The Challenge of Change:

Building the 21st Century Economy

Conference Background Paper

"e-Commerce to e-Economy Strategies for the 21st Century"

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The e-economy will happen to Canada, whether or not we do anything about it. Our challenge and opportunity is to make it happen for Canada.

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Executive Summary

Over the past quarter of a century, the increasing use of computers in all aspects of life, combined with the widespread deployment of the Internet, has fundamentally changed society and radically altered the dynamics of economic growth. For every country and community, the management and flow of information – and its translation into knowledge – are dramatically redefining the pace and direction of social progress and economic development. In advanced economies, wealth creation depends more and more on the capacity to use information and knowledge effectively, both in the production of goods and in the increasingly important realm of services and other forms of "intangible" economic activity. Moreover, using knowledge to innovate – in effect, finding smarter ways of doing work or conducting business, often by means of information technology – is the key to improving productivity and to maintaining competitiveness.

An economy dependent upon knowledge must necessarily rely on a strong networked base of advanced information and communications technologies (ICTs), as well as the capacity – the skills, know-how and entrepreneurship – to exploit them for economic and commercial advantage. This reliance on ICTs now extends far beyond the few industries like telecommunications, software and computer services that are traditionally associated with the technology. In fact, the use of ICTs, like electricity, has infiltrated virtually the entire economy. This has created an **e-economy**, in which firms, organizations and governments make effective use of ICTs to spur on product and process innovation across all sectors of the economy.

In today's global economy, competition can come from anywhere, at any time and in any industry sector. Traditional sources of comparative advantage no longer guarantee national prosperity. New strategies are needed to build an economy that generates wealth by capitalizing on the potential of ICTs to enhance innovation and productivity in every industry sector. This is the challenge of the e-economy.

Six years ago, the federal government set a goal for Canada – to become a world leader in e-commerce. We have largely reached this goal and are poised for a new challenge – to be the first country to build an e-economy for the 21st century.

To reach this new national goal, Canadians will need to develop strategies that:

- **transform business models and organizational structures** in the private and public sectors to generate continuous streams of productivity gains and product innovations, through the application and use of ICTs;
- **create a climate of trust** among consumers and businesses that fosters the growth of the e-economy in Canada and internationally and creates global markets for electronic goods and services; and
- **build an intelligent infrastructure** to serve as the backbone of the e-economy – by encouraging investment, strengthening research, enhancing commercialization and ensuring that all Canadians have access to this infrastructure and know how to use it.

Developing and implementing these strategies will require partnership and collaboration among the private, public and academic sectors as well as other agencies and organizations that strive to link these together. It will also require the active involvement of Canadian consumers and citizens.

This fall, leaders from Canada's private, public, academic, and not-for-profit sectors will meet in the national conference *e-Commerce to e-Economy: Strategies for the 21st Century*. This conference will begin the process of developing strategies for promoting national prosperity in the digital world of the twenty-first century.

The purpose of this paper is to provide background information on the rise of the e-economy, to outline the major strategic challenges facing Canada, and to pose the following series of "challenge questions" for discussion at the fall conference, as well as in the broader public debate about the e-economy.

Challenge Questions

Transforming Organizations

1. **What kinds of organizational changes are needed to increase productivity in the public and private sectors?**
   - What kinds of new business models can private sector firms, including SMEs, adopt to improve their productivity and competitiveness?
   - How can large or leading firms champion the adoption of IT and e-business throughout the sector?
   - How can governments cooperate in designing and implementing citizen-centric services on a cross-jurisdictional basis?
   - How can health care and educational services be transformed to improve quality and contain costs?
2. **What adjustments are needed to transform the workplace for the e-economy?**
   - What adjustments are needed in education and skills development systems to prepare Canadians for the work requirements and managerial responsibilities of the e-economy?
   - What adjustments are needed to employee benefit systems and social safety nets to help individuals and communities cope with the effects of rapid technological change, global competition, out-sourcing and the flexible employment practices that are the hallmarks of the e-economy?
   - What adjustments are needed to labour codes and management practices to help employees and their families maintain a good quality of life in an online, real-time, 24/7 world?

Creating an Enabling Environment

3. **What more needs to be done in Canada to build an environment of trust in the e-economy for businesses and citizens?**
   - What additional measures are needed to support privacy, information integrity and network security?
   - What further steps are needed to protect the interests of consumers and businesses and provide means to resolve disputes?
   - How can protection of intellectual property rights be balanced with access to information and knowledge?
   - What additional measures are needed to build trust in the e-economy internationally?
   - What measures are required to deal more effectively with spam, viruses and other threats to Internet use?
   - How can the use of authentication be accelerated?
4. **How can Canada help build an enabling environment internationally?**
   - What new international arrangements are needed to facilitate trade in electronic goods and services using ICT networks?
   - How can Canada help build e-economy capacities in developing countries?

Building an Intelligent Infrastructure

5. **How does Canada foster investment in the deployment and use of intelligent infrastructure in the short- to medium-term?**
   - What frameworks are needed to govern ubiquitous, broadband, IP-based multimedia networks at the national and international levels?
   - How can universal, affordable access to the intelligent infrastructure be ensured?
   - What is government's regulatory and oversight role?
6. **What strategies are needed to stimulate the commercialization of research on intelligent infrastructure, services and applications?**
   - What measures are needed to promote and encourage understanding and use of intelligent infrastructure services and applications by consumers and businesses?
   - What should be the research priorities in transforming business models, organizational structures, and production processes?
   - What is the role of public-private partnerships in stimulating commercialization and research?
   - Does government have a more direct, interventionist role and if so, what is it?

Ensuring Success

7. **What overall strategies are needed to catalyze actions that respond successfully to the opportunities and challenges presented by the e-economy?**
   - How can the different stakeholder groups build on the partnership model that was developed as part of the Canadian Electronic Commerce Strategy?
   - What additional measures are needed to address the broader challenges of the e-economy?
8. **Are there other factors in addition to those that have already been identified that are yet to be understood or fully harnessed that will enable Canada to benefit more fully as we progress towards a mature e-economy?**
9. **What is needed to make the e-economy a national priority?**

I. Introduction

The **e-economy** has emerged as the primary engine of productivity and growth for the global economy. Successful economic strategies will enhance our capacity to adopt and exploit technology, information and knowledge in order to create sustainable competitive advantage.

The e-economy will happen to Canada, whether or not we do anything about it. Our challenge and opportunity is to make it happen for Canada.

Over the past quarter of a century, the increasing use of computers in all aspects of life, combined with the widespread deployment of the Internet, has fundamentally changed society and radically altered the dynamics of economic growth. For every country and community, the management and flow of information – and its translation into knowledge – are dramatically redefining the pace and direction of social progress and economic development. In advanced economies, wealth creation depends more and more on the capacity to use information and knowledge effectively, both in the production of goods and in the increasingly important realm of services and other forms of "intangible" economic activity. Moreover, using knowledge to innovate – in effect, finding smarter ways of doing work or conducting business, often by means of information technology, is the key to improving productivity and to maintaining competitiveness.

An economy dependent upon knowledge must necessarily rely on a strong networked base of advanced information and communications technologies (ICTs), as well as the capacity – the skills, know-how and entrepreneurship – to exploit them for economic and commercial advantage. This reliance on ICTs now extends far beyond the few industries like telecommunications, software and computer services that are traditionally associated with the technology. In fact, the use of ICTs, like electricity, has infiltrated virtually the entire economy. This has created an **e-economy**, in which firms, organizations and governments make effective use of ICTs to spur on product and process innovation across all sectors of the economy.

