costs as barriers to usage.[179]

As the Conference Board of Canada noted in its 2001 report,[180] e-learning is one answer to sweeping global changes and to our own labour market and productivity issues. E-learning affords SMEs, as well as large organizations, an opportunity to provide workplace learning, and can enable Canada to close its "digital divide" through the development of e-literacy.

Furthermore, a 2003 Conference Board of Canada study of 570 employers suggested that approximately 77% of employers surveyed were using some form of e-learning to deliver training to their employees. Most of these employers cited "just-in-time learning" as the key benefit associated with e-learning. However, the report also noted that e-learning accounted for only a small percentage of respondent organizations' total training efforts. For 37% of respondents, e-learning represented 1–5% of their total training effort; for 24%, 6–15% of training effort; and for 12% of respondents, e-learning was not used.[181]

While most respondents evaluated their training efforts based on rates of participation and user satisfaction, very few actually measured the impact of e-learning on organizational performance. This lack of measurement is consistent with findings for more traditional modes of training.[182]

Using the internet for job-related learning

To perform better on the job or to develop skills for a future job, numerous Canadian workers learn informally on their own. Using the internet for this reason is considered a form of self-directed job-related learning. The majority (58%) of those who reported participating in self-directed job-related learning in 2002 used the internet or computer software.[183] A number of job-related courses depended on internet use—in 2002, the internet was used as a mode of instruction in 11.6% of non-distance education, job-related courses.

The training challenges of SMEs

Faced with competition in a global knowledge-based economy and under pressure from their most important business partners, firms must attain increasingly higher levels of excellence and performance. In this changing environment, organizational learning and workforce training constitutes a critical success factor for these enterprises.[184]

SMEs differ from large firms in several areas—including environment, strategy, structure, technology and culture, and in their training and development needs.[185] E-learning can enable employees to train on-site in the workplace, or to access work-related learning at home. However, the provision of training is often an issue for SMEs, where resources are significantly less than those of larger firms.

Globalization and the internationalization of markets have increased competitive pressures on SMEs. While e-learning is becoming increasingly common across all organizations, very little is known about the extent to which SMEs use this technology in their training processes. There is also a lack of information on the extent to which e-learning can meet these firms' training needs.[186]

E-learning may yet achieve its potential in this regard—if SMEs can manage and use it wisely, with the support of researchers and practitioners.[187] It can play a key role in securing our future success by fostering the requisite skills and knowledge needed to secure Canada's competitive advantage.

SECTION 5: THE OPPORTUNITIES AND CHALLENGES OF E-LEARNING

The pervasiveness of new technologies can be felt in almost all sectors of Canadian society. As Statistics Canada notes in its report *Our Lives in Digital Times*, "ICT-induced outcomes touch virtually every aspect of life, ranging from the economic to the social, the political and the cultural domains."[188]

The transformative effects of e-learning over the past decade, as Rossiter Consulting (2006)[189] has observed, have been remarkable. The education sector has moved toward the adoption of learning technologies in formal educational institutions such as elementary and secondary schools, colleges and universities. Learning technologies have also penetrated early childhood and health-related environments, and can be found throughout communities—in libraries, cultural and community organizations, and in homes. More recently, the use of e-learning as an effective training tool has gained momentum within the business community.

The Benefits of E-Learning

There are a host of specific claims regarding the value and importance of e-learning. Mainly, these are:

- better academic achievement, higher motivation for and satisfaction with the learning process;
- increases in communication and collaboration among all participants in the educational process;
- global access to resources and teaching;
- decreases in both the direct and indirect costs of formal education (including reductions in the dropout rate);
- provision of more flexible and accessible learning environments—learning anywhere, at any time;
- meeting social demands—such as the need for creating professionals who are literate in modern informational technologies and well prepared for the ICT challenges of the global economy; and
- facilitating learning opportunities for Aboriginal students and those in more remote areas.

Fast-tracking knowledge and skills for tomorrow

The potential of e-learning to contribute to the economic, social and cultural development of Canada and to support the lifelong learning needs of Canadians is well recognized.[190]

E-learning is considered an effective approach to improving human capital as it can help to upgrade the skills of adults, educate students within the K–12 and post-secondary education sectors, and provide access to learning opportunities for people with disabilities. E-learning can also afford communities with culturally appropriate learning materials and enable employers to deliver training to their employees.[191]

A powerful learning tool, e-learning may help to address low literacy rates and can contribute to other areas of learning such as numeracy and scientific reasoning.

E-learning can help to develop a culture of lifelong learning—the integration of learning into all aspects of Canadians' daily lives—enabling individuals to adapt their learning around the demands of work and family responsibilities. Through lifelong learning, Canadians can more easily achieve their goals, live a more fulfilling life and play a more dynamic and confident role in society.

By providing a flexible learning environment, e-learning can help foster a learning society that is the hallmark of innovation, creativity and improved social equity. Importantly, the use of global communications may create opportunities for cross-cultural knowledge development.[192]

Complementary, adaptive and flexible learning tool

Despite a lack of definitive empirical research, there is growing practical evidence that the use of ICTs can benefit the learning process in ways not possible through traditional learning approaches. As Murray (2001)[193] notes, e-learning can provide opportunities for complementary learning approaches.* It supports, rather than replaces, other modes of learning. Ideally, it is a responsive and adaptive tool that broadens, rather than restricts, opportunities to learn.

Over the last several years, the focus on learning technologies has shifted from an emphasis on the technology, toward the centrality of the learner and the learning process. As the Organisation for Economic Co-operation and Development (OECD) noted in 2001, "Technology alone does not deliver educational success. It only becomes valuable in education if learners and teachers can do something useful with it…[E]ducational content and e-learning services…need to be tailored to local needs and cultures."[194]

A 2001 study of e-learning in higher education reached a similar conclusion: "The technology is taking its proper place as an enabler rather than as the focus. Students don't focus on the technology; they focus on what they want to accomplish."[195]

As the OECD (2005)[196] suggests, however, the rationale for e-learning's development entails wide-ranging, complex and contested issues. These issues include: widening access; pedagogic innovation on-campus; enhancement of distance learning; organizational change; knowledge-sharing; revenue generation; and increased access to workplace learning through more flexible training and reduced training costs.[197] Comprehensive research is needed to assess the validity of these claims and to determine best practices for achieving desired outcomes.

We do know, however, that improved access to e-learning enhances learning opportunities for Canadians who want to pursue higher education for the purpose of career development or lifelong learning. E-learning can enable individuals who are employed full-time are better able to fit courses around their work schedules. As well, e-learning can provide greater flexibility for people with disabilities and for those living in remote communities.

Individuals who have left the school system because of a failure to meet the requirements, and who are reluctant to return, may have acquired considerable

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* Simulations of various kinds are enabling case-based approaches to learning in which a learner can practise a process safely until it is perfected. This approach to education offers ways of learning that are difficult (or even impossible) to achieve in any other manner, and can lead to deeper learning and/or more rapid acquisition of expertise.

occupational and life experience that could be developed further through exposure to learning technologies. E-learning enables such individuals to select the content they want and need, and to engage in learning at a time and place best suited to their needs.

Other advantages of e-learning include improved allocation of teaching resources—particularly given the looming shortage of qualified teachers and faculty at all levels of education, exacerbated by retirements over the coming decade and increased enrolment rates in post-secondary education. These issues can be partially addressed through more efficient allocation of teaching and content-development resources—for example, by sharing across institutions.[198]

Access to rich, high-quality, approved learning content can be improved through structured learning object repositories shared across institutions and jurisdictions, as demonstrated by the Co-operative Learning Object Exchange (*see text box below*).

Learning objects and the Co-operative Learning Object Exchange (CLOE)

Learning objects, Parrish (2008)[199] notes, are "short instructional components": products of "a design strategy and software techniques whose goal is to facilitate their discovery and reuse." While definitions of "learning object" are often confused and ambiguous, the term generally refers to any learning resource— from a small piece of a learning program (such as an illustration or a description of a concept), to an entire unit of instruction, to the entire course itself.

Learning objects can be stored on an online repository, such as the Learning Object Repository (LOR) of the University of Waterloo, which is a member of CLOE. CLOE consists of 25 Ontario universities working collaboratively to develop infrastructure for the joint development of multimedia-rich learning resources. All learning objects created for CLOE are stored on the University of Waterloo's LOR.

The key innovation of CLOE is the creation of a virtual market for the exchange of multimedia content to support e-learning. Each institution develops and contributes multimedia learning objects to address shared instructional challenges—and in return, uses resources developed by partner institutions.

Resources are exchanged according to a credit system. The more successful (that is, the more used) the resource, the higher the exchange credits earned. Original developers do not accrue exchange credits unless other institutions use their resources—an incentive for collaboration.[200]

Numerous models of hybrid and blended learning—such as traditional classroom teaching combined with e-learning components—and the development of communities of learners are being explored. These approaches recognize the importance of person-to-person interaction in learning, even within an e-learning framework.

Effective workplace training tool

E-learning is also considered an effective training tool for skills upgrading and workplace training. The 2001 Conference Board of Canada study of 570 enterprises, employers and employees identified the benefits of work-related e-learning:[201, 202]

• employee control over learning;

• cost-effectiveness;

• the ability to reach more employees in different locations;

• "just-in-time" learning;

• flexibility (it can be used at any time);

• relevant learning;

• reduced travel costs;

• employees can train "on-site"—where and when appropriate; and

• more efficient and more effective delivery of training content.

These benefits are particularly important to SMEs given that, in a global knowledge-based economy, numerous unresolved problems related to workplace learning still beset these firms. A major hurdle is the provision of education and training to meet the specific needs of SMEs, their owner-managers and their personnel.[203]

Many SMEs face skills shortages, yet lack sufficient resources to recruit and retrain labour, especially skilled labour. The Conference Board of Canada notes that SMEs "may be a prime testing ground for adopting and applying the possibilities of affordable e-learning."[204]

E-learning for older workers

Adult learning and training has become more critical than ever in light of several factors: future workforce and skills shortages, retirement of the baby-boom generation, low fertility levels and decreasing numbers of youth entering the labour market.[205] These factors have contributed to strong interest in maintaining the skill levels of the workforce. A key response to this challenge is to maintain the motivation, skill level and employability of older workers (aged 45 and over). In this context, e-learning is a potential response to the challenges posed by these demographic shifts.[206]

Research has illustrated that many older workers want to continue learning and earning, but in ways that suit their lifestyle preferences. This often involves part-time work and part-time community service and volunteering. In general, many older workers want to continue learning, including acquiring the skills needed to use computers and other technologies.[207]

E-learning can be a powerful tool for developing flexible strategies that reflect the needs and preferences of older people.[208] Such strategies should consider that mature-age workers are not a single demographic with defined characteristics, but several distinct market segments.[209]

For example, "just-in-time" learning enables employers to integrate individual learning with organizational needs, providing employees with the knowledge and skills they need, when they need them. Rather than enrol in full courses, employees can receive modules of information relevant to their specific needs. Training systems can be designed to align with equipment and technologies that are already part of the organizational process and can be built into the employees' work program.[210]

Yet, despite these and other claims about its benefits, e-learning continues to be a largely unexplored area of learning.

Increasing success in e-learning[211]

As Shank notes, e-learning seems to be most successful—in terms of completions—with the use of content that is either required or linked to an external incentive such as certification.

As a supplement and not a replacement to traditional teaching methods, e-learning can enhance the potential of many learning environments. In schools, tools like electronic portfolios[212] can enable students to receive considerably more feedback on projects and can help them learn how to self-assess their learning and skills accurately. Instructors in most colleges and universities routinely use course management systems (CMS) to post syllabi, assignments and lecture notes, and to continue discussions with students between class sessions.

As an alternative to exclusively e-learning, many workplace organizations have adopted a blended approach—a combination of online and in-class instruction.[213] Virtual classrooms, which provide for live instruction without the travel, are also proving popular.[214]

Many of the challenges associated with this mode of learning have yet to be addressed.[215] To date, there appears to be no comprehensive or coherent approach in Canada to align e-learning's vast potential as a learning tool with a clearly articulated and informed understanding of what it can or should accomplish.

Return on investment: from cost-savings to effective learning

Businesses in Canada are experiencing increased competitive pressures because of globalization and the internationalization of markets—leading some companies to engage in training projects that are critical to their becoming "world-class" enterprises.[216] To remain competitive, companies must analyze their training needs in greater depth, train more employees with different skill sets and knowledge backgrounds, and attempt to accomplish these goals more rapidly than in the past—while also reducing training costs.[217]

Therefore, rigorous analysis of return-on-investment (ROI) is critical if enterprises are to understand the true benefits of e-learning to their immediate and long-terms goals. However, answering this question requires a full understanding of the real costs associated with e-learning.

Typically, organizations define ROI using a simple equation: cost savings versus an initial investment.[218] As Dory notes, "a lot of e-Learning solutions have, at least on paper, a huge Return within a very short time."[219]

However, this cost-savings evaluation can prove to be too restrictive, as it does not necessarily reflect the real cost of e-learning (including intangible costs). Development of customized programs or content can be very efficient, but also expensive and time-consuming. There are also costs for maintaining the learning management system including licensing, monitoring and upgrading. Clearly, cost savings are not a guarantee of e-learning's quality or effectiveness.