To promote a dynamic and competitive e-economy, Canada needs to support the conditions that foster innovation and research for the development, application and diffusion of these technologies throughout society. In the long-term, an effective national response to the many challenges of the e-economy will require nothing less than a cultural shift – in organizations and institutions in the private and public sectors, in civil society and in the lives of families and individuals.

Information and communications technologies – which include hardware, software, systems, and the networks that connect them with people – have become integral parts of business processes in every economic sector. "…a new wave of innovation, primarily based on information and communications technologies (ICTs) is surging through the OECD."[1]

ICTs have made it possible to transform business models, organizational structures, the division of labour, and the nature of work. They have emerged as a key source of competitive advantage for firms and countries. By overcoming barriers of time and space and shrinking entry costs, ICTs have helped create a truly global marketplace.

In the global economy, competition can come from anywhere, at any time. Traditional sources of comparative advantage no longer guarantee national prosperity. New strategies are needed for an economy based on ICTs – the e-economy.

In 1998, the federal government set a goal for Canada – to become a world leader in e-commerce. Today, we have largely reached this goal and are poised for a new challenge – to be the first country to build an e-economy for the 21st century.

To build a strong e-economy, we need strategies to:

- transform business models and increase the adoption of Internet Business Solutions (IBS) by all firms, including small- and medium-sized enterprises (SMEs);
- re-invigorate and redefine the delivery of government and public services;

1. *A New Economy? The Changing Role of Innovation and Information Technology in Growth*, Organisation for Economic Co-operation and Development (OECD), 2000.

- build trust and confidence in the e-economy among citizens and businesses;
- create an environment that will foster the e-economy internationally;
- develop an intelligent infrastructure – the backbone of the e-economy;
- ensure that all Canadians have affordable access to this infrastructure and know how to use it;
- strengthen research in the technical, economic, business and social aspects of the e-economy; and
- apply this research, through commercialization and other means, to increase innovation and build competitive advantage.

Acting on these objectives in the short- to medium-term will require collaboration among private, public, academic and fourth-pillar organizations.[2] It will also require the active involvement of Canadians – as consumers and as citizens.

Canada has already started this work through a series of thematic workshops on different aspects of the e-economy. From September 2003 to May 2004, Industry Canada and its partners, the National Research Council Canada, the Canadian e-Business Initiative and CANARIE Inc., held six workshops to discuss the current state, opportunities and challenges for research on e-government/e-democracy, e-business, privacy, security and trust, e-learning, e-health and finally, the intelligent infrastructure and e-society. These workshops provide some background to the national conference where, in September 2004, leaders from Canada's private, public, not-for-profit and academic sectors will meet to discuss *e-Commerce to e-Economy: Strategies for the 21st Century*.

The purpose of this conference is to map out strategies for promoting national prosperity in the digital world of the twenty-first century. The process that led to the development of Canada's 1998 Electronic Commerce Strategy gave leaders from these sectors a similar opportunity to frame a vision and chart a course for our country's future economic growth.

Since then, Canada's private and public sectors have been global leaders in developing and implementing e-commerce strategies. We significantly enhanced our world-class information and communications technology capabilities and have translated these advantages into superior economic performance. We are positioned to benefit from the e-economy, today and tomorrow.

The purpose of this paper is to provide background information on the rise of the e-economy, report on the key findings of the six workshops and to pose a series of challenge questions for discussion at the e-economy conference, as well as in the broader public debate about the e-economy.

2. Fourth-pillar organizations are high value-added coordination mechanisms that connect government, private and academic organizations in ways that enable them to achieve common goals and shared objectives through collaborative effort, more effectively than would be possible under alternative arrangements such as partnerships, strategic alliances or joint ventures.

II. The Rise of the e-Economy

During the latter half of the 1990s, the North American economy grew at a rapid rate. Recent studies demonstrate that productivity gains resulting from the production and use of ICTs were the principal source of economic growth during this period.[3]

These findings confirm that the most effective strategy for increasing Canada's national wealth in the global economy of the 21st century will be to enhance productivity and competitiveness throughout our economy – primarily by developing and applying ICTs.

Building national wealth through ICT-enabled productivity gains will benefit all Canadians. As the federal government recognized in the February 2004 Speech from the Throne, it is vital that Canada's economy continue to grow so that we will have the resources needed to strengthen our social foundations, particularly in areas such as health care and education.

A. From e-commerce to the e-economy

In 1998, the federal government published a strategy that set out a vision for Canada's future in electronic commerce and how it could be achieved. The goal of this strategy was ambitious – to become a world leader in the development and use of electronic commerce by using the Internet in business-to-consumer (B2C) and business-to-business (B2B) transactions.

The Canadian Electronic Commerce Strategy established four priorities:

- **Building trust in the digital economy**, by increasing consumer and business confidence in e-commerce by addressing security, privacy and consumer protection concerns;
- **Clarifying marketplace rules** in order to remove barriers to the use of electronic commerce by updating laws and regulations governing the marketplace, financial issues and taxation and intellectual property protection;
- **Strengthening the information infrastructure**, by ensuring that networks support the growth of electronic commerce and allow interoperability; and
- **Realizing the opportunities**, by maximizing the job and growth potential of e-commerce through skills development, awareness raising and showing government leadership as model users.

This strategy was based on the principle of private and public sector partnerships. It recognized that the private sector has the lead role in developing and using electronic commerce in Canada, that government must provide support through policy and operational responsibilities and that consumers and public interest groups should also be involved.

Six years have passed since the adoption of the Canadian Electronic Commerce Strategy. Now, the partnership principle of this Strategy must be extended to other elements of Canada's emerging e-economy. Specifically, the time has come to look at how productivity, competitiveness and consumer welfare can be increased in all sectors of the e-economy through strategies that maximize the role of ICTs in organizational transformation, as well as in product and process innovation.

B. What is the e-economy?

The e-economy – the use of information and communications technologies for product and process innovation across all sectors of the economy – has emerged as the primary engine of productivity and growth for the global economy. Successful economic strategies will enhance our capacity to adopt and exploit technology, information and knowledge in order to create sustainable competitive advantage.

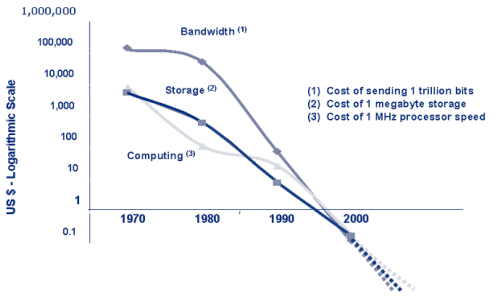
There are five main factors that will shape the maturation of the e-economy:

- **Technology drivers**, including the digitization of all forms of information and communication, expanding capacity, speed and intelligent systems (Figure 1);

3. *Industry Canada Research Monograph: Economic Growth in Canada and the United States in the Information Age*, Edited by Dale Jorgensen, May 2004 (pp. 1–5).

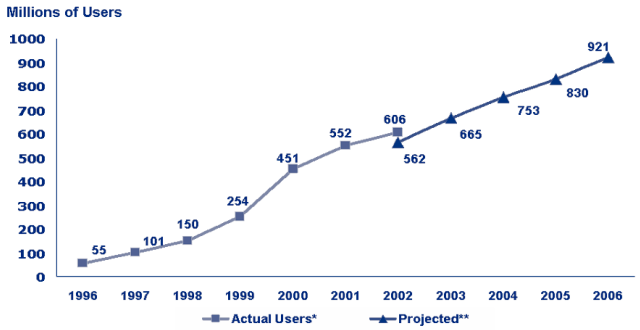
Figure 1: Technology Drivers

Moore's Law: The Cost of Computing Power, Memory and Bandwidth Continues to Decrease



Source: Federal Reserve Bank of Dallas, *1999 Annual Report: The New Paradigm.*

Figure 2: Internet Usage Races Ahead



Sources: * http://www.nua.com/surveys
** Computer Economics, June 2002.

- **Increased network connectivity** between buyers and sellers, particularly via the Internet (Figure 2);
- **Increased competition** in the global marketplace;
- **Organizational transformation** in all sectors of the economy;
- **Social adaptation** to the e-economy.

The e-economy encompasses more than economic and technical change. The ICT-powered revolution of the 21st century will transform all aspects of economic, social, cultural and political life on a global basis. Its impact will be at least as profound as the revolutions triggered by the application of steam power, electrical power and fossil fuel power in the 19th and 20th centuries.

C. Productivity: the essential building block

The e-economy is based on the hypothesis that productivity will increase throughout the economy if ICTs are applied in ways that fundamentally transform organizations and support product and process innovation. In this vision, ICTs can also be applied to help build an e-society by helping, for example, to transform government and improve the efficiency and effectiveness of education, health care and other public services, as well as by fostering new forms of communication and collaboration among members of civil society.

For a number of years, the validity of this hypothesis was in doubt due to the lack of evidence that there was any relationship between investment in ICTs and productivity growth and the lack of evidence that it was possible to increase productivity in the service sector through investment in ICTs or by any other means.

There are a number of different sources of productivity growth – the quantity and quality of labour, the quantity and quality of capital, and the way in which labour and capital are organized and applied in production processes.

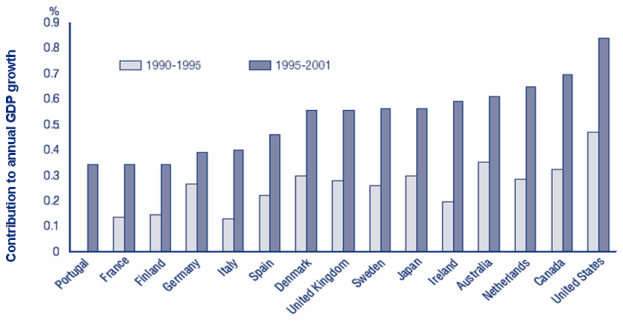
As Figure 3 illustrates, research has demonstrated that over the past five years, investments in ICTs have been the most important contributor to increased productivity in all economic sectors and to overall economic growth.

Building the e-economy is not only a matter of investing in ICTs. Investments are also required in software and skills development and business process transformation. **The effects of ICT-enabled changes in the organization of labour and capital inputs to production processes are important contributors to productivity improvements in the ICT sector and in the economy as a whole.**

Organisation for Economic Co-operation and Development (OECD) studies have shown that for every $1 invested in ICTs, matching investments of $9 are needed in these other areas.[4] Over time, this ratio will most likely decline as social and organizational adaptation to ICTs take place and as younger people who have grown up with the technology enter the workforce.

4. *ICT and Economic Growth: Evidence from OECD Countries, Industries and Firms*, OECD, 2003 (p. 90).

Figure 3: Contribution of ICT Investment to GDP Growth (selected countries)



► Countries for which data are available, growth accounting estimates show that ICT investment typically accounted for between 0.3 and 0.8 percentage points of growth in average annual GDP. The U.S. and Canada received the largest boost in GDP growth from ICT investment.

Source: OECD, *ICT and Economic Growth*, August 2003.

D. Canada's productivity challenge

In spite of the recent general economic slowdown – and the dip in ICT investment over the past two to three years – the productivity of Canada's economy has continued to increase. Canada experienced a marked improvement in labour productivity growth over the 1990s[5] and recently a doubling of its average annual growth in multifactor productivity.[6]

This continuing growth in overall productivity results from several factors, including:

- **Organizational adaptation** – After two decades of experience, enterprises have learned how to organize business processes to make more effective use of ICTs, just as in previous economic revolutions it took several decades to learn how to make productive use of steam engines and electricity.
- **The network effect** – The Internet has made it practical for businesses to link suppliers, production units, customers, and ICT resources through electronic networks, thereby increasing efficiency, supporting innovation and adding value through personalized products and services. This is an instance of Metcalfe's Law, which states that the value of a network increases geometrically according to the number of users it connects.[7]

In seeking to grow our productivity, we face a special challenge. Even though Canada has consistently ranked among the G7 leaders in terms of economic growth, we have generally lagged behind the United States. Differences in productivity between the two economies have been identified as the main reason for this gap. Narrowing this gap is a strategic priority for Canada.

5. *The Daily*, Statistics Canada, July 14, 2004.
6. *The Economic Impact of ICT: Measurement, Evidence and Implications*, OECD, 2004.
7. The mathematical expression of Metcalfe's Law is $V = n\ (n-1)$ where V equals the value of the network and n equals the number of users and/or terminal devices connected to the network.

III. Transforming Organizations

The previous chapter presented a macro view of the emergence of the e-economy by outlining the role ICT networks are beginning to play in raising productivity, generating growth and establishing competitive advantage across the Canadian economy as a whole.

In this chapter, we will examine the emergence of the e-economy from a different perspective, at the micro level, by looking at how private firms, governments and public service providers redesign their business and service models, using ICT networks to transform production processes and organizational structures.

In seeking transformation, the goals of the private and public sectors are different. Private firms seek competitive advantage. Governments seek to improve the efficiency and effectiveness of public services. In both cases though, they are beginning to adopt network-based models – the new organizational paradigm for the e-economy.

A. Transforming business models

The e-economy is founded on the adoption of network-based e-business models and practices by firms in all sectors. As a recent study noted,

The key factor driving the implementation of e-business throughout the economy is the competitive advantage such technologies and applications offer . . . A growing number of businesses are using the Internet and employing e-business solutions (sometimes referred to as Internet Business Solutions or IBS) to improve and modify their business processes, reduce operational costs, expand markets, increase revenues, enhance collaborative business partnerships, and strengthen customer and supplier relationships. Individual firms are increasingly employing electronic applications to ensure competitiveness in the marketplace and to survive against competitors who are adopting these strategies.[8]

The Internet and other advanced communication networks make it possible for buyers and sellers to interact on a global basis. They also make it possible for firms to organize worldwide value chains, to control production, distribution and service processes in real time and to source human capital from countries or regions that offer a competitive advantage.

1. The current state of e-business in Canada

Canadian businesses have good Internet and broadband connectivity compared to other countries. In this respect, they are well positioned to adopt e-business models and practices. While basic connectivity has been achieved, however, much more remains to be done to adopt more complex applications (see Figure 4).