The Complexities of ROI Assessment

The extent to which the employee e-learning is aligned with business objectives forms the crux of an effective ROI assessment. A process for analysis of ROI needs to go beyond the simple question—"Did we save money?"—to a deeper understanding of whether e-learning is linked with business drivers, goals, and organizational development.[220]

Critical to a meaningful analysis of ROI is a process to define the objectives, outcomes and measures of e-learning at the exploratory phase or start of the actual program.[221]

In 1959, Donald L. Kirkpatrick, Professor Emeritus at the University of Wisconsin, defined his ideas on training evaluation, which were published in 1975 in the landmark book *Evaluating Training Programs: The Four Levels.*[222] Numerous writers have since developed and modified Kirkpatrick's model, to address the issue of how to measure ROI in a variety of contexts. However, the basic tenets of Kirkpatrick's model remain intact and are organized into four levels of measurement that include:

• Level 1: the participant's reaction to the training as it is delivered;

• Level 2: the participant's "learning"—changes in attitudes, knowledge and skills;

• Level 3: the participant's improvement in performance (e.g., capability and implementation/application); and

• Level 4: the organization's or business team's results—the effects of the trainee's performance on the business or environment.

The complexities and costs associated with evaluation increase with each rise in level. However, studies report that most organizations limit their assessment of courses and training programs to levels 1 and 2. Typically, there is no evaluation or assessment of whether learning objectives are being met, nor of business impact.[223] The 2003 Conference Board of Canada survey of its customers' e-learning practices[224] found that very few organizations are conducting in-depth evaluations of their e-learning efforts. Of the 570 organizations that responded, only 33 conducted Level 4 evaluation—compared with 153 that used Level 1 evaluation, 134 that used Level 2 evaluation and 60 that used Level 3.

The Kirkpatrick model is a widely recognized framework for categorizing evaluation data on training.[225] Initially cited as four steps, the framework was extended in the 1980s by Jack Phillips to include a fifth level *(see Table 5.1, p. 60)* linking training and business results—in other words, the return on investment (ROI).[226]

Ostensibly, analysis of ROI enables organizations that invest in e-learning to answer the question: "Was the e-learning effort worth the money and time invested?"[227] Such analysis focuses on the specific return on investment, with a comparison of the solution's cost relative to the solution's benefits. It takes into account the program costs as well as intangible benefits.

Table 5.1: E-learning's return on investment: five levels of evaluation

The industry-accepted Kirkpatrick/Phillips evaluation methodology describes the focus and required actions at each level of the measurement process.

Level of Evaluation	Focus of the Measurements and Actions Required to Evaluate the Learning Solution
Level 1: Reaction and/or Satisfaction	**Focus:** Specific level of satisfaction and reaction to the learning solution as it is delivered to the participants. **Action:** Measure employees' initial reaction, satisfaction and their planned action derived from learning event (such as post-course survey assessing quality of course).
Level 2: Learning	**Focus:** Specific knowledge, skill(s), and/or attitude(s) to be developed/acquired by the participants. **Action:** Analyze learning with tests, simulations and instructor evaluations.
Level 3: Job Application and/or Implementation	**Focus:** Participants' behaviours that must change as the knowledge and skills are applied in the work setting, following the implementation of the learning solution. **Action:** Analyze skills gained over time to see if on-the-job behaviours changed as a result of learning event. Gather data on how employees are using new skills. Identify barriers and enablers, and isolate the effects of the training from other factors that can influence behaviours.
Level 4: Business Impact	**Focus:** Specific business measures that will change as a result of the participants' application(s) of training. **Action:** Measure the business impact/benefits. Determine the monetary value of the measured change. Measure intangible benefits (such as increased job satisfaction among employees who participated).
Level 5: Return on Investment (ROI)	**Focus:** Specific returns on investment from the implementation of the learning solution, with a comparison of the solution's cost with the solution's benefits. **Action:** Analyze the ROI. Express the business impact, including taking into account the program costs and intangible benefits, then use the calculations to make adjustments in future training programs.

Source: Jack J. Phillips and Ron D. Stone, *How to Measure Training Results: A Practical Guide to Tracking the Six Key Indicators* (New York: McGraw-Hill, 2002).

An effective ROI measurement strategy

An effective ROI strategy must take into account the following organizational elements:[228]

- stakeholder interest in measuring learning results;

- measurement results should be made highly visible;

- senior management's willingness to support change initiatives and use value measurement data for continuous improvement; and

- ongoing support of a learning department as a key player in change-management processes.

Employers and e-learning surveys

According to a Conference Board of Canada 2003 survey, employers use a variety of measures to assess their e-learning solutions. Of the 38% of employers who measure e-learning outcomes, 96% measure employee satisfaction, 84% measure employee learning retention, and 63% measure employee behaviour change. Most employers (73%) were very confident or confident in the evaluation information, and 27% were not; while 46% tied these evaluations into long-term planning.

Source: Debbie Murray, *E-Learning for the Workplace: Creating Canada's Lifelong Learners* (Ottawa: Conference Board of Canada, Sept. 2001), Catalogue no. RH34-20/2002E.

The Limitations of E-Learning

Information and communication technologies have been integral to the growth of diverse forms of open, online and distance education over the last 40 years. These forms of education have brought new opportunities for lifelong learning to many countries. Delivery of resources, however, does not guarantee learning, even when the initial barriers of access have been overcome.

As Abrami et al. (2006) note, Canadian enthusiasm for the use of e-learning—as well as apprehension regarding it—appears widespread.[229]

Levels of adoption of e-learning in Canada are also significantly slower than predicted. A 1998 study predicted that 50% of all workplace training would be delivered online by 2003.[230] However, other studies have suggested that the actual percentages in 2005 were significantly lower, ranging from 15% to 20%, depending on the survey.[231]

Proponents of the application of electronic technologies to education have long argued that computers possess the potential to transform learning environments and improve the quality of learning outcomes. However, others suggest that the use of technology to improve learning can undermine the benefits accrued from traditional formal education, from kindergarten through university.[232]

For example, some studies have suggested that e-learning may create an imbalance between the development of computer skills and the fostering of essential academic and thinking skills. As well, e-learning could foster technology dependencies and isolation, rather than encourage the development of learners who can embrace a range of learning approaches and interact with other learners. Technological problems such as failed equipment or poorly functioning software could also erode the joy and motivation to learn.[233]

Although conclusions from Canadian primary research, international literature reviews, policy documents, media reports and practitioner publications are mostly favourable, a closer examination of the evidence paints a less convincing portrait. In Canada, there is a lack of evidence in some theme areas related to e-learning—notably early childhood learning—and a lack of experimental and quasi-experimental evidence that would allow unambiguous causal conclusions to be drawn about e-learning as an effective learning tool.[234]

Ungerleider and Burns (2002)[235] have noted the lack of methodologically rigorous evidence of e-learning's effectiveness in promoting achievement, motivation, and meta-cognitive learning, and in facilitating instruction in content areas in elementary and secondary schools. They also emphasized that student academic achievement does not improve simply as a result of having access to computers in the classroom: concurrent changes to instruction are also needed.

E-learning is a tool, not a pedagogical method. To be effective, e-learning must be linked to teaching practices that have demonstrated benefits, and should be used appropriately to reflect the nature of the content and learners' needs and abilities.[236]

These issues are echoed in a 2005 study on adult education conducted at Cardiff University.[237] Results of the AdultLearning@Home project suggest that ICTs have not increased participation and achievement rates in adult education. Instead, e-learning tends to be associated with the same factors that determine school-leaving age, such as gender and socio-economic background. The project underlined several key issues that contribute to the e-learning debate, including:

- Individual motivation and self-discipline as a key factor underlying the success of ICT-based learning.

- E-learning was most often associated with the use of technology itself, rather than as a means to learning something else.

- ICTs appeared to reinforce existing patterns of learning and were mainly of benefit to people who were already learners, or who would have become learners without the availability of ICTs.

- Adult learning through ICTs was largely informal and unstructured, even when it took place at work or in educational institutions. It was often augmented by books, television programs, and help and advice from others.

As Driscoll (2008)[238] notes, reports describing the failure of e-learning programs and courses are noticeably absent. However, when taken together, reports of failure appear to fall under four themes:

- organizational barriers, in which an organization did not properly prepare for nor support its own e-learning effort(s);

- pedagogical problems, in which the e-learning programs did not achieve the intended results;

- technical problems, in which the technology selected did not address the real needs or resulted in some other unanticipated difficulty; and/or

- financial problems, in which the e-learning project was under-funded and, therefore, could not produce the anticipated gains.

Some researchers suggest that the continued evolution of e-learning is unlikely unless there is a better understanding of it.[239] Nichols (2003)[240] notes that there are few examples of academic literature specifically concerned with e-learning theory. The use of technology in education has tended to be technology-led rather than theory-led.[241] Only "pedagogical advantages will provide a lasting rationale for implementing eLearning approaches," suggests Nichols. Research is needed "to establish theory not evaluation, principles not practices, pedagogies not applications."[242]

It is not clear to what extent e-learning can develop communication and problem-solving skills and the capacity to use information critically. Such skills are essential aspects of effective learning and are among the core competencies that contribute to the development of a strong, knowledge-based economy and to greater social cohesion. In an increasingly complex and interconnected world, learners also need to understand diverse perspectives, reason ethically, work effectively in teams, be able to create new knowledge, and be lifelong learners.[243]

Student reluctance: chat rooms and discussion groups

Some aspects of e-learning are better utilized than others. As studies have suggested, some students are reluctant to use chat rooms and discussion groups.

The difficulty in getting students to participate in electronic discussion forums is also highlighted in a U.K. report by Hall and Cotterill (2004).[244] The authors suggest several reasons for such low participation rates:

• Students do not want their thoughts to be publicly exposed and subjected to criticism.

• Any contribution made is permanent and cannot be justified nor explained immediately as in a face-to-face interaction.

• Student contribution may be misinterpreted without the opportunity to justify reasoning.

• Students do not want to look stupid if their answer is wrong.

• Students are reluctant to criticize their peers.

Thus, as Anderson (2008) observes, the challenge for educators and course developers is to construct an e-learning environment "that is simultaneously learner-centred, content-centred, community-centred, and assessment-centred."[245]

Challenges for education are less about motivating learners or student competence and more about harnessing the potential of the internet to enhance learning.[246] Although ICTs have significantly transformed our lives, the process is not yet complete.[247] Predicted outcomes of ICTs, such as the paperless society and the end of mail and retail shopping, have yet to occur. While ICT "forces" suggest certain directions, other forces—including attitudes and behaviours—mediate in such a way that "ICTs have powerful and lasting influences, albeit different from the 'obvious' ones predicted at early stages of deployment and use."[248] Indeed, there is still much we do not know, such as the long-term impact of ICTs on learning. However, the impact of e-learning on teachers, learners and systems will likely be significant.[249]

As the Australian Department of Education and Training notes, participation in the information age goes beyond having a skilled workforce; it is a basic right for all members of the community.[250]

Dropping the internet

A significant challenge is to harness the vast potential of the internet to enhance learning opportunities and experiences for Canadians.[251]

However, many Canadians, for various reasons, discontinue use of the internet. The 2005 Canadian Internet Use Survey (CIUS) indicated that although 68% of adult Canadians went online for personal, non-business reasons in 2005, an estimated 850,000 Canadians who had used the internet previously reported they had not used the internet during the preceding 12 months.[252]

Those who did not use the internet during 2005 were divided into two groups: those who had never used the internet/non-users (28%); and former users or internet dropouts (4%), of which 55% had stopped using the internet within the last two years. Compared with internet users, former users were slightly older on average, more likely to be female, have lower levels of income, and to reside in smaller towns and rural areas.

Former internet users cited several reasons for their discontinued use: personal reasons such as "no need, not interested, no time," or internet use was too difficult (59%); a computer-related reason, such as broken equipment (26%); and an access issue such as "too costly" (20%). Less than one in 10 cited other reasons such as privacy concerns, and fear of objectionable content or of disclosing personal information.[253]

Challenges to provision of e-learning in Canada

E-learning in Canada is developed and delivered by a variety of instructors, content developers and technology providers. Each provider plays an important role in the facilitation of e-learning delivery, often interacting with each other to achieve desired outcomes. However, each provider faces a number of challenges that can limit their effectiveness.[254]

Instructors/content providers
Online course content is created by instructors or acquired from external sources.

Content providers are confronted by several challenges:

- ensuring the retention of copyrights in order to facilitate sale of products to multiple customers;
- formatting content—for use across a variety of e-learning platforms—that will expand, rather than restrict, potential markets;

- aligning content with institutions' learning methodologies; and
- addressing the impact of factors on learning—such as type of content, learning environment, and characteristics of each learner.

To reach a wider audience, content developers must attempt to make their materials convertible to a range of formats so they can be used on computers (both online and offline), PDAs and Smartphones, and in printable format.