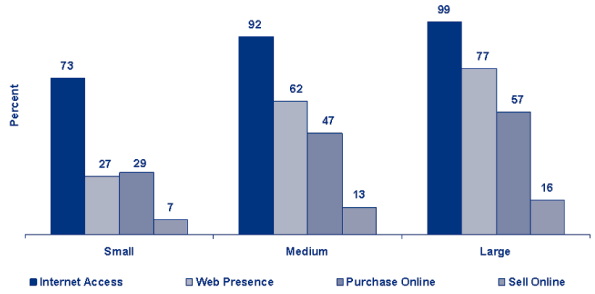
The adoption of Internet Business Solutions allows firms to reduce transaction costs throughout their value chains by implementing network-based just-in-time and real-time production, distribution, sales and service business models. IBS can be to the e-economy what the assembly line and mass production were to the industrial economy – a transformation of the basic business model.

2. Strategic issues in business transformation

In the global marketplace, any productivity or competitiveness gap between Canadian businesses and their international competitors is a critical issue that should be analyzed on a sector-by-sector basis, so that strategies can be formulated to build on our traditional sources of comparative advantage. In local markets, the low rate of IBS adoption by SMEs leaves many of them vulnerable to competition from larger-scale international rivals in sectors where there is unrestricted international market access and where goods and services can easily be sold on a transborder basis.

8. Neogi, P.K., A. Leduc, and C. Peters, "Internet Connectivity and e-Business Adoption by Canadian Firms: An Empirical Analysis". Proceedings of the 6th International Conference on Electronic Commerce Research, Dallas, 2003.

Figure 4: e-Business Adoption Rates in Canada, 2002 by Size of Firm



Source: Survey of Electronic Commerce and Technology 2002, Statistics Canada, April 2003.

SMEs are the lifeblood of the Canadian economy and it is vital to our future prosperity that we maintain the competitiveness of our SMEs. They account for over 99 percent of Canadian companies and contribute significantly to job creation and economic growth. Of the 2.2 million businesses in Canada in June 2003, just over one million had employees on their payroll; of these, only 2773 had more than 500 employees.[9]

SME adoption of advanced e-business models and practices lags seriously behind adoption by larger firms. While many SMEs are using basic applications such as e-mail and non-transactional Web sites, they lag in the use of advanced e-business applications such as e-procurement, supply chain management, accounting and finance management and human resource management. This is despite the substantial cost saving and profit-enhancing potential of these applications.

Research by the Canadian e-Business Initiative (CeBI) through its *Net Impact* work identifies the reasons that Canadian firms, particularly SMEs, have been slow to adopt advanced e-business models and practices. One possibility is that most applications are designed for large-scale enterprises and are not adapted to the needs of smaller firms. Another is that many businesses lack the skills and resources needed to identify and apply e-business solutions.[10]

As part of a national strategy for the e-economy, it will be important to consider whether we should aim to be a producer of advanced e-business solutions, or whether we should focus instead on helping firms become intelligent consumers of products that are developed elsewhere. The answer to this question has important implications for research, education, training and skills development.

9. *Business Register*, Statistics Canada, June 2003 and *Key Small Business Statistics*, Industry Canada, May 2003.
10. *Net Impact Study Canada: The SME Experience*, Canadian e-Business Initiative, 2002.

Box 1: Conclusions of the e-Business Workshop, Toronto, October 30, 2003

1. A clear and common theme was that "e-Business is Business", meaning that all current and future business research should include e-business as a fundamental activity; it is not a luxury.
2. E-business research needs to be multi-disciplinary and larger-scaled to have impact. This is particularly problematic within universities where "silo" research is more accepted and rewarded.
3. Building better communication and collaboration among researchers is key to moving forward. There is a clear need for a mentoring organization – perhaps a fourth pillar – that can foster collaborative and multi-disciplinary work.
4. SMEs face special challenges adapting e-business, but e-business is critical to Canada's future competitiveness. Unfortunately, research by and for small business is hampered by SMEs' desire to see immediate payback and results. This limits SME participation in research as well as research projects directed at SMEs.
5. Current research tends to be pan-sectoral; a stronger focus on specific industry sectors is needed as the research questions are likely to differ.

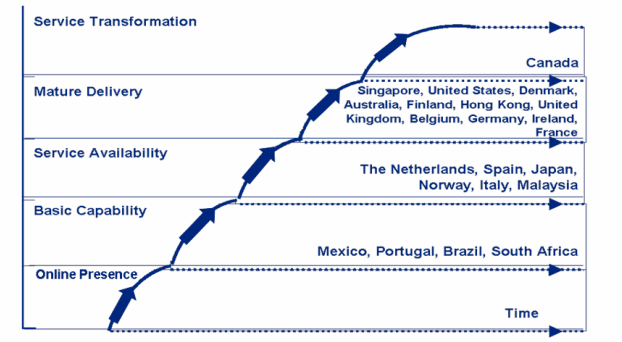
3. Implications of e-business for the workplace

The adoption of IBS and e-business models also raises serious issues related to the transformation of the workplace. A flexible, highly adaptable, real-time business model requires a flexible, adaptable workforce. New knowledge, skills and abilities are required at all levels of the firm, from the executive suite to the production floor.

Low cost and efficient communications makes outsourcing a key feature of the e-business model. While Canada is a recipient of "insourced" work from other countries, it is also the originator of work sent elsewhere. There are social, political and economic implications arising from this activity.

Figure 5: Canada: A World Leader in e-Government

Countries progress toward e-government maturity through a series of plateaus



Source: *e-Government Leadership: Engaging in the Customer*, Accenture, 2003.

Workers in the host country are competing with workers half a world away, in countries that usually have completely different wage structures, working conditions and environmental protections. It is important that outsourcing takes place in a way that is least disruptive both to host and recipient countries. A gathering of the facts and implications of this activity are necessary before any policy is put in place. International organizations, such as the OECD have begun work on this issue.

The transformation of the workplace to fit the e-business model also raises questions about social and human impacts. On the one hand, the flexibility made possible by mobile work offers previously unavailable opportunities for participation in the workforce to people with family responsibilities, as well as to those with disabilities. On the other hand, because ICTs make it possible for people to be available any time, anywhere, there is concern that e-business practices require people to work longer hours and are consequently interfering with family, leisure and voluntary activities and leading to rising levels of stress.

B. Transforming government

As part of Canada's Electronic Commerce Strategy, the federal government undertook to become a model user of information technology and the Internet. As Figure 5 illustrates, it has been successful in meeting this objective: according to the international management consulting firm Accenture, Canada has ranked first in the world in the implementation of e-government for the past four years.

The challenges facing individual government departments and agencies in using electronic networks to transform their operations are in some ways similar to those facing private enterprises. Transforming traditional governmental "silos" into integrated, online service delivery networks, however, involves several additional challenges. These include:

> "... the federal government must commit to a citizen-centric approach and transform its operations – as a matter of the highest priority – into an integrated, multi-channel, multi-service delivery network operating across programs, departments and jurisdictions.
>
> *Government On-Line Advisory Panel, December 2003*

- **engaging citizens** more fully in policy formulation program planning, service delivery, and performance evaluation;
- **transforming government services** with the active involvement of all stakeholders; and
- **reforming the inner workings of government** so that cross-cutting issues are dealt with more efficiently.

A successful response to these challenges requires the adoption of a client-driven approach to transforming government services that cuts across the boundaries that divide different departments and agencies as well as different levels of government.

C. Transforming public services

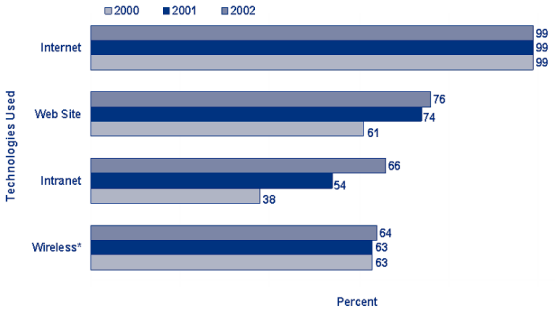
In addition to the challenges Canadian governments face in transforming their overall operations, they face special and particularly acute challenges in transforming the delivery of two key public services – education and health care – which together account for some 15 percent of the gross domestic product (GDP) and the lion's share of provincial government expenditures. In addition, these sectors face significant shortages of qualified professional personnel, such as nurses, teachers and professors.

In both of these areas, Canada faces a rising demand for services. The ageing population increases demand for health care services, while the requirements of the e-economy increase demands for education, skill-development and lifelong learning services.

Box 2: Conclusions of the e-Government Workshop, Fredericton, October 22, 2003

1. While e-government in Canada is at a crossroads methodologically, practically and philosophically, the focus should be on the notion of e-governance, rather than rigid constructs and technological infrastructures that place little emphasis on the socio-economic implications of a system of e-government on the citizens of a democratic state.
2. E-governance holds the potential to revolutionize the way decision-making is carried out by breaking down the silos or stovepipes i.e. vertical integration models of government that have proven to isolate and polarize sectors of society.
3. To be democratic, e-government structures must be voluntary, and while it may so happen that many individuals respond positively to the premises of e-governance, those who wish to avoid it or, implicitly, those who cannot afford to take part in it, must be given the opportunity to access government services in a more traditional manner.

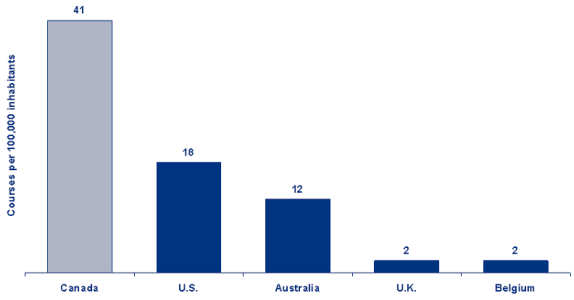
Figure 6: ICT Use by Public Health Care Enterprises (percent)



*A wireless device used to access the Internet (eg. mobile phones, wireless PDAs and wireless laptops).

Source: Survey of Electronic Commerce and Technology, Statistics Canada, April 2003.

Figure 7: Canada a leader in e-Learning



Source: TeleCampus of TeleEducation NB. http://telecampus.edu, March 2002.

There is a consensus that ICTs can be applied to improve service and contain costs in our health care, education and skill development systems as well as deliver these services quickly and effectively to rural and remote regions. In 2001, health care expenditures represented approximately 9.6 percent of Canada's GDP. For 2003, they were estimated at 10 percent of GDP.[11] This means that, for example, if health care expenditures could be reduced by 1 percent through the intelligent application of ICTs, annual costs would fall by more than $1 billion. As well, investments in learning have a multiplier effect as they can contribute to the effectiveness of all other sectors.

As Figures 6 and 7 illustrate, ICTs and Internet-based services are used to assist the delivery of health care and education services. These applications, however, have just begun to scratch the surface of what is possible, particularly through the use of broadband networks. Much more needs to be done, both in urban areas and in rural and northern communities, as we move towards an e-economy and e-society.

In the area of health care, both the Kirby and Romanow Commissions recommended that the federal government should invest in developing tele-health and tele-medicine services. In addition, the federal government has devoted considerable resources to the development of health care information systems designed to improve patient care and health care delivery in all areas of the country.

The role of ICTs and the Internet in education, training and skills development has also been the subject of considerable discussion and debate over the past decade.

11. Canadian Institute for Health Information, *National Health Expenditure Trends, 1975–2003*.

Box 3: Conclusions of the e-Learning Workshop, Vancouver, January 14, 2004

1. E-learning is already a significant component of learning and will continue to grow. The question is how Canada will make most effective use of e-learning as it builds an e-economy.
2. There is some urgency in the development of a pan-Canadian e-learning strategy. Other countries are moving ahead of Canada and we need to respond in spite of our jurisdictional challenges.
3. Effective e-learning emphasizes learning, especially pedagogical aspects and access to high-quality education and training opportunities.
4. There are important gaps in quantitative e-learning research that should be addressed, preferably through long-term research funding and possibly through a new administrative structure.
5. Policy makers need to think in much longer time frames – from 5 years to 25 years.

Box 4: Conclusions of the e-Health Workshop, Fredericton, April 29, 2004

1. Governance in e-health should be national in scope, apolitical and citizen-centric, with the citizen at the centre of information control and access.
2. The development of the Personal Health Record (PHR), including the research phase, requires the engagement, at all levels of those involved – citizens, providers, governments and the private sector. The citizen will have to be assured that the process is trustworthy and that transference of all or part of the PHR will require consent.
3. The adoption of the PHR by individuals will establish a baseline for measuring health and wellness throughout their lives; its development must be of benefit to all and must improve the health of Canadian citizens.

Canada was the first country in the world to connect all of its public schools and libraries to the Internet. A logical next step might be to upgrade these connections to full broadband capability – and to develop educational services and applications that take full advantage of broadband communications to give all children equal opportunities to learn.

Outside the formal education system, considerable work has been done to apply ICTs in the training, skills development and lifelong learning programs sponsored by the public and private sectors.

Beyond incremental improvements in service delivery through the use of ICTs, the real challenge facing providers of health care, education and other public services is re-thinking their service models in light of the possibilities that are opened up by ICTs and the Internet, and re-designing their delivery systems and organizational structures to fit these new service models.

D. Challenge questions

What strategies are needed to transform organizations?

What kinds of organizational changes are needed to increase productivity in the public and private sectors?

- What kinds of new business models can private sector firms, including SMEs, adopt to improve their productivity and competitiveness?
- How can large or leading firms champion the adoption of IT and e-business throughout a sector?
- How can governments cooperate in designing and implementing citizen-centric services on a cross-jurisdictional basis?
- How can health care and educational services be transformed to improve quality and contain costs?

What adjustments are needed to transform the workplace for the e-economy?

- What adjustments are needed in education and skills development systems to prepare Canadians for the work requirements and managerial responsibilities of the e-economy?
- What adjustments are needed to employee benefit systems and social safety nets to help individuals and communities cope with the effects of rapid technological change, global competition, outsourcing and the flexible employment practices that are the hallmarks of the e-economy?
- What adjustments are needed to labour codes and management practices to help employees and their families maintain a good quality of life in an online, real-time, 24/7 world?

IV. Creating an Enabling Environment

The exchanges that take place between buyers and sellers of goods and services are the lifeblood of an economy, just as the exchanges that take place between citizens, their elected representatives and providers of public services are the lifeblood of a polity.

For an economy or polity to work well, the parties to these different kinds of exchanges must trust each other and have confidence that the institutional framework within which they are operating is stable and that it will yield consistent, reliable and predictable results. Given this context, made-in-Canada approaches should work in concert with general international cooperative initiatives.