Technology providers
Technology providers develop the technology that enables e-learning delivery. Their services range from the facilitation of individual distance-learning courses to complete Learning Management Systems (LMSs) provided by companies such as Blackboard Inc.

Technology providers are confronted with several challenges including:

- adhering to common technological standards that will facilitate collective use across educational institutions, which may have differing solutions among various departments;
- pressures associated with continuous evolution in hardware and consumer expectations for new product offerings; and
- the need to develop products that reflect proven educational principles, and to consider the personalized learning styles, contexts and needs of users.

Of particular note, the transformation of learning through technology will continue, with or without the active participation or engagement of Canadian organizations and institutions. Increasingly, foreign institutions and corporations will provide Canada with e-learning tools and services—reflecting market demands rather than a vested interest in fostering Canadian content or culture.[255]

SECTION 6: FACILITATING THE LEARNING EXPERIENCE

Economies, businesses and individuals are increasingly reliant on ICTs to access the services and information they need. To remain competitive and enhance economic and social participation, Canada needs a population that is able and willing to use ICTs.

Recent reports have suggested that today's e-learning efforts are likely to use a combination of methods known as "blended learning" (the blending of traditional learning with e-learning). Thus, the issues of content use, access, quality, professional development and learner-support services need to be considered.

Specifically, these issues embrace several themes:

• Learners need specific skills—such as computer literacy, information literacy and general literacy—to use ICTs effectively.

• Those with disabilities need e-learning programs that address their particular needs.

• Meeting the needs of 21st-century learners requires acknowledgement of learner diversity (cognitive, cultural, social, economic) and the need for flexible and accessible content.

• Quality assurance is critical—to ensure an optimal match between sound teaching theory, learners' needs and the design of technology.

• Professional development is necessary to ensure that teaching professionals have adequate understanding and technical support.

• Resource-sharing can facilitate the learning experience, but can also raise concerns about issues of intellectual property protection and copyright.

The Development of ICT Skills

The delivery of e-learning resources does not guarantee learning, even when initial access barriers—such as lack of infrastructure, services or technology—have been overcome. The "digital divide" can persist despite equality of access to the internet; and the "knowledge gap"—differentials in the ability to make sense of, absorb and act upon knowledge—can also limit the usefulness of ICTs for many individuals.[256]

To benefit from e-learning, individuals must have aptitudes specific to e-learning, such as computer/digital literacy, information literacy and general literacy skills. As well, individuals' levels of awareness of the benefits of e-learning, and their confidence levels in using technologies, are critical "buy-in" factors.

ICT skills are now considered key basic skills and "digital competence" is the fourth of the key competencies (for lifelong learning) cited in the European Reference Framework (*see text box, p. 68*). ICT skills also have considerable potential to enhance learning by enabling adults to access flexible, motivating and personalized learning programs at a time, place and level responsive to their needs.[257]

Key Competencies for Lifelong Learning: European Framework

In 2006, the European Reference Framework of key competencies for lifelong learning (for the EU) identified *digital competence* as one of the eight main competencies needed for "personal fulfilment, active citizenship, social cohesion and employability in a knowledge society."

Digital competence involves using computer applications such as word processing, spreadsheets, databases, information storage and management; and understanding the opportunities and potential risks of the internet and communication via electronic media (e-mail, network tools) for work, leisure, information-sharing and collaborative networking, learning and research.

Source: European Commission, *Key Competencies for Lifelong Learning: European Reference Framework* (Belgium: 2007). Available at: ec.europa.eu/dgs/education_culture/publ/pdf/ll-learning/keycomp_en.pdf.

Computer literacy

Although the term *computer literacy* has many definitions, it refers typically to an individual's awareness of and proficiencies with the technology, operating systems and applications.[258] For example, a computer-literate user has basic knowledge of an operating system (e.g., copying files, printing documents) and use of the internet/web, including browsers and search engines.[259]

Such skills are increasingly necessary as computers are an essential part of many workplaces and learning institutions. Most students recognize the importance of computer literacy and assume that computer skills and knowledge will contribute to personal and professional success.[260] However, not all students have the same level of experience nor similar exposures to computers.

As Statistics Canada (2002) has suggested, most people use informal learning methods when first learning to use a computer—particularly learning by trial-and-error—or seeking help from friends or family. In 2000, 96% of all computer users reported that they had taught themselves computer skills through trial-and-error; 78% had received informal help from a friend or family member.[261]

Some student satisfaction surveys have suggested that computer competence has a significant effect on participation in e-learning activities.[262] In some cases, the learner's level of proficiency in using a computer can influence the decision to drop out of school. Some learners report the need for more training to obtain a level of comfort with the technology. Others note that the technology is too difficult to use. Many students also overestimate their abilities. It seems reasonable to suggest that adequate technical support is very important to students using a virtual learning environment.[263]

Digital literacy

Digital literacy represents a person's ability to understand information found on the computer and in media, and to perform tasks effectively in a digital environment; "digital" refers to information represented in numeric form and primarily for use by a computer; and "literacy" includes the ability to read and interpret media (text, sound, images), reproduce data and images through digital manipulation, and evaluate and apply new knowledge gained from digital environments. According to Gilster,[264] the most critical of these is the ability to make educated judgments about what is found online.[265]

Information literacy

It is acknowledged that we live in an information-rich society, where the amount of information and knowledge in the world was, as recently as the late 1990s, predicted to double every two years.[266] A significant challenge for the 21st century is to keep pace with increasing technological advancements, and to sift through and evaluate voluminous amounts of information.

However, as Lynch has noted: "The internet (and related communications technology) has fundamentally changed the paradigm for processing, distributing and acquiring information. It has opened up incomprehensible stores of data to citizens."[267] Lynch emphasizes that *data* and *information* are not the same, and that information is not necessarily knowledge: "in other words, adding value to all this data depends on an individual's ability to process this increasingly ubiquitous global data warehouse."[268]

Information literacy is a combination of knowledge and skills essential to participation in our information-rich society. It involves analysis of information needed, knowledge of types of resources, evaluation of access tools, design of research strategies, interpretation of results, and assessment of information content. In this context, information literacy involves both thinking and doing.[269]

Multiple literacies in a technological society

"In a technological society, literacy extends beyond the functional skills of reading, writing, speaking and listening to include multiple literacies such as visual, media and information literacy. These new literacies focus on an individual's capacity to use and make critical judgements about the information they encounter on a daily basis."

Source: The Centre for Literacy of Quebec, Montreal[270]

Indeed, information literacy plays a significant role in the learning process. It provides a means to express personal ideas, develop arguments, refute the opinions of others, learn new things, or simply identify the truth or factual evidence about a topic. As most individuals will change jobs several times over the course of a lifetime, they must become versatile learners, capable of adapting to new careers by using their ability to learn how to learn.[271]

Those who are not information-literate may be unable to make informed decisions about an information-related problem, and must rely on others instead of thinking for themselves. Those who are information-literate can analyze and interpret data—and this ability enables them to respond critically and creatively to problems. Consequently, we can think of information literacy as contributing toward personal empowerment and our freedom to learn.[272]

Using technology in health care

Technology plays an important role in the delivery of health care. The benefits of technology include advancements to treat disease and illness, increased efficiency of practitioners, and assistance for individuals to manage their own health-care needs.

According to CCL's *Survey of Canadian Attitudes toward Learning* (2006), most Canadians are able to find relevant health-related information and use a number of sources, including their family doctor, the internet and books. However, more than one-half reported that they had received conflicting information. This finding suggests that people need adequate information-literacy skills to help them evaluate the abundant health information available on the internet.[273]

Physicians also benefit from technologies during their daily work activities. As the Canadian Medial Association (CMA) reported in 2008, 13% of physicians indicated that they use e-mail to communicate with patients for clinical purposes; 50% use e-mail to communicate with colleagues for clinical purposes; 71% have high-speed access to the internet in their main patient setting; and 17% report having a practice website.

The use of ICTs in health care, or *e-health*, enables governments to deal with mounting health-care pressures. These range from rising health-care costs and shortages of personnel, to the increasing prevalence of chronic disease in an aging population. ICTs offer better health outcomes, increased accessibility, better integration of health-care "silos," cost efficiencies and improved client/consumer satisfaction. As the CMA (2008) notes, most jurisdictions in Canada "have adopted e-health as a critical underlying component of primary-care reform," motivated in part by investments made in the health-care system.[274]

Literacy

An individual's level of literacy proficiency can impact the extent to which they use ICTs.[275] A 2005 Statistics Canada study confirmed that new gaps created from ICT use accentuate already existing gaps. The group with the lowest skills "continues to lose out, even though it is the group that stands to benefit proportionately more from the opportunities afforded by the new technologies."[276]

The study observed that ICTs, by their very nature, depend on and enhance communication abilities. And, as Massé et al.[277] observed, literacy skills are essential to the development of computer/digital literacy, which entails cognitive skills such as those underlying reading and problem-solving. As literacy skills increased, "the increases in diversity and intensity of internet use, and use of computers for task-oriented purposes was substantial."[278] In Canada, individuals with high prose-literacy skills (levels 4 and 5)* were more than twice as likely to be high-intensity ICT users compared with individuals at lower literacy levels (levels 1 and 2).[279]

The computer can be a very cost-effective and efficient way to teach basic literacy skills to groups in need of training. Whenever possible, classrooms should facilitate instruction in computer usage to use computer-learning modules, prior to students beginning. Subsequently, participants may choose to use the computer to work independently off-site.[280]

E-learning and disabilities

Students with disabilities—such as mobility, psychological, learning, hearing and visual—can benefit from the flexibility of time, location and instructional mode that is made possible through learning technologies. However, there is a serious lack of information on whether approaches such as distance education are reaching individuals with disabilities who might not otherwise have access to higher education.[281] There is also a lack of information on participation rates and academic success of learners with disabilities.[282]

Despite these limitations, a study of students with learning disabilities who were enrolled in distance education at Athabasca University provides insight on the factors that impact completion rates. Conducted between 1998 and 2001, the study showed that the 604 students with disabilities enrolled in undergraduate courses had an average (course) completion rate of 45.9%—a figure somewhat lower than that of the general university population.† Completion rates ranged from 40% for students with psychological disabilities to more than 65% for students with sensory disabilities.

A major finding was that students with disabilities who received more types of support services—ranging from assessments for interactive technology to help with study skills and organizational strategies—tended to have higher completion rates, and that certain types of assistance were particularly helpful for certain

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* See Section 1 for an explanation of the five levels of literacy, as defined by the OECD.

† In March 2004, 912 students at Athabasca University had self-registered with a disability—representing 3% of the total population of 26,678 students.

disabilities. Such insights are of concern given that in 2004, more than 100,000 students with disabilities were enrolled at Canadian post-secondary institutions, but less than one-half were receiving disability-specific support services.[283]

> ### Athabasca University: support for students with disabilities enrolled in e-learning
>
> In 1998, Athabasca University established the Office for Access to Students with Disabilities to help students with disabilities gain equal access to, and succeed in, Athabasca courses and programs. Students receive services such as:[284]
>
> • information;
>
> • assessments for interactive technology;
>
> • assistance and/or referral for funding and services;
>
> • help with study skills and organizational strategies;
>
> • extension of course contract dates; and
>
> • alternative methods for writing exams.

Technologies have the potential to enhance the lives of people with disabilities. As Treviranus (2007) notes, a culture of inclusiveness enables society to reach its full potential: the "inclusive design [of technologies] makes room for contributions from people who live a different and more challenging experience and must hone incredible resourcefulness as a daily necessity."[285]

Treviranus cautions that we need to look beyond our conceptions of what constitutes "normal" or "average" to enable all members of society to participate—regardless of culture, language, gender, age, class, ability "and other forms of human difference." This requires us to "question and stretch our restrictive conceptions of the user, the worker, the learner, the educator, the professional."[286]

Accessibility and flexibility

Sims and Stork (2007) argue that because physical and geographic boundaries are "insignificant" to web-based learning, "the multiplicity of learner characteristics and circumstances" make this form of learning "a potentially rich and more complex milieu."[287] Historically, e-learning provided learners with homogenous content. More recently, it is progressing toward the creation of content that meets the increasingly diverse cognitive, cultural, social and economic needs of learners. The concept of learner-centeredness requires an understanding of the needs of learners and the technologies they use in their day-to-day lives, and may include incorporating aspects of text messaging, gaming and other Web 2.0 technologies.

Acknowledgement of learner diversity will also bring greater flexibility in how content is created and shared. E-learning embraces student diversity—permitting students to pace their learning according to their cognitive, social/emotional and cultural/traditional needs, and by facilitating an independent learning approach.

The learner's success is demonstrated through one's ability to:

- communicate effectively in written and oral construction;
- engage in independent learning;
- share thoughts, understanding and ideas without fear of being labelled;
- demonstrate leadership, creativity, ambition and desire to learn—intrinsic qualities that are essential to successful e-learning;
- risk learning in an innovative manner;
- respect diverse points of view through dialogue and discourse, unencumbered by gender, appearance, and/or race; and
- continuously appraise and investigate independent learning.

Quality assurance

Quality assurance in education is a process that evaluates the calibre of a course, program, or institution. Although there are numerous approaches to quality assurance, in general, the process entails two key elements: clearly delineated standards and criteria of quality; and established procedures through which an institution or program might be evaluated against these standards.

Under the right circumstances, e-learning can provide a high-quality learning experience. It should enable the learner to engage in active, collaborative and self-directed approaches to learning. E-learning should complement and enrich traditional on-campus instruction. The use of e-learning should also allow learners to develop specific applied skills that are currently in great demand.[288]

However, as the 2001 report of the Advisory Committee for Online Learning noted, the promise of e-learning will not be realized without initiatives to remove significant obstacles. Development and delivery of online courses and programs will require many institutions to make significant structural adjustments and to commit resources beyond the capacity of many institutions. Research and development are needed to discover the best approaches for exploiting this new medium's potential. Copyright and intellectual property issues may also inhibit e-learning's development.[289]

Professional development

As Abrami et al. (2006)[290] note, compared with issues of course design and infrastructure support, professional development has received little support.

Often within the e-learning context, trainers, teachers, professors and instructors are asked to teach online without adequate understanding, support and professional development for doing so. The limited provision of professional development is generally specific to the technology requirements—at the expense

of developing a stronger understanding of relevant pedagogical methods. However, a growing number of universities have learning technology and faculty support units that assist faculty to use tools and software in support of their courses. E-learning can provide faculty with the opportunity to learn how to use and integrate available technologies into their curricula, as well as provide ongoing opportunities for other aspects of professional development.

As Wilson (2008)[291] notes, faculty members have many concerns about e-learning including constraints of time, resources, support from administration and faculty, and knowledge to teach online.

Other concerns are related to course quality, student skills and needs, career impact, the available technology, ownership and control of the content, integrity and privacy; as well as the intellectual challenge, work flexibility, and support and recognition for online teaching.

Critical to the success of e-learning, however, is the faculty role in developing and delivering courses. Faculty must see the personal and professional pay-off for investing time and effort online, and develop competence and confidence by doing the work with appropriate support. E-learning and faculty depend on each other for success.[292]

The Cradleboard Teaching Project

Founded in 1996 by Buffy Sainte-Marie, the Cradleboard Teaching Project fosters learning about Aboriginal cultures as a complement to formal school curriculum. The Cradleboard Project now includes online curricula, written by and about Aboriginals, for incorporation into social studies classes. It explains subjects like geography and science from an Aboriginal perspective, and bridges the divide between Aboriginal and non-Aboriginal cultures.

Cradleboard provides lesson plans and curricula to teachers. Its interactive components enable children to learn while communicating with long-distance peers through the use of technology.

For more information on Buffy Sainte-Marie and the Cradleboard Teaching Project, visit CCL's *Profiles in Learning*, available at www.ccl-cca.ca.

Historically, professional development was delivered face-to-face in conventional learning settings, with little or no opportunity for follow-up or future inquiries. Recent studies have identified factors that improve the delivery of professional development including:[293]

- additional technology training on the use of materials and equipment;

- customizing staff development according to individual needs;

- adding more lab activities;

- involving staff in the developmental process;

- providing more understanding of how to use learning management systems; and

- differentiating development for new and returning learners.

Professional development is costly, which often impedes the quality and quantity of such opportunities. Provinces, territories and institutions that share professional development resources tend to have the highest success in implementation and transference.

The development of online modules, courses and programs and the provision of labour-intensive coaching can be very time-consuming for faculty members. Sustaining their commitment to e-learning—while also continuing traditional teaching, research and engagement responsibilities—is difficult, if not impossible to accomplish.[294]

Sharing resources

Open Educational Resources (OER) are free, online learning and teaching resources that reside in the public domain.[295] OER are useful for instructors, students and self-learners as they comprise full courses, course-related materials, modules, textbooks, videos, syllabi, lectures, lesson plans, homework assignments, quizzes, lab activities, pedagogical materials, games and simulations and any other tools, materials, or techniques used to provide access to knowledge.[296]

Central to sharing of resources and the OER movement is the basic, yet inspired, concept that knowledge is a public commodity and that ICTs and the internet provide opportunities to share, use and reuse this knowledge.[297] OER are the knowledge components that encompass the essential parts of education—the tools, resources and techniques for learning and teaching.[298]

A growing inventory of readily available educational materials and resources and an increasingly engaged and connected education community can transform educational opportunities. Research indicates that the open-education movement has already begun to affect the education landscape.[299] It is estimated that tens of thousands of course websites and other educational materials are freely available online, originating from hundreds of institutions, organizations, and educators around the world.[300]

This unprecedented access to educational resources is combined with the collaboration of a growing body of educational institutions. Through the creation of consortia and alliances, these institutions share and create open educational technologies, resources and repositories, and develop new models for the collaborative production and distribution of educational resources.[301]

Online library resources important to student success

Library resources and information-literacy support are just as important to student success online as they are in the face-to-face environment. The Canadian Association of Research Libraries (CARL) subscribes to more than 270,000 electronic journals, over one million e-books, and a plethora of other media. Cost savings and increased access of about 50% have been achieved through provincial and national co-operative initiatives and across all learning sectors. Web-accessible citation-management systems, information-literacy modules, online reference, and reciprocal borrowing and interlibrary loan delivery of traditional materials are also supported. With experience in information organization and electronic-rights management, librarians have the capacity to support Learning Object Repository (LOR) management.

Despite the move toward collaboration, some educational initiatives will remain in closed domains, inaccessible to classrooms, disciplines, or institutions because of preservation concerns such as authorship and ownership.[302]

Emergent and growing interest in OER parallels growth in the use of and participation in e-learning in universities and colleges. OER provide a useful example of the range of policy considerations that need to be addressed. The OECD's 2007 report *Giving Knowledge for Free*[303] (*see Table 6.1, p. 78*) illustrates the motivations of governments, institutions and individuals to engage in the development and use of OER. It also summarizes the factors that support or impede the use of OER and outlines a final set of considerations that need to be addressed in order to support e-learning.

Table 6.1: Drivers, inhibitors and motivations for developing and sharing open educational resources

Governments	Institutions	Individuals
Widening participation in higher education	Altruistic reasons	Altruistic or community supportive reasons
Bridge the gap between non-formal, informal and formal learning	Leverage on taxpayers' money by allowing free sharing and reuse between institutions	Personal non-monetary gain
Promote lifelong learning	"What you give, you receive back improved"	Commercial reasons
	Good public relations and showcase to attract new students	It is not worth the effort to keep the resource closed
	Growing competition—new cost recovery models are needed	
	Stimulate internal improvement, innovation and reuse	

Underlying drivers	Underlying inhibitors
Technical: Increased broadband availability; increased hard-drive capacity and processing speed; new and improved technologies to create, distribute and share content; simpler software for creating, editing and remixing.	*Technical:* Lack of broadband and other technical innovations
Economic: Lower costs for broadband, hardware and software; new economic models built around free content for recovering costs.	*Economic:* Lack of resources to invest in broadband, hardware and software. Difficulties to cover costs for developing OER or sustaining an OER project in the long run.
Social: Increased use of broadband, the desire for interactivity, increased skills and willingness to share, contribute and create online communities.	*Social:* Absence of technical skills, unwillingness to share or use resources produced by someone else.
Legal: New licensing regimes facilitating sharing of free content.	*Legal:* Prohibition to use copyrighted materials without consent.

Learning Object Repositories Network: LORNET

LORNET carries out research on networked repositories of learning objects, which are used to make documents, tools, and web services available for learning and knowledge management within organizations.[304]

LORNET's research is conducted in collaboration with six universities: the Université du Québec's Télé-université, the University of Waterloo, Simon Fraser University, the University of Saskatchewan, the University of Ottawa, and École Polytechnique de Montréal, and brings together more than 100 researchers, professionals and graduate students.

Source: www.lornet.org

Intellectual property

Issues of intellectual property and copyright significantly impact e-learning. Treviranus suggests that this challenge must be resolved if the optimal benefits of online content are to be achieved at the least cost.[305]

The issue of intellectual property rights in Canada's post-secondary institutions is diverse and complex. Faculties at some institutions may be reluctant to create electronic content because it is at risk of being copyrighted, owned and expanded by a program, and taught by a different instructor.[306] In some cases, faculty/instructor contracts place 100% ownership with the post-secondary institution—the content expert is not free to reuse their instructional materials in other settings.[307] At other Canadian post-secondary institutions, intellectual property belongs to the author, which adds complexity to the sharing, reuse and repurposing of such content.

Although there are no formal e-learning strategies at the federal level, progress has been made toward the creation of content and the sharing of resources. An IP Matrix, created through the Flexible E-Content project funded by CANARIE Inc., can identify the extent to which any newly created intellectual property can be used or reused. The matrix review includes parameters such as:

• length of term;

• specific audiences;

• whether derivative works are allowable;

• where and how attribution is required, and

• if commercial use is permissible.

This matrix can also be used to calculate the financial compensation for intellectual property and to trigger calculations for contribution repayment, should any be required.

BCcampus and Campus Alberta have created similar collaborative approaches within their provinces that permit post-secondary institutions to share research and content. However, these types of collaborative efforts are uncommon between provinces, even when memoranda of agreement have been established.

Library and Archives Canada (LAC) is leading an initiative to create a national strategy to guide Canada's "scientific, cultural, and education communities, businesses, and civil society in the production, use, sharing and preservation of its vast and growing body of digital information." LAC's 2007 draft strategy for consultation has suggested that to increase its capacity to preserve digital information, it needs "a framework to strengthen, co-ordinate and better communicate [its] collective efforts."[308]

Copyright

Canada's efforts to address copyright within "e-content" have been fragmented and dependent on individual interpretations and resources available to K–12 school districts, post-secondary institutions or service sectors.

Under current laws, all third-party content must be attributed to its author and source and be approved for inclusion by the source of origin. Content should not be used unless copyright has been addressed. It cannot be shared without permission from the author, as it does not belong to the person who has included it within a learning object or an online course. This means that, under current regulations, students and teachers risk copyright infringement through routine use of the internet.

In many cases, particularly within the K–12 context, limited resources and understanding of copyright laws have led to the inclusion of online third-party content without any of the above provisos. Historically, teachers who created online content had little time to address third-party content, even if they understood—and in most cases they did not—that it required authorization prior to inclusion.

Institutions such as the Canadian Association of Research Libraries (CARL) and the Council of Ministers of Education, Canada (CMEC) recognize the need to balance issues of content protection with educational needs. For instance, CARL has created a module on how to identify and avoid plagiarism. Moreover, CMEC has created a copyright consortium of all provinces and territories (except Quebec). The consortium is calling upon the federal government to recognize the rights of students and educators to have reasonable and equitable access to publicly available internet materials in their educational pursuits.[309]

Proposed education and research amendments to the *Copyright Act*

As this report's time of publication, the federal government is reforming the *Canadian Copyright Act*. Proposed amendments to the Act include the following provisions for education and research:

• **Technology-Enhanced Learning:** Amendments apply to teachers and students within the physical classroom, and to those participating in the lessons (or viewing the lessons afterwards) from a remote location through the internet. Teachers and students would be allowed to use copyrighted material in lessons conducted via the internet. Teachers would be allowed to deliver digital course material to students, and copyright owners would receive fair compensation. Students would be able to print one copy of the course materials. However, schools would need to ensure that (1) internet access to a lesson is restricted to teachers and students in the course; and that (2) lessons could not be distributed or copied to students not enrolled in the course. Once the course has ended, all recordings of lessons from that course would need to be destroyed. Schools would need to take measures to limit the distribution of digital course materials, and prevent copying and distribution of materials among students.

• **Educational Use of Internet Material:** Teachers and students would be able to use material found on the internet for the purpose of education or training. This part of the *Copyright Act* would not apply to the use of internet material that has been restricted by a digital lock or expressly prohibited by a clearly visible notice. Students and teachers would need to be wary of internet content that has been posted without the consent of the copyright owner, as the educational exception would then not apply.

• **Library Materials:** Librarians are able to digitize print material in order to send an electronic copy to a library client as part of an interlibrary loan. The client receiving the material would then be able to view the material with the use of a computer, or to print a single copy. However, the client receiving the electronically transmitted material would not be allowed to make permanent copies (digital or otherwise) other than the one print copy, and would not be permitted to distribute it further. Electronic access to the material would be terminated following five business days. The library would be responsible for ensuring that only the intended recipient receives the material and that they act in accordance with the conditions established by the provision.

Source: Industry Canada, "Canada's Bill C61: fact sheets," www.ic.gc.ca/eic/site/ crp-prda.nsf/eng/h_rp01157.html (accessed Nov. 19, 2008).

Geist (2007)[310] suggests that governments can play a key role in issues related to copyright, by improving access to content they control or help fund. This could be accomplished without legislation and at minimal cost. Specifically, he proposes the following measures:

- the elimination of Crown-copyright legislation that grants government control over taxpayer-funded work;

- the introduction of open-access requirements for federally-funded research;

- the establishment of new incentives in book publishing and television production-funding programs to encourage open business models; and

- the repositioning of public-broadcaster content by adopting open licenses, which invite the public to remix the content to tell their own stories.