In this respect, the e-economy is no different from the economy that preceded it. The task of creating trust and establishing confidence, however, is complicated by several factors:

- **Global nature of the e-economy**. It is impossible to build an enabling environment solely within the borders of a single country. Trading arrangements in the e-economy, both domestic and international, need to be at least as transparent and trustworthy as in the non-online world.
- **Participation rates of trading partners**. To facilitate the full development of the e-economy, this environment must include all countries that have electronic trading relationships. Ideally, it should extend to all the countries in the world.
- **Verification of trading partners and redress of problems**. Dealings are facilitated by electronic networks linking parties who may not know each other and may never meet, who may live in countries that have different legal regimes and business norms, and who may have no independent means of verifying what is presented on the Internet, or of seeking redress if problems arise.
- **Network vulnerability**. The networks linking these parties – particularly the public Internet – are vulnerable to all kinds of threats, ranging from spam and viruses, to theft and fraud, to attacks intended to disrupt service and undermine the security, integrity and reliability of networks.
- **Intangible nature of products and transactions**. Many of the goods and services exchanged are intangible, payments are generally made in intangible forms, and the identities of parties to transactions are usually intangible. In the e-economy, at the moment when commitments are made and promises given, there is rarely anything tangible to hold.

In all these ways, the e-economy raises new challenges in building trust and confidence, even though similar issues have always existed.

A. Issues for Canadian consumers, businesses, and citizens

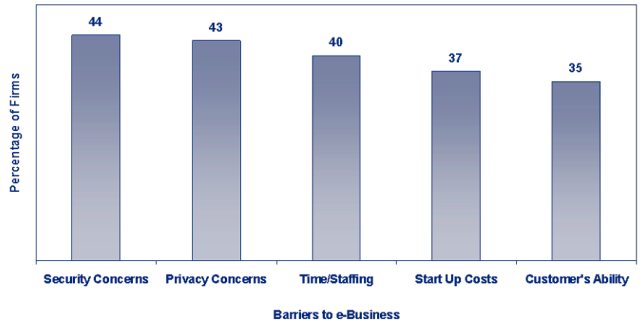
If the e-business models and practices described in the previous chapter are akin to an iceberg afloat in the e-economy sea, e-commerce is its tip – the part that is visible to ordinary Canadians and to most SMEs in their day-to-day activities, either as participants in Internet-based buying and selling, or as users of automated payment systems in more traditional kinds of transactions.

Canadian consumers and businesses are well positioned to participate in e-commerce activities, and in similar kinds of transactions with governments and public service providers. Canada's rates of Internet penetration, broadband access, and Internet use are among the highest in the world. However, surveys consistently show that although a high percentage of Canadians use the Internet to window shop for information about products and services, a much smaller percentage is willing to make purchases online.

As shown in Figure 8, concern about privacy and the security of personal information are the main obstacles to using networks to make financial transactions, and are among the main reasons Canadian firms have been slow to implement IBS. Similar concerns about privacy and security are an important obstacle to implementing government services online, particularly for transactions that involve the exchange of personal information and financial payments.[12]

12. *E-Business in Canada: New Momentum*, EKOS, 2004.

Figure 8: Impediments to e-Commerce



Source: EKOS e-Business in Canada: New Momentum, 2004.

To overcome these obstacles, it is necessary to develop strategies that address these concerns and create an environment of trust in which consumers, businesses and citizens can have confidence in the honesty and integrity of the e-economy.

B. Strengthening confidence and trust in the e-marketplace

One of the key objectives of Canada's Electronic Commerce Strategy was to create an environment of trust in which individuals and businesses would have as much confidence in the workings of the e-economy as they have in the workings of the traditional industrial economy.

Creating this environment is a complex challenge. Among other things, it involves measures to:

- authenticate and authorize parties to transactions;
- assist individuals in managing their identities online;
- protect the privacy of personal information and the confidentiality of corporate information communicated or stored electronically;
- ensure that networks operate reliably;
- protect intellectual property rights in electronic goods and services, including developing the appropriate polices, practices and tools for digital rights management;
- establish a legal framework for contracts to function electronically;
- develop dispute resolution mechanisms that function effectively in an e-business environment; and
- protect individuals and businesses against annoying or abusive practices, such as unsolicited bulk e-mail (spam).

SPAM: The size and significance of the problem

Spam has become the Internet issue *du jour*. It is a significant worldwide problem that clogs networks and, due to its implication in virus distribution, identity theft facilitation and other criminal activities, significantly erodes trust in electronic commerce.

According to Brightmail, a leading Internet security firm, in June 2004, spam accounted for 65 percent of Internet e-mail. Canada is heavily implicated in spamming, rated within the top ten countries from which spam originates.

Brightmail Logistics and Operations Centre, July 2004

To a large extent, the creation of an environment of trust involves the application of existing laws, regulations and commercial norms to the electronic environment, through the amendment or extension of existing instruments or through judicial interpretation. In some areas however, new instruments may be required.

Creating an environment of trust is not only the responsibility of policy-makers, regulators and the courts. As in any business environment, the private sector has a major role to play in its own right or in cooperation with government in developing business norms, standards and codes of conduct, as well as in identifying and encouraging the adoption of best practices.

Groups representing the interests of consumers and the public also play a role in creating an environment of trust in the e-economy. Citizens, as consumers, need to be aware of their rights under the law, the precautions they should take before providing personal information online, the tools available to them to protect their privacy, the standards of conduct they should expect from businesses and governments and the remedies that are available to them to redress grievances.

Spam, or unsolicited commercial e-mail, has grown in volume to now place significant pressure on the

Internet and its users. The Radicati Group and MessageLabs estimate that worldwide, spam cost businesses US$20.5 billion in 2003. The biggest potential cost of spam, however, is the loss of public confidence in Internet communications. Some businesses are considering abandoning the Internet in favour of reliable and secure private and closed user group networks, for both operational and internal communications. Politicians and corporate executives have publicly expressed concern that spam mail, if allowed to continue along its current growth path, could drive businesses and consumers away from using the Internet.

Rather than traditional regulatory approaches, issues like spam require concerted action by governments and the private sector aimed at establishing practical and pragmatic rules of the game. So serious is the threat of spam that cooperative, multi-jurisdictional enforcement of civil and criminal sanctions will most likely be required to stem the tide.

In sum, the task of building an environment of trust in the e-economy is complex. It involves actions to create an enabling legal and regulatory environment, to develop voluntary codes of practice, to educate businesses, consumers and public service providers and to create tools that are easy to use. This can only be done if all stakeholders work in partnership.

Where do we currently stand in building this environment of trust?

1. Government-industry partnership initiatives

The federal government is making significant progress in dealing with many of the issues set out in the 1998 Electronic Commerce Strategy, as well as second generation issues, through the following initiatives.