Innovative Approaches to E-Learning in Canada

Canada is host to a number of efforts to align new technologies with innovative learning approaches. This section profiles a selection of Canadian initiatives that hold promise: ABRACADABRA, Athabasca University, Northern Ontario School of Medicine, the Sunchild E-Learning Community Model, and the Operating Engineers Training Institute of Ontario.*

ABRACADABRA: A web-based literacy software for young learners

ABRACADABRA (A Balanced Reading Approach for Canadians Designed to Achieve Results for All) is web-based literacy software for early elementary classrooms across Canada. Designed by the Centre for the Study of Learning and Performance (CSLP) at Montreal's Concordia University, ABRACADABRA is based on the "best knowledge available on the science of learning acquisition, brain development and foundations of literacy in early childhood."[311]

A cross-Canada, multidisciplinary team of education professionals—including researchers, policy-makers, school administrators and language arts consultants—continue to guide the project, to ensure that the technology aligns with sound pedagogical principles and practices.

The software offers a range of student and teacher resources. Student activities enable children to practise skills necessary to become independent readers. Children can read and hear stories and fables, and spell and sound out words. Teacher resources include a professional development module—with printable resources, lesson plan suggestions and extension activities—a teacher's handbook, literacy activities and assessment capabilities. Monitoring and assessment are built into the system through the Student Records Feature, which reports on student progress, and enables teachers to modify instruction as needed.

The program was first tested during November 2004 and May 2005 in Montreal. CSLP also introduced ABRACADABRA to pre-school, after-school and summer-school programs at Montreal YMCAs. Subsequent trials confirmed the software's efficacy as a powerful learning tool. In June 2006, a study of 150 first-grade students showed significant improvements in key literacy skills such as letter-sound knowledge, phonological blending, listening and reading comprehension.[312]

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* Other relevant exemplars are highlighted throughout the body of this report.

Other studies show that the program promotes word-level decoding and related letter-sound and phonological abilities.[313]

The research team from Concordia has also systematically explored the effectiveness of this program for children with attention difficulties. The team has concluded that these children are as likely to succeed in learning as children who are not at risk, using the ABRACADABRA intervention.[314]

The CSLP has partnered with Charles Darwin University in Darwin, Australia, to help reach the Aboriginal population. The program is being adapted to meet this target audience's cultural and language needs, and to address issues of instability in teaching methodology that arise from high turnover in teaching staff.

Athabasca University

Established in 1970, Athabasca University (AU) is a fully accredited, internationally recognized institution that delivers exclusively online and distance-education courses and programs. As formalized in its mission statement, the university "is dedicated to the removal of barriers that restrict access to, and success in, university-level studies and to increasing equality of educational opportunity for adult learners worldwide."[315] The university is structured to remove barriers associated with time and space, past educational experience, and level of income.[316]

Any person aged 16 or over is eligible for admission. AU's prior learning assessment and recognition (PLAR) process enables individuals to seek credit for learning acquired through work and life experience. Admission (except where a prerequisite is required) is not based on prior academic achievement. Students can use AU courses to "top-up" credits from another post-secondary institution, and block-transfer agreements are in place with many partner colleges. The university has established multiple campuses, or "centres of learning," throughout its home province of Alberta.

The university offers more than 700 courses as well as bachelor's degrees, master's degrees, and undergraduate and graduate certificates and diplomas—with a focus on liberal arts, sciences and professional programs. Currently, 150 courses are available online, representing 80% of student activity.

All courses are complete, modularized packages, rather than hybrids that blend in-class and e-learning.[317] Courses are individualized to enable students to learn at their own pace. Considerable emphasis is placed on alignment of course materials with online student support including advising, counselling, technological support and library services. Individualized accommodations and support services are available to students with physical, sensory, psychological or learning disabilities. To meet the needs of Aboriginal scholars and communities, and to preserve indigenous knowledge and culture, AU has also established the Centre for World Indigenous Knowledge and Research.

Athabasca University uses a variety of distance-learning methods including multimedia online activities, print materials, web, e-mail, internet, CD-ROM, computer software, audio/video conferencing, audio/video tapes, and TV or radio. Courses may consist of a combination of delivery methods. Students registering in online courses require access to a computer with an internet connection.[318]

In 2004, the *Financial Times* of London, U.K., ranked AU's online MBA program as one of the top 75 in the world.

AU's research in online and distance education is transforming pedagogy. In 2004–2005, research funding totalled more than $2 million.

Athabasca University: a leader in e-learning research

"In addition to faculty-driven research from across the major academic disciplines, Athabasca University's major research focus is on e-learning. Three Canada Research Chairs, in distance education, in e-learning and in space science and instrumentation, lead the university's research teams.

AU is committed to building on its e-learning leadership through the Canadian Institute for Distance Education Research and its new doctor of education program. Two other significant research initiatives are the Centre of Excellence for Research in New Learning Technologies and the Athabasca River Basin Research Institute."

Source: Association of Universities and Colleges Canada, "Canadian universities: Athabasca University," www.aucc.ca (accessed Oct. 20, 2008).

The Northern Ontario School of Medicine

The Northern Ontario School of Medicine (NOSM) is a joint initiative of Thunder Bay's Lakehead University and Sudbury's Laurentian University. Created in 2005, NOSM has a mandate to educate physicians and provide health care in northern Ontario's rural, remote, Aboriginal and francophone communities.[319]

The demographics of the student population reflect NOSM's aim to be socially accountable to the cultural diversity of the region it serves. For the class of 2008–2009, 91% of medical students were from Northern Ontario, 5% self-identified as Aboriginal, and 26% self-identified as francophone.[320]

NOSM has collaborative agreements with the North East and North West Local Health Integration Networks, and affiliations with more than 70 health centres and hospitals across Northern Ontario. These agreements enable students, faculty and staff to become immersed in the culturally diverse communities they serve. NOSM offers residency programs throughout Northern Ontario and opportunities for students to experience a range of cultural contexts.

Each campus has a state-of-the-art research laboratory. Students have access to e-learning technology including interactive video-conferencing and web-based course materials. They learn in small groups, often in distributed community-based learning sites supported by broadband communication information technology.

New technologies are integral to the success of the program. At publication time of this report, current technologies in use at NOSM are: a PDA- and web-based logbook system for undergraduates to record their clinical experiences; and an online database system that manages information about the school's clinical tutors, placements, residents, electives, and other community-based educational activities and resources.[321]

New technologies and medical education

"In just a few years, e-learning has become part of the mainstream in medical education. While e-learning means many things to many people, at its heart it is concerned with the educational uses of technology…Deploying new technologies usually introduces tensions, and e-learning is no exception. Some wish to use it merely to perform pre-existing activities more efficiently or faster. Others pursue new ways of thinking and working that the use of such technology affords them. Simultaneously, while education, not technology, is the prime goal (and for health care, better patient outcomes), we are also aware that we cannot always predict outcomes…The use of technology in support of education is not, therefore, a causal or engineered set of practices; rather, it requires creativity and adaptability in response to the specific and changing contexts in which it is used. Medical education, as with most fields, is grappling with these tensions."

Source: Rachel Ellaway and K. Masters, "AMEE Guide 32: e-learning in medical education, Part 1: learning, teaching and assessment," *Medical Teacher* 30, no. 5 (2008).

Sunchild E-Learning Community

Aboriginal learners are the most disadvantaged segment of the Canadian school population.[322] Typical challenges of communities include the lack of on-site secondary schools—requiring learners to move from home to attend secondary school, or face lengthy commutes to the nearest school.

Established in 1999, the Sunchild E-Learning Community is a First Nations-controlled school that provides Aboriginal learners of all ages with access to high-school diploma courses, basic adult upgrading, trades, industry training and university courses. As well, Sunchild's use of an e-learning platform eliminates the geographic barrier that limits the ability of many First Nations schools to attract and retain high-quality teachers.[323]

Sunchild offers two types of programs: a blended program, and a standalone e-learning program. The blended program combines e-learning with complementary classroom-based instruction. In contexts where no other high-school courses are offered on-reserve, the entire high-school program is offered through the e-learning model. Students are expected to attend real-time instructor-supported e-learning—which involves audio, whiteboard and chat capabilities enabled by compressed software (WebCT and Elluminate Live) operating over a common phone line[324]—and to participate in tutorials. Students can also access archived classroom instruction in real time. An on-site student mentor, typically from the local community, provides support resources, assists with technical issues, helps students remain on track with assignments, and acts as a community liaison and coach.[325]

The Conference Board of Canada has concluded that "in the context of current financial realities, the Sunchild E-learning Community presents a unique, First Nations-oriented, learner-centric and reasonable cost education service that delivers positive educational results."[326] High-school graduation rates are 80%, compared with estimated on-reserve graduation rates of 20%.[327] Success is largely attributable to "the e-learning model that brings teachers and curricula into diverse classroom sites through the use of collaborative technologies."[328]

Operating Engineers Training Institute of Ontario (OETIO)

The OETIO offers a wide variety of training programs for individuals interested in entering the trades or upgrading their knowledge or skills base. Relevant to present and future industry needs, OETIO provides safety-training programs in crane operation and construction.

Both classroom training and distance education are available. As hands-on training is of particular importance in the construction industry, the OETIO has virtual reality and mechanical simulators that can replicate mobile and tower cranes and heavy equipment in a safe, controlled, and realistic environment. The OETIO has also developed a complete range of one-quarter-sized mechanical simulators—fully functioning replicas of hydraulic heavy equipment—to train students.[329]

SECTION 7: GOVERNMENT EFFORTS IN E-LEARNING—CANADIAN AND INTERNATIONAL

Canadian Governments' Key Role in Shaping the Future

An interconnected world: educational innovation

"Economic progress is increasingly dependent on innovations in the use of the technology," notes George Pohle, Global Leader of the IBM Institute for Business Values.[330] "In economies reaching ubiquitous adoption of the internet and communications technologies," he suggests, "future competitiveness is driven by the creation of new services that exploit the infrastructure."

For developing nations, sustaining investment in connectivity is still necessary. But policy-makers must also focus on new educational approaches that will make their people more sought after in a tightly interconnected world.

As technology advances, the learning modes and needs of Canadians also change.[331] A more globally and technologically dependent society places new and increased pressures on learning systems to be flexible, adaptable and accessible. Developments in e-learning have typically outpaced the ability of policy-makers to shape the developments in constructive ways; as a result, policies in most jurisdictions in Canada lag behind the implementation and practice of e-learning. However, the gap is now narrowing.[332]

Canadian federal, provincial and territorial governments have recognized the potential of new learning tools to enrich traditional teaching and extend lifelong learning opportunities. Governments have taken significant steps toward responding to these emerging learning needs and pressures, by making substantial investments in technology, technological infrastructure and education policy.[333] Governments and institutions have initiated many online and technology-enhanced programs to meet the growing demand for lifelong learning opportunities, and to respond to the expectations of a new internet- and technology-savvy generation.[334]

This section identifies key government initiatives for ICTs in education and learning. It should be noted that a number of these initiatives no longer exist—partly due to the short-term nature of the projects and initiatives, or to budgetary constraints. This section is not an exhaustive list, nor does it provide an in-depth analysis. It is intended only to highlight the efforts made by federal, provincial and territorial governments to address the integration of ICTs into different learning environments.

Federal government

The federal government has had a major role in shaping ICTs in education policy—directly through fiscal measures, and indirectly through programs related to the information infrastructure available to public institutions.

The Canadian government's investment in national infrastructure projects dates back to the 1800s. These projects—which included canals, railways, power, postal services, and bridges and highways—were essential to nation-building, security, social cohesion, and the creation of national economic advantage. ICT infrastructure has been compared in importance with these early infrastructure projects that helped to define the country.[335]

While each federal department has its own policy principles, e-learning is widely perceived throughout the government as a tool that affects many areas of interest for Canadians. Because learning and technology cross many policy boundaries, no single federal department has direct overall control. As a result, several e-learning programs have been delivered through partnerships between various government departments.[336]

Fundamentally, many federal departments are concerned with questions related to e-learning such as access, content and e-literacy. Where it has related to their core mandate, some departments have made positive endeavours in e-learning.[337]

Human Resources and Skills Development Canada (HRSDC)

Established in 1992, HRSDC's *Sector Council Program** supports private-sector activities that improve the skills of the adult workforce, through the promotion of workplace learning and training. With the support of the program, councils representing a variety of sectors initiate activities (such as skills development tools and e-learning) in response to the skills- and labour-market issues that directly affect them.

A known leader in this area is the Textiles Human Resources Council (THRC). The THRC's award-winning *Textile Training Through Technology*® workforce-development system uses the web and other technologies to provide state-of-the-art programs in subjects that range from textile manufacturing, to technical and essential skills, to personal and business performance.[338] The *Textile Training Through Technology* program is a blended training (traditional and e-learning) approach in which peer coaches and mentors are an integral part

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* Sector councils are national consensus-based partnerships between business, labour and education stakeholders within an economic sector. They identify and address human resources and skills development issues through collective, collaborative and sustainable approaches. Source: Human Resources and Skills Development Canada, "Sector Councils." Available at: www.hrsdc.gc.ca/eng/hip/hrp/corporate/sector/sectorcouncil.shtml (accessed Oct. 23, 2008).

of the program. It is available to all employees in the industry, from shop-floor workers to senior managers. Access to the program is extended to suppliers and education institutions in order to promote awareness of the industry's skills and development needs.

In 1996, HRSDC established the Office of Learning Technologies (OLT).[339] During its term of operation (1996–2006), the OLT's objectives were to promote the effective use of learning technologies, to support assessment, conduct research and testing related to the use of technologies for learning, and increase the availability and sharing of knowledge about learning technologies.

OLT's three core supports were community-learning networks, learning technologies in the workplace, and new practices for learning technologies. In partnership with universities, colleges, non-profit organizations and associations, OLT aimed to create, develop and facilitate the implementation of new learning technologies to improve access to skills and learning opportunities.

The OLT laid the foundation for building e-learning program competency within HRSDC, and supported the department's adoption of e-learning in all its forms. The OLT's work was complementary and at times in collaboration with Industry Canada and other federal departments.

Industry Canada

Industry Canada's *Connecting Canadians* program was developed in 1997 so that Canadians across the country could learn and benefit from new ways of communicating and doing business over the internet.[340] *Connecting Canadians* involved many programs and services for public schools, libraries, First Nations schools, and rural and remote communities.[341]

Its key program, *SchoolNet*, was integral to Industry Canada's strategy of making Canada the world's most internet-connected country. Operational from 1994 to 2007, *SchoolNet* promoted the effective use of ICTs in education and learning, and the program aimed to provide all Canadian learners with the skills necessary to succeed in a knowledge-based society. In 1999—with the support and collaboration of the provincial and territorial governments, the education community and the private sector—Canada became the world's first country to have all of its schools and public libraries connected to the internet.[342] The program has been praised for its cost-effectiveness, inclusiveness and success.[343] As Tumin (2000)[344] notes of the *SchoolNet* program, "It was less a fixed plan than a continuously-evolving idea, animated by distinctively Canadian imperatives, driven by entrepreneurs in government and industry, buttressed by small wins and growing political support at small-town levels and at the highest levels of government."

As part of Industry Canada's objective to strengthen communities, the *Broadband for Rural and Northern Development Pilot Program* launched in 2002 to improve internet access for First Nations, northern and rural communities. The initiative aimed to provide these communities with access to improved online services in areas such as health and education, and to foster economic opportunities. By 2005, the program had exceeded expectations by extending broadband access to more than 896 rural and remote communities.[345]

Another Industry Canada initiative is the *Computers for Schools* program, created in 1993 and still in existence. In partnership with the private sector, the program donates computers to K–12 schools, public libraries and registered not-for-profit learning organizations across Canada. To date, close to a half-million computers have been donated to schools across Canada.[346]

To support collaboration among researchers within Canada and abroad, Industry Canada created the Canadian Advanced Network and Research for Industry and Education (CANARIE). CANARIE was established in 1993 to support collaboration among researchers, both within Canada and abroad. It stimulates and supports research, innovation and growth by facilitating the development and use of its network as well as the products, applications and services that run on it.[347] It serves a network of educational institutions at various levels—government labs, research institutes, hospitals and other organizations within both the private and public sector—in a wide range of fields.

By encouraging and participating in strategic collaborations among key sectors, CANARIE brings economic, social and cultural benefits to Canadians. In 1998, CANARIE's CAnet 3 marked the world's first national optical internet research and education network, and enabled the delivery of formal and non-formal learning by connecting learners in real time to instructors and other learners.[348]

Increased growth in network traffic, expected growth in new high-bandwidth applications, and planned extreme high-bandwidth grid projects have resulted in the building of a new network to support leading-edge research in Canada including the deployment and operation of CAnet 4.

CAnet 4, as did its predecessor CAnet 3, interconnects the provincial research networks, and through them connects universities, research centres, government research laboratories, schools and other eligible sites, with each other and with international peer networks. These applications are based upon the increasing use of computers and networks as the platform for research in many fields. For researchers, they are essential requirements for national and international collaboration, data access and analysis, distributed computing, and remote control of instrumentation.[349]

Through a cost-sharing program in partnership with Industry Canada and HRSDC's Office of Learning Technologies, CANARIE funded 32 e-learning projects *(see text box, p. 91)* during the period of 1999–2004.[350] The program's goal was to reduce structural barriers to the use of advanced networks in education and training. The funded projects covered all regions of Canada and were highly collaborative, with over 265 participating organizations from both private and public sectors.

Some CANARIE-funded projects

MusicGrid: connecting Canada with music
Schools across Canada built a national network for music education. MusicGrid, using CAnet 4 and satellite links, connected music students, teachers, conservatories, professional musicians and researchers across Ontario, Quebec, Newfoundland and Labrador and Nunavut. Funding for the program continued until 2004.

Advanced Broadband Enabled Learning Project (ABEL): plugging into learning
With CANARIE's support, a York University-led project developed the infrastructure, multimedia tools and digital content needed to shift professional development into the classroom. A pan-Canadian teaching community was built through the use of video-conferencing and online discussions. More than 350 K–12 and high-school teachers used CAnet 4 to communicate with university faculty, researchers, student teachers and school administrators at 13 sites across Ontario and Alberta. www.abelearn.ca

Virtual Veterinary Medicine Learning Community (V²MLC): virtual veterinarians
Using CAnet 4, veterinary students and practitioners were able to share knowledge, resources, and the latest in animal medicine—regardless of where they lived and worked. The virtual veterinarian website provided access to digital video, medical images, 3-D animation and case studies. This enabled veterinary students to accompany interns on "virtual rounds" in another city, and a professor to deliver lectures online to students at several veterinary colleges. The concept behind this project has the potential to be applied to human medicine, law, engineering and other disciplines. www.ovc.uoguelph.ca/Canarie/Phase2/Web/

The Inclusive Learning Exchange: barrier-free education
The Inclusive Learning Exchange (TILE) enables the learners to choose the type of information display that best suits their needs. For example, a learner with a visual disability can display information in a large font; and a learner with a hearing disability can see written captions of audio material. This technology, which applies to learning environments ranging from primary, secondary and post-secondary schools to workplace training, provides continuous learning opportunities for Canadians. TILE's approach is being implemented across Canada and internationally by a network of learning communities from several sectors. inclusivelearning.ca

Source: CANARIE, "Funded projects," www.canarie.ca/funding/elearning/projects.html (accessed Oct. 24, 2008).

Canada School of Public Service

Although there is no overarching federal policy framework for e-learning, the Campus*direct* program—the Canada School of Public Service online campus—clearly demonstrates federal acknowledgement of e-learning's benefits. Campus*direct* allows public service employees throughout Canada and around the world to access more than 350 e-learning resources. Launched in 2003, Campus*direct* has grown considerably, and by 2005, had more than 20,000 members. Part of Campus*direct*'s mission is to explore the many emerging technologies and tools in e-learning. Its newest offering involves a blended-learning format—where the learner uses online courses and attends facilitated sessions both online and in the classroom.[351]

Provincial and Territorial Governments

Many provincial initiatives have been embarked upon through partnerships with federal departments. The integration of ICTs in education across provincial jurisdictions has resulted in varied ICT policies and initiatives. The reasons for this are two-fold: 1) the rapid rate of technological change that continues to create new forms of use; and 2) provincial governments' requirement to identify the arrangement that will best accommodate regional differences.

Provincial initiatives date back to the late 1970s, when Newfoundland and Labrador established the first province-wide distance-learning network—Telehealth & Educational Technology Resource Agency (TETRA)—in 1977.[352] In 1986, Ontario created *Contact North/Contact Nord* in Northern Ontario, a program that remains strong today. Both networks, built on a uniquely Canadian premise, progressed with technological advancements—beginning as audio and audio-graphic networks that used simple teleconferencing and computing applications, and evolving into online e-learning networks with the maturity of the web.[353] Considerable efforts are still underway within most provinces and varying approaches have been adopted, depending on the province, level of education and desired learning style.[354]

In collaboration with Industry Canada's *SchoolNet* program, the Canadian Education Association (CEA) profiled the Canadian policy landscape for ICTs in education in its *Focus on…ICT*.[355] Drawing on the CEA's review of the provincial policy landscape, select policy perspectives of each province are highlighted below.*

The Atlantic provinces of Prince Edward Island and Nova Scotia focused initiatives on supporting technology in education, and on funding for infrastructure within the provinces. Prince Edward Island's strategy[356] specified technical standards and outlined key performance measures. Nova Scotia's vision[357] set out key outcomes for ICTs in education. It stated that selection of technologies should be based on the province's general beliefs about learning, current learning theory, affordability of the technologies, educational value in relation to cost, equity of learner access and acceptance of the technology in various learning contexts.

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* The provincial policy perspectives highlighted in this section draw on a secondary source; they do not represent an in-depth analysis of all provincial and territorial policy-related material.

Alberta's commitment to investments in ICT infrastructure was the basis for its SuperNet project *(see text box, below)*—which provided a high-speed, high-capacity broadband network linking government offices, schools, universities, health-care facilities and libraries. The project became the backbone for connecting communities throughout the province—to date, more than 4,200 connections have been developed across more than 420 communities in Alberta.[358]

Alberta's Distributed Learning Strategy

In 2004, Alberta Education developed a Distributed Learning Strategy, an initiative aimed at ensuring that strategies for technology development, distribution and use were linked to the future of formal education. Alberta Education is working with stakeholders to develop a strategic plan that clearly articulates the changing nature of the global world. The plan's objective is to align the skills students will need in the future with educational strategies that use technology. The ministry hopes that its information collection will provide equity, access, and standards around distributed learning opportunities in the province. The province has introduced SuperNet to provide broadband access to all its communities, creating an infrastructure where technologies such as video-conferencing and other emerging technologies can be supported.

Quebec pursued a less traditional approach by identifying technology as one of five fields of study, not merely as a means of teaching or learning other subjects. The province, however, also recognizes the importance of technology within all aspects of life: "Technology is everywhere and students must be introduced to it at an early age in order to understand the world in which they live."[359]

Similarly, Manitoba identified technology—along with literacy and communication, problem-solving and human relations—as a foundational skill that prepares students for their roles in society.[360] The province recognizes that technology has the potential to enable students to learn but also to enhance their understanding of the existing links between technology, society and the environment.

Provincial differences in the approach to ICTs in education are especially acute in provinces with unique geographic and cultural differences. The territories of Nunavut and Yukon have viewed technology as a tool to preserve and enrich learning of their local cultures, traditions and languages. The isolated and remote nature of all three territories (Nunavut, Yukon and the Northwest Territories) has presented unique challenges. Learning through technology has been considered instrumental to bridging the distance and providing learners with greater access to educational resources and opportunities.[361]

BCcampus

Established in 2002, BCcampus is a consortium of 26 public post-secondary institutions, with a mandate to provide British Columbia learners with a web-based access point to post-secondary e-learning programs and services. As Education Minister Shirley Bond stated October 30, 2002, the mission of BCcampus is to "bring together the expertise and resources of all of BC's public post-secondary institutions into a new collaborative model for distance education...[to] make education available to all students, particularly those living in rural and remote communities, and those whose lives demand a more flexible schedule for their education."[362]

Since its inception, use of BCcampus application and registration services has increased. Growth in registrations rose from 30% per year in 2004 to 50% growth in 2006. The BCcampus portal has facilitated over 15,000 enrolments in online courses offered within the province's post-secondary institutions.

British Columbia established the Provincial Learning Network (PLNet) to improve "geographic inequity caused by the high cost of telecommunication services to schools and colleges located in small urban and rural and remote communities."[363] PLNet was founded and continues to operate on the core principles of universal access, equitable pricing and services driven by client needs, and commitment to a regional and community focus.

The Newfoundland and Labrador Department of Education also acknowledged equity and access as important themes for education policy and used the strategy of partnership-building to achieve its technology goals for education within the province.

Newfoundland and Labrador's Centre for Distance Learning and Innovation

Newfoundland and Labrador's Centre for Distance Learning and Innovation (CDLI) was created in 2001 with a mandate to ensure that students across the province in rural, remote and isolated areas could access the same learning opportunities as students in urban areas. The number of course registrations has increased by 69% since its inception and the number of teachers by 65%. With 36 high-school courses now available, the number of course offerings have increased by 100%. To date, 103 high schools now offer CDLI courses as part of their curricula.

In 2008, the federal Commissioner of Official Languages recognized CDLI for its success in offering French-language training to rural areas of the province, citing that it was "very popular… interactive and takes advantage of new technologies."[364]

Collaboration and partnerships between Saskatchewan Learning* and external sources enabled the province to overcome the fiscal constraints that for many years had limited its ICT growth; this collaboration also enabled Saskatchewan to make rapid progress in the development of ICT infrastructure and programs.[365]

The province of New Brunswick has always been strongly committed to technology, especially to distance education. One of its e-learning goals is to develop international partnerships to enhance its e-learning agenda—in order to create enhanced learning opportunities for students and educators in a global environment.[366]

Ontario's approach has been more localized. School boards have a distinct role in determining district-level policy and planning for technology and education. Activities related to ICTs in education take place at the local level rather than within the province's ministries.[367]

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* Saskatchewan Learning encompasses education in early childhood, K–12 and post-secondary, as well as public libraries.