- ***Personal Information Protection and Electronic Documents Act (PIPEDA)***, enacted April 2000, came into full effect on January 1, 2004. This Act sets out the ground rules for how private sector organizations can collect, use or disclose information in the course of their commercial activities. It seeks to balance an individual's right to privacy with the legitimate business needs of organizations. The Act is the product of a partnership between government and the private sector. It is based on the Canadian Standards Association's *Model Code for the Protection of Personal Information*, which is incorporated into the legislation.
- ***Canadian Code of Practice for Consumer Protection in Electronic Commerce*** establishes good business practice benchmarks for merchants conducting commercial activities with consumers online. Like *PIPEDA*, the Code is the product of partnership between different stakeholder groups. It was developed by a working group composed of representatives of different industry sectors and tested through pilot projects before being finalized by the e-Commerce Leaders Code Review Committee and endorsed by federal, provincial and territorial ministers responsible for consumer affairs in January 2004.
- ***Principles for Electronic Authentication*** (2004) establish benchmarks to ensure that authentication products and services embody sound business and market practices, meet the needs of Canadians and are accepted internationally. These marketplace principles were developed by a working group with membership drawn from a wide range of business interests, professional associations, end users, academia and governments. The *Principles* extend and complement the existing governance structure for authentication services in Canada.
- **Ministerial Task Force on Spam** came about as the result of a partnership and consensus with key industry stakeholders and consumer organizations to identify ways of reducing spam or unsolicited commercial e-mail. It will oversee the implementation of a six-point Action Plan, calling for specific initiatives by government and the private sector, including the use of existing laws and regulatory measures, the review of regulatory gaps in current laws, the improvement of current industry practices, the use of technology to validate legitimate commercial communications, the enhancement of consumer education and awareness and the promotion of an international framework to fight spam.[13]

2. Business-led initiatives

The business community has undertaken a number of activities to assist SMEs in dealing with privacy concerns, including,

- The Canadian e-Business Initiative's (CeBI's) **Online E-Security and Privacy Guide** for SMEs, which includes reviews of how other countries manage their approach to e-business security and privacy issues.

13. News Release and Backgrounder, May 11, 2004. Available at **www.e-com.ic.gc.ca**

Box 5: Conclusions of the Privacy, Security and Trust Workshop, Montréal, October 27, 2004

1. The ability to deal with the issues surrounding privacy, security and trust (PST) is conditional on creating opportunities for education and strategies to keep this expertise and this talent in Canada.
2. Education of the general public is necessary if Canadians are to make informed decisions with respect to privacy and trust issues. Currently, policies, procedures and legislation are not easily accessible or well understood by all Canadians.
3. To implement a truly effective PST model, the foundation for partnerships and collaborations must be multi-disciplinary and include academia, governments and industry.

- The Canadian Bankers' Association and the Canadian Chamber of Commerce's **Minding your e-Business** seminars, which were conducted across the country; and
- The Canadian Institute of Chartered Accountants' (CICA's) e-business toolkit, **Winning with e-business**, for use by small businesses, organizations and chartered accountants.

C. Creating an enabling environment internationally

In the past five years, substantial progress has been made in building an environment that will support the development of the e-economy within Canada. This, however, is only the beginning.

In the e-economy, electronic goods and services can be produced and offered for sale anywhere in the world as easily as they can be produced and offered for sale in local markets, providing that a number of conditions are met:

- **International agreements** must be in place to facilitate trade in electronic goods and services between countries.
- **Consumers and businesses must have confidence** that their interests will be protected when buying and selling electronic goods and services in other countries.
- **The network facilities and human capital** required both to operate and to govern international markets for electronic goods and services must be present at both ends of trading relationships.

Building an international environment that will enable the growth of the e-economy in all countries, whatever their current level of development, poses significant challenges on each of these dimensions.

1. Facilitating trade in the e-economy

Traditionally, international trade agreements were limited to trade in physical goods and sought to lower or remove tariffs and other barriers to the movement of these goods across borders. Today, agreements that reduce or eliminate obstacles to the movement of intangible goods and services that are traded electronically over ICT networks, as well as obstacles to the movement of people who produce, distribute or service these products are just as important.

In the past two decades, considerable progress has been made in removing barriers to trade in services at both the regional and international levels. The North American Free Trade Agreement and the process of constructing the European Union pioneered the extension of traditional trade principles and disciplines to trade in services and the movement of people. These achievements helped lay the foundations for the World Trade Organization (WTO) agreements on Trade in Services and Trade-Related Aspects of Intellectual Property Rights, which begin to address issues that facilitate the growth of the global e-economy.

In addition to these formal agreements, the WTO launched a comprehensive work program to examine all trade-related issues related to global e-commerce, including those that relate to trade in goods, services and intellectual property, with particular emphasis on the needs and interests of developing countries. Pending the results of this work, WTO members have agreed to encourage the growth of e-commerce by not imposing customs duties on electronic transmissions.

Other international fora, such as Asia-Pacific Economic Co-operation (APEC) and the United Nations, facilitate international trade within an

electronic environment. The Electronic Commerce Working Group of the United Nations Commission on International Trade Law (UNCITRAL) is working on a draft convention on the use of data messages in contracts across jurisdictions. This work on electronic contracting follows UNCITRAL's 1996 Model Law on Electronic Commerce and the 2001 Model Law on Electronic Signatures.

It is clear from all the international work done to date that balancing the interests of both developed and developing countries is an extremely complex challenge.

This challenge is complicated by the fact that in the global e-economy, the boundaries between economic and social activities blur, as do the boundaries between issues that are purely national and those across all nations. This complexity is demonstrated by ongoing debates about the relationship between international trade agreements, universal human rights and national policies in areas such as culture, education and health care services and environmental and labour standards.

2. Increasing confidence and trust internationally

The international arrangements that permit and encourage cross-border trade in electronic products and services and other forms of global e-commerce must also help to ensure high levels of marketplace trust.

For consumers to provide personal information, enter into agreements, or make payments for the purchase of products across borders, they must be confident that they know the identity and business reputation of the party with whom they are dealing, that their privacy will be protected, that any personal and financial information they provide will be secure and that they have appropriate means of redress against fraud, theft and unfair business practices.

Businesses share many of the same concerns as consumers. They want to know that the confidentiality of corporate information will be protected in other jurisdictions, that intellectual property rights will be respected and enforced, that they have effective means of resolving disputes with suppliers and customers in other countries, and that networks are reliable and secure. Above all, they want simplicity and consistency between the laws and regulations of different countries.

Establishing an international environment of trust for consumers and businesses is not an easy task. Legal frameworks often differ between countries – it is not always clear which jurisdiction has responsibility for an electronic transaction that involves parties in different countries and enforcement can be a problem given the intangible nature of e-economy assets and the ease with which they can be moved within cyberspace or from one country to another.

During the past few years, the OECD has begun to systematically address the issues on the trust agenda for the e-economy. The OECD updated its guidelines for protecting privacy and ensuring the security and confidentiality of information that flows across the borders of its member states. It has also developed new guidelines related to consumer protection and network security, and is examining issues of authentication and spam. Canada plays a leading role in these efforts, just as it did in the formulation of the OECD 1998 e-Commerce Strategy.

Like Canada, individual countries have enacted legislation and implemented measures to create trust in the e-economy. These international efforts to create a global environment of trust, however, are often patchwork, but confidence and trust issues are starting to be addressed in various global fora, such as the World Summit on the Information Society (WSIS), with all interested stakeholders, including governments, the private sector, non-governmental organizations and other international organizations at the table.

3. Building capacity in developing countries

As the amount of economic activity that takes place on networks rises and as the e-economy spreads to developing countries, it is becoming critical to develop international frameworks for governing the e-economy that harmonize different national approaches and provide a basis for cooperative enforcement across jurisdictions.

Building the capacity of developing countries to participate in the construction of this global framework will be a major challenge. As experience in other areas shows (e.g. trade in services), innovation in global governance arrangements cannot be fully successful unless developing countries have the technical, legal and institutional capacity to implement international agreements within their national jurisdictions.