E-Learning Ontario: improving literacy and numeracy

E-Learning Ontario is committed to finding new and innovative ways to meeting the needs of a wide range of learners across the province. Its strategy is to provide participating school boards with the key building blocks for a successful e-learning program. Course and program offerings aim to help students develop solid reading, writing and math skills and to improve their learning options as they work toward graduation. Programs aim to provide significant support in achieving the government's 2008 targets—75% attainment of the provincial standard for literacy and numeracy and a high-school graduation rate of 85% by 2010–2011.[368]

The challenge for Canada

In many OECD countries, governments play a significant role in the direction and funding of higher education in general and in e-learning in particular. Governments also play a key role in influencing institutions through strategic funding and policy. As the OECD notes, there is a need to understand what governments and related agencies can do to create an enabling environment for e-learning development and to reap all its benefits.[369]

The challenge for Canada is to find new ways to strengthen its future while respecting the accomplishments of the past and the well-established traditions, protocols and policies which define our provincial and territorial jurisdictions. However, to move forward also requires a clearer understanding of: the evidence on e-learning as a tool for learning; the gaps and future directions; expert consensus on e-learning from multiple perspectives; and public policy at both the provincial/territorial and federal levels.

International Efforts in E-learning

The potential of e-learning to contribute to national economic and social goals has motivated a number of countries to develop strategic e-learning policy frameworks that foster collaboration and co-operation across jurisdictions, multiple countries and between public and private agencies and organizations.

Charpentier, Lafrance and Paquette (2006) note that while Canada over the last decade has played a leadership role and gained international recognition in e-learning—e.g., in infrastructure deployment, learning methodology, tools and practices, work on accessibility, and research on learning objects and repositories—it is starting to trail behind in that very important sector.[370]

A 2009 survey by the International Telecommunications Union[371] ranked Canada 19th out of 154 countries in the category of advanced use of ICTs. Canada's significant drop from ninth place in 2002 was largely due to the gains made in Europe. Sweden ranked first, followed by South Korea, while the remaining eight countries out of the top 10 were all from Western Europe.

The survey considered factors such as the proportional use of technologies including fixed lines, mobile cell phones, internet and broadband access, and mobile broadband services. Also considered were the amount of bandwidth available per internet user, the proportion of households with computers and internet access, and literacy and education levels.

As research has demonstrated, countries that have implemented e-learning policies realize that technologies and ICTs are rapidly transforming economies, commanding new skills and competencies, and providing flexible lifelong learning opportunities.[372]

Charpentier (2006)[373]* observed that e-learning strategies and action plans in most countries, other than the U.S., are government-initiated—through ministries/departments, public-funding councils or multi-ministerial committees. Furthermore, these wide-ranging government action plans translate into initiatives with significant public funding.

Australia, Korea, the U.S., U.K. and France are examples of countries that have embraced an e-learning agenda, as have multi-country organizations such as the European Union (EU) and the Commonwealth of Learning (COL).[374]

* Most of the content for this section is derived from this key report.

Table 7.1: E-learning organizations and policy milestones in selected countries				
	United Kingdom	**Australia**	**Korea**	**France**
Key government ministries and agencies	Department for Education and Skills (DfES) Ireland, Wales, Scotland, England Governments' Education Ministers Funding Councils (HEFC, FEFC), FutureLab, NCSL	Department of Education, Science and Training (DEST) Ministerial Council on Education, Employment, Training and Youth Affairs (MCEETYA) Australian Government Information Management Office (AGIMO, previously NOIE)	Ministry of Commerce, Industry and Energy (MOCIE) Ministry of Education and Human Resource Development (MOEHRD) Ministry of Labor (MoL) Ministry of Government Administration and Home Affairs (MOGAHA)	Ministère de l'Education Nationale, de l'Enseignement Supérieur et de la Recherche (MENESR)
Key policy milestones/ documents	1997–2004: States Policy 2003: E-learning National Consultation 2005: DfES e-strategy: *Harnessing Technology: Transforming learning and children's services* (March 2005)	1998: *A Strategic Framework for the Information Economy—Identifying Priorities for Action* 1999: Adelaide Declaration from the States, Territory and Commonwealth Ministers of Education 2000: *Learning for the Knowledge Society: An Education and Training Action Plan for the Information Economy* 2004: *Australia's Strategic Framework for the Information Economy 2004–2006: Opportunities and Challenges for the Information Age*	1996: e-Korea Project / e-Campus 1998: *Adapting Education to the Information Age* 2001: *Towards Education Reform and the Development of Human Resources* 2002–2003: MOCIE—*The Present Situation of e-Learning Industries and Means to Facilitate Them*	1997: *Plan d'action gouvernemental pour une société de l'information* (PAGSI) 2002: RESO plan (*Pour une REpublique numérique dans la Société de l'information,* or *For a Digitalized Republic in the Information Society*) 2004–2006: TICE Action Plan (Technologies de l'Information et de la Communication en Éducation)
Key organizations responsible for policy implementation	Becta—British Educational Communications and Technology Agency: policy and program advice; bring coherence and synergy between stakeholders; evaluate needs and impacts of policy action plans JISC—Joint Information Systems Committee: centralized and co-ordinated direction for the development of the infrastructure and activities in line with the e-strategy JISC Regional Centres	education.au: responsible for building national infrastructure to provide shared online content and services EdNA online (Education Network Australia) Government agencies in each sector of education	KERIS: Korea Education & Research Information Service KRIVET: Korea Research Institute for Vocational Education & Training KADO: Korean Agency for Digital Opportunity and Promotion KELIA: Korea e-learning Industry Association KALIC: Korea Advanced e-Learning Infrastructure Centre	Sub-Directorate of Information and Communication Technology in Education (SDTICE): sub-directorate of MENESR Délégation aux usages de l'internet (DUI—Delegation for the Use of the Internet) interministerial committee attached to MENESR

Australia

The Australian government[375] has taken a lead role in creating the appropriate environment for all Australians to have access to, and benefit from, the information economy. Following the establishment in 1997 of the National Office for the Information Economy, the government launched its strategic framework for bringing Australia into the information age. In 1997, state and territorial governments created education.au, a national agency dedicated to providing innovative learning technologies, particularly shared online content and services that would benefit education institutions and learning communities.[376]

Another government initiative is EdNA Online (Education Network Australia), created in 1995 as a gateway to all educational and training resources and services in Australia. Organized around Australian curricula, the gateway lists all institutions and courses available in Australia. It also provides a database of resources useful for teaching and learning. These tools are free to Australian educators. In February 2003, it was estimated that EdNA Online had over 165,000 quality-evaluated resources and 323,000 linked resources. EdNA Online also provides funding for internet connection and professional development opportunities for teachers.

Emerging technologies and the wider environmental context

"The implementation and use of emerging technologies cannot be divorced from the environment—this includes the political and legal; social and cultural; educational; and technology environments that are already in place and evolving. As part of the process of planning for the future, it is vital that the wider environment context is fully considered."[377]

Source: Australia, Department of Education, Skills, Training, "Information and Communication Technology (ICT) Strategy." Available at: www.det.wa.edu.au/training/training/content-ictstrat.asp (accessed Oct. 15, 2008).

Korea

Korea's Ministry of Education and Human Resource Development (MEHRD) and the Ministry of Labor (MoL) have significantly influenced the development of e-learning in Korea. In 2000, the MEHRD amended the Lifelong Education Law to create online universities along defined standards. This permitted the establishment of diverse lifelong educational institutions—among them, lifelong-learning centres attached to universities.

Through an insurance reimbursement program, the MoL introduced and promoted internet training courses that contributed to the expansion of e-learning in corporate training.

Other important governmental e-learning initiatives in Korea include:

• *KERIS* (Korea Education and Research Information Service)
Founded in 1996, KERIS operates EDUNET, an e-learning portal servicing elementary and high-school teachers, students and parents. KERIS supports various projects—including instructional content, learning content and content utilization support—and has developed distance-teacher professional-development centres, of which 39 were active in 2001.

• *KUACE* (Korean University Alliance for Cyber Education)
Created in 2001 to promote the advancement of e-learning in higher education, KUACE promotes the development of online/cyber-universities. In 2004, there were 16 cyber-universities created, excluding the 151 traditional colleges and universities (of the 376 Korean institutions) offering online courses and programs.

• *KRIVET* (Korea Research Institute for Vocational Education and Training)
Through its centre for e-learning, KRIVET advises the MoL about e-learning. The MoL subsidizes employers for a portion of the costs associated with employee web-based training.

United States

Support for e-learning in the U.S. is distinct from government-initiated support for e-learning generally observed among other countries, given the diversified e-learning activities in the U.S. education sector—technology, tools and content development—and a dynamic private e-learning market. As Charpentier et al. (2006) note, these conditions reflect "the innovation potential that comes from the historical proximity of private universities and corporations supporting programs and research."[378]

A particularly successful example of innovation is EDUCAUSE, a not-for-profit association with a mandate to advance higher education through the intelligent use of information technology. EDUCAUSE is active in a wide range of activities including:

• professional development activities;

• applied research;

• strategic policy advocacy;

• teaching and learning initiatives;

• online information services;

• print and electronic publications, including books, monographs and the magazines *EDUCAUSE Quarterly* and *EDUCAUSE Review*;

• special-interest collaborative communities; and

• awards for leadership and exemplary practices.

EDUCAUSE's programs include:

- *ECAR, the EDUCAUSE Center for Applied Research:* provides subscribers with timely research and analysis to help higher-education leaders make better decisions about IT;

- *Net@EDU:* promotes the development of advanced networking in higher education through member activities that span the spectrum of academic networking—from administration of campus networks to local, state, regional, national, and international networking projects;

- *ELI, the EDUCAUSE Learning Initiative*: supports new collegiate learning environments that use IT to improve the quality of teaching and learning, contain or reduce rising costs, and provide greater access to higher education;

- *Core Data Service:* a web-based interactive database based on an annual survey that compares institutional IT environments and practices;

- *Networking Initiatives:* focuses efforts to define and develop emerging network technologies;

- *Policy Initiatives:* the association's legislative and regulatory tracking and advocacy activities involve federal policies that impact IT in higher education;

- *Security Initiatives:* provides resources on computer and network security for the higher-education community; and

- *.edu Administration:* covers policies and processes for managing the .edu internet domain.

Multimedia Educational Resource for Learning and Online Teaching (MERLOT)

Developed in 1997 at the California State University Centre for Distributed Learning, MERLOT is an open-source and arguably sustainable community that serves as a "leadership cooperative for faculty communities."[379] Through community portals organized by discipline, program and partnership, MERLOT shares teaching knowledge and manages digital resources to enhance learning and student success in higher education.[380]

MERLOT supports the open repository at www.merlot.org. For institutional partners, the freely accessible resources reduce costs and risks associated with strategic initiatives. MERLOT also increases their impact through the "systematic exchange, reuse and adaptation of resources, services and tools."[381]

United Kingdom

As Charpentier, Lafrance and Paquette (2006) note, the U.K. has a long tradition of innovation in education, notably its model of Open University and distance learning. Since the mid-1990s, U.K. states have developed strategies and action plans to support ICT in education initiatives such as Scotland's National Grid for Learning, Wales' 2001 e-learning strategy, and *The Education Technology Strategy of Northern Ireland* (1997). England's councils and agencies have also promoted ICT use in all levels of education.[382]

Following consultations with many stakeholders, the Department for Education articulated a national e-learning strategy,[383] *Harnessing Technology: Transforming Learning and Children's Services* (2005).[384] Responsibility for implementation rests with British Educational Communications and Technology Agency (Becta) and the Joint Information Systems Committee (JISC).

Becta (www.becta.org.uk) has four main roles: provide strategic advice to government; co-ordinate the e-strategy; provide analysis and research; and strategic delivery.

JISC (www.jisc.ac.uk) centralizes and co-ordinates the development of infrastructure and activities, and provides tools and services to higher-education institutions and further-education colleges. In particular, JISC provides: a world-class network (JANET); access to electronic resources; new environments for learning, teaching and research; guidance on institutional change; advisory and consultancy services; and regional support for further-education colleges.

France

Since the mid- to late-1990s, France has pursued a proactive policy aiming at increasing the use of ICTs in primary, secondary and further-education institutions—and at making the internet and ICTs accessible to all of French society.[385]

Specific initiatives include:

• a governmental action plan for the Information Society (PAGSI);

• Information Systems and Telecommunications, which includes the provision of user support and instruction;

• publication of the infrastructure master plan to provide a framework for regional initiatives;

• launch of the 2007 RESO plan (For a Digitalized REpublic in the Information SOciety/Pour une REpublique numérique dans la SOciété de l'information);

• implementation of phase two of an initiative to increase use of ICTs in education by the Interministerial Committee on the Information Society's (CISI—Comité interministérial pour la société de l'information); and

• CISI's global plan with respect to infrastructure, services, contents, ICT uses and training, at school as well as in society in general.[386]

European Union

As Charpentier, Lafrance and Paquette (2006) note, European countries have combined their efforts by supporting initiatives and programs managed by EU organizations, in collaboration with national entities in each country. Among the many programs to help harmonize and co-ordinate national policies on common goals, education and training became a major integrating component in 2000.[387]

The Lisbon European Council held in March 2000 established the EU objective of becoming the most competitive and dynamic knowledge-driven economy of the world. The Lisbon Council has since generated many initiatives such as SOCRATES (school and higher education), Leonardo Da Vinci (addresses vocational education and training—*see text box below*), lifelong learning and ICT in education (focused on e-learning).

From e-learning to m-learning: the Leonardo da Vinci Project

The European Union's Leonardo da Vinci Project[388] set in place the first stage in the creation of a global provision of training on the wireless internet. It established the first building block for the next generation of learning—the move from distance learning (d-learning) and electronic learning (e-learning) to mobile learning (m-learning).

Aimed at the development of an European area of co-operation, the project supported and supplemented member states' policies on lifelong learning, while fully respecting their responsibility for the content and organization of vocational training.

The innovative approach of the Leonardo da Vinci Project showed that ICT training should not be limited to the use of ICTs in training centres, but should extend also to training on the web, and to harnessing the training benefits of mobile technologies. The project was set to run for seven years (2000–2006) at an estimated budget of 1.15 billion Euros. Up to 31 European countries could participate.

In March 2001, the EU adopted an e-learning action plan, *eLearning: Designing Tomorrow's Education*, articulated around four action lines:

• infrastructures and equipment—to equip schools with multimedia computers;

• training—to train European teachers in digital technologies;

• European quality contents and services—to develop software and services to speed up networking of schools and teachers; and

• co-operation at all levels.

At the Barcelona European Council of March 2002, the Council called on the European Commission to draw up an e-Europe 2005 action plan that would focus on e-learning—among other priorities—and ensure digital content was available in the learner's native language. The e-learning initiative sought to accelerate changes in education and training systems that would advance the knowledge economy and digital culture society. It focused on e-learning in schools, universities and the workplace.[389]

The e-learning program for the period of 2002–2006 entailed the promotion of digital literacy, European virtual campuses, e-twinning of schools (*see text box, p. 105*), teacher training, and transversal actions to promote e-learning in Europe.[390]

E-learning is also a research priority of the European Union. The Sixth Framework Program for Research and Technological Development (2002–2006) supported research on the contribution of Information Society Technologies (ISTs) to innovation in education and training through its Technology Enhanced Learning (e-learning) strategic objective. Research aims included lowering technological barriers and enabling learners to use existing, widely available technologies as well as new technologies. Fostering the availability of European e-content, products and services in the internet economy was another important research priority.[391]

European Union (EU) initiatives in e-learning

European Schoolnet: www.europeanschoolnet.org/ww/en/pub/eun/about/euninfo.htm

European Schoolnet (EUN) is a network of 31 Ministries of Education in Europe and beyond. Created in the mid-1990s, EUN aims to bring about innovation in teaching and learning to its key stakeholders: Ministries of Education, schools, teachers and researchers. EUN's activities are comprised of three strands of work: policy, research and innovation; school services; and learning resource exchange and interoperability.

eTwinning of schools: www.etwinning.net

Part of the Comenius, the EU's progam for schools, this community education initiative strengthens and develops networking among schools. Its activities include educational projects, internet-based learning communities and professional development of teachers' and trainers' skills in the pedagogical and collaborative use of ICTs.

Elearning portal: elearningeuropa.info

This European portal provides e-learning support and a centre for the promotion and exchange of best practices.

The Commonwealth of Learning (COL)

Created in 1987, the Commonwealth of Learning (COL)[392] is an intergovernmental organization established by Commonwealth heads of government. The COL encourages the development and sharing of open-learning/distance-education knowledge, resources and technologies among participating countries.

COL's mission is to help developing countries improve their access to quality education and training, through the use of open and distance learning. COL initiates and finances numerous services, products and collaborations and transfers this know-how to developing countries.

COL's collaboration with UNESCO, World Bank and other organizations has led to major initiatives in Africa such as *SchoolNetAfrica*—a professional development program for directors and principals of sub-Saharan African teacher-training colleges—following a similar program initiated in India in 2003.

OBSERVATIONS

E-learning: The Global Context

"The country that first learns how to harness fully the potential of this new medium, and transforms this understanding into products, will have a competitive advantage over other nations in its capacity to develop human capital."

Source: Advisory Committee on Online Learning, *The E-learning E-volution in Colleges and Universities: A Pan-Canadian Challenge* (Ottawa: Industry Canada, Feb. 2001). Available at: www.cmec.ca/postsec/evolution.en.pdf (accessed Nov. 13, 2008).

Information and communication technologies (ICTs) have the potential to transform and inform our everyday lives. New learning tools play a key role in enriching traditional teaching methods and can greatly extend learning opportunities to Canadians in all walks in life.

Research suggests that, in addition to basic literacy and analytical skills, computer literacy can improve educational outcomes and help workers acquire the skills they need in the knowledge-based global economy.

Worldwide, there is strong interest in the formation of socially productive skills, such as literacy and numeracy skills. Countries such as Australia, the U.K., France and South Korea are pursuing policies and programs that support lifelong learning among their citizens, and are harnessing e-learning's potential contributions to economic and social development. Collaboration and co-operation across jurisdictions and among public and private agencies and organizations are a hallmark of their e-learning policy frameworks.

E-Learning in Canada 10 Years Later: Are We There Yet?

Over the past 10 years, Canada has played a leadership role and gained international recognition for several initiatives and achievements in e-learning.* However, the promise and potential of e-learning have yet to be realized fully. As Garrison and Anderson (2007) have noted, although lifelong learning is at the forefront of policy discussions and technology is transforming education, "there is little in the way of planning or a vision of e-learning for the future."[393]

E-learning in Canada remains a loose connection of provincial, territorial and federal e-learning networks, educational providers (public and private) and targeted initiatives. The consequences of this approach include duplicated efforts, fragmented goals and objectives, and sporadic and short-term initiatives.

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* These areas include infrastructure deployment, learning methodology, tools and practices; work on accessibility; and research on learning objects and repositories.

Despite this, e-learning in Canada retains a strong foundation that can be used to support an integrative approach to the development and implementation of social and economic policies. Indeed, Canada is poised to use e-learning as a method of delivering lifelong learning.

Creating favourable conditions for e-learning: priority issues

For the full potential of e-learning to be achieved, conditions favourable to learning must be created and maintained. Efforts are required in four key areas: generating multi-sectoral momentum; developing a shared vision for e-learning across Canada; harnessing the potential of technology to facilitate the needs of learners; and filling gaps in research.

1. Generating momentum: stakeholder collaboration and sharing of resources

ICTs and the internet have created a platform for access to information, including educational resources. They have subsequently fostered a culture of sharing, where global content is contributed and distributed with few restrictions.[394]

Despite Canada's rich array of e-learning resources and expertise, lack of co-ordination and communication limit further progress. Stakeholders must work together—through discussion forums, sustainable funding, by linking learning object repositories, training for policy and research, and collaborating internationally.[395]

Canada could benefit from bringing sectors together—including educational institutions, the federal and provincial governments, business and community-based organizations and associations—to discuss mutually beneficial ways of working together.[396]

"In order to collectively advance teaching and learning globally, we need to devise mechanisms to harvest, accumulate, and distribute locally created educational assets, pedagogical innovations, and wisdom of practice in a manner that can be reused effectively in different local contexts…As practice and experience is made increasingly tangible and transferable, we need to create a network of educational knowledge-bases that inspires and helps to inform future efforts."

Source: Toru Iiyoshi and M. S. Vijay Kumar (eds.), *Opening Up Education: The Collective Advancement of Education through Open Technology, Open Content, and Open Knowledge* (Cambridge, MA: The MIT Press, 2008).

To commit to e-learning, Canadian institutions should consider sharing the costs in order to take advantage of synergies and economies of scale.[397]

Creating momentum will require strong leadership focused on establishing mechanisms for effective policy and program co-ordination. It will also require the strategic engagement of stakeholders. Some core principles could include: respect for provincial jurisdictions and autonomy; reduction of redundancy and overlapping of e-learning tools, infrastructure, and activities; promotion of a shared vision; effective collaboration; and facilitation of a joint-action plan.

2. A shared vision of e-learning

Articulating a shared vision among stakeholders would form the foundation for the development and implementation of a joint-action plan. Success will largely depend on the clarity of the vision and level of commitment. A joint-action plan would allow the agenda to move forward in a productive manner, but requires the involvement and mobilization of efforts by a wide range of stakeholders— from policy- and decision-makers, researchers, public and private institutional representatives to community agencies, educators and learners.

While a wide array of partnerships currently exists, there is also a need to establish mechanisms that will reinforce and strengthen these relationships. Stronger partnerships will foster an environment for effective policy and program co-ordination. They will also promote a coherent approach to critical issues, such as open-source software (where appropriate) and open access to research and scholarships. Equally important, new partnerships will help eliminate redundancy, reduce costs, and improve the rigor of resources, instruments and tools.

The concept of collaborative partnerships recognizes that the successful use of ICTs in support of learning does not rest on a simple "build-it-and-they-will-come" approach. It identifies that appropriate e-learning resources and support—and effective communication, dissemination and training strategies—must be in place to offer users and learners positive experiences that will foster engagement in e-learning.

In 2001, the Advisory Committee on Online Learning articulated an action plan designed to create alliances and foster synergies necessary to restore Canada's position within the global learning arena. The plan included initiatives intended to encourage innovation in post-secondary education, and to place learners at the centre of their own education. It contained measures designed to enhance the quality of the PSE learning experience through new institutional strategies. As well, it advocated support for the creation of more high-quality e-learning materials, and investments in learning research and related product development.

It is well worth re-visiting these recommendations—elements of the action plan could help restore Canada's leadership role in e-learning.

3. Harnessing the potential of technology to facilitate the needs of learners

In its report, the Advisory Committee on Online Learning recommended that post-secondary institutions provide a range of support, including technical, to enable learners to take full advantage of e-learning opportunities. The report also contained recommendations to make e-learning more accessible for individuals with disabilities. It suggested that educational institutions, the private sector and government should ensure that the design of hardware, software, operating systems, online courses and learning resources and tools used for e-learning be adapted to meet the differing needs of people with disabilities.

4. Filling the gaps in research

A common framework to advance e-learning requires the foundation of high-quality evidence. Numerous authors—including Fournier (2006), Abrami (2006), Charpentier (2006), Expert Panel on E-Learning (2006) and Rossiter Consulting (2006)—have identified the need for data that provide a better understanding of how e-learning is used and implemented in Canada. In particular, they identified the need for research on the issues of access, quality, cost and outcomes.

The report by the Advisory Committee on Online Learning[398] emphasized the need for more research on learning—both traditional and online—that would help answer key questions, such as: What learning techniques are most effective? How do individuals learn? How do learner styles and types differ? How do individuals engage in learning throughout life?

The report also highlighted the importance of ensuring that the highest-quality learning experience is made available to online learners. This requires an understanding of how the full potential of ICTs can be harnessed for learning, and how e-learning experiences and outcomes differ from those of traditional learning approaches.[399]

An effective data strategy would identify core issues and concerns, synthesize and update existing research, generate new evidence, facilitate knowledge exchange, and support the development of action plans.

An e-learning data clearinghouse

Research has identified the need for an e-learning data clearinghouse that would:

- monitor trends in the development, use and implementation of e-learning in Canada and internationally that affect essential competencies and skills—such as literacy (including information literacy), numeracy, and scientific reasoning—which would be widely suitable for use in multiple sectors and contexts;

- set learning targets that demonstrate scalable and sustainable impacts in essential competencies and skills as a function of the development of country-wide e-learning tools;

- collect quality evidence on promising practices; and

- through dissemination activities, create awareness of effective e-learning practices and build capacity among decision-makers, practitioners, business and industry, and the general public.

E-learning: Final Thoughts

Lifelong learning is Canada's greatest safeguard against an uncertain future—it will help us face the challenges of increased globalization, rapid advancements in new technologies and demand for innovation and higher productivity.

Canada appears well positioned to maximize its human capital by advancing lifelong learning through new technologies. The Advisory Committee on Online Learning (2001) expressed its conviction that "Canadians are among those who will gain the most from the effective use of information and telecommunication technologies in building a creative and knowledge-based society." It also noted that the extent to which Canada benefits "will to a considerable degree be determined by how quickly and effectively our institutions embrace online learning."[400]

Federal, provincial and territorial governments have already recognized the potential of ICTs by making substantial investments in technology and education policy. The challenge for researchers, educators and decision-makers is to build on these efforts, while working swiftly and collaboratively to meet Canada's learning needs in the 21st century.

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