D. Challenge questions:

What strategies are needed to create an enabling environment?

What more needs to be done in Canada to build an environment of trust in the e-economy for businesses and consumers?

- What additional measures are needed to support privacy, information integrity and network security?
- What further steps are needed to protect the interests of consumers and businesses and provide means to resolve disputes?
- How can protection of intellectual property rights be balanced with access to information and knowledge?
- What additional measures are needed to build trust in the e-economy internationally?
- What measures are required to deal more effectively with spam, viruses and other threats to Internet use?
- How can the use of authentication in the marketplace be accelerated?

How can Canada help build an enabling environment internationally?

- What international arrangements are needed to facilitate trade in electronic goods and services using ICT networks?
- How can Canada help build e-economy capacities in developing countries?

V. Building an Intelligent Infrastructure

A. An intelligent infrastructure

The latter half of the 20th century witnessed the development of an entirely new technology based on semiconductors, integrated circuits, microprocessors and ultimately a wide range of information technology devices that embedded them. The last quarter of the century saw a parallel development in the world of networks, based on emerging telecommunications technologies, such as fibre-optics, and the eventual dominance of the Internet and of communications using the Internet Protocol (IP). Over the years, both sets of developments have had such a profound effect on the underlying service sectors, especially the computer industry and telecommunications carriers, and on how businesses in general operate, on what consumers need and are willing to pay for, and on how society's institutions operate and relate to one another, that it is commonplace to refer to what happened during that fifty-year period, without hyperbole, as a "revolution" – the ICT revolution.

The notion of "revolution" is apt because these technological developments bring about transformative changes. At the same time, while social revolutions can take place overnight, after fifty years the ICT one certainly is not over. The basic technologies underlying all of the products and services of the ICT sector continue to double in power or capacity per dollar every 6 to 18 months, and the second- and third-order effects of these technological changes on the evolution of new products and services, as well as on the development of broader changes in the marketplace and in society, are still unfolding.

Against the backdrop of this rapidly changing landscape, several trends and themes can be identified:

- The network as a transformative force in this revolution came somewhat later than did IT itself, but in the last ten years, with the emergence of the Internet, the World Wide Web, and e-business and other network-enabled applications, the fundamental role of the network in future applications of IT has been assured.
- The role of the network has rapidly evolved from being simply a means of enabling communication between people, whether synchronous or asynchronous, whether tethered, nomadic or mobile, whether voice, text or multimedia, to also being a means to access information and multimedia material, as well as an effective and efficient means to conduct transactions and access services, especially knowledge services.
- Attracted by opportunities and driven by competitive pressures, the adaptation of current service industries, such as finance, travel and learning, and the creation of entirely new businesses, such as off-shore tax processing, are feeding the emergence of a knowledge-service sector, focused on both the business and consumer marketplaces, which will be an increasingly important sector of the economy as the 21st century unfolds.
- By their very nature, the implementation of inter-organizational transactional applications using the network and the employment of external knowledge services alter the way in which businesses operate, whether in the private or public sectors, since these activities are fundamental to most business processes.
- Across the spectrum of application sectors, addressing the opportunities for business process improvement is spurring on innovation and productivity gains.

These trends underscore the observation that, because of the growing dependence on the network, the ICT revolution is entering a new phase. This new phase has three important characteristics that make it quite unlike the past.

First, in this new phase, the historically separate infrastructures of the IT environment – conceived as distinct islands of hardware and software controlled by individual companies, service organizations or individuals – and the network – conceived as simply the technological means by which common carriers link individuals to each other or to the IT environments – are beginning to merge. To provide services in this new environment, IT infrastructures must be

interoperable. To support the new demands, networks must be responsive to the requirements of the applications being linked together. The entire environment is, from a service perspective, a new infrastructure – an intelligent infrastructure – and, as with all infrastructures, new standards and protocols are required to ensure that it functions properly.

Second, businesses and other organizations are recognizing a new need to coordinate their business processes across organizational boundaries in order to reap the productivity gains of the new technologies. In some instances, these collaborations are being facilitated by third party organizations such as industry associations, and in some instances they are explicitly focused on the development of shared infrastructure to support increasingly interdependent business processes.

Third, the power and functionality of intelligent networks has created an insatiable demand for greater capacity and bandwidth. The increasing popularity of bandwidth-intensive applications, like videoconferencing and tele-medicine, continues to drive the requirement for both higher speed backbone networks for the Internet as well as consumer and business access to broadband connectivity "downstream" (see Figure 9).

Box 6: Conclusions of the e-Society and Intelligent Infrastructure Workshop, Winnipeg, May 4, 2004

1. An intelligent infrastructure, which refers to the combination of networks and "smart" applications of computing power to innovate business and organizational practices, has the potential to affect all aspects of the Canadian economy and society, especially the areas of health, education, business and government.
2. Improving the commercialization of research, developing more appropriate applications of IT and encouraging ICT providers to better serve SMEs and the public sector would help promote the transition to an e-society. There is a special need to strengthen the flow of ideas, innovations, knowledge and products between researchers and those who may benefit from using the research.
3. We need a better understanding of the impact of ICT applications and process changes on individuals, organizations, government and the private sector. The development of communities of interest that foster collaboration on a sectoral basis as well as the coordination of research programmes is necessary to realise the full potential of the emerging e-society.

B. Building an intelligent infrastructure in Canada

In the next five to ten years, Canada's ICT sector faces a number of formidable challenges as it continues to update the physical infrastructure for the e-economy. These include the challenges to:

- **enhance and expand 'next generation' networks** – ubiquitous, broadband, mobile networks that provide IP-based multimedia services, including network-based applications and grid computing;
- **develop applications, content and knowledge repositories** for these new network architectures, including digital rights management;

- **establish standards** for networks, services, applications and content in this new environment – and for the common language that will enable all of them to communicate; and
- **secure the financial and human resources** required to develop an intelligent infrastructure in the face of global competition.

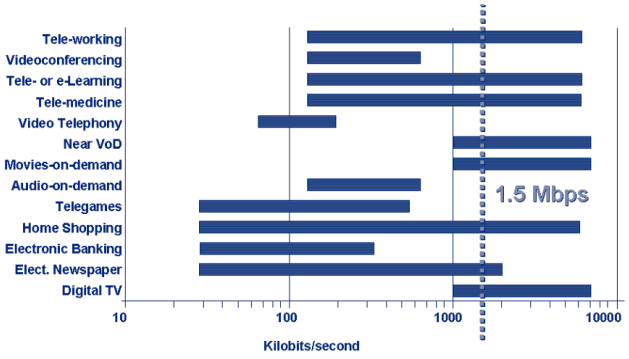
The Broadband Challenge. Worldwide, the growing demand for bandwidth-intensive consumer and business applications has fuelled the development of broadband networks. Canada currently ranks among the world leaders in broadband penetration (see Figure 10), driven by intense competition between telecommunications carriers and cable companies. A majority of Canadian businesses now use high-speed Internet access, and almost half of the households having Internet access use broadband (see Figure 11). Recently, however, as the major population centres and urban areas have been covered, the rate of private sector investment and the pace of deployment of broadband infrastructure have slowed.

As a result, the nature of the broadband challenge has shifted toward the need to address the question of access. Because of Canada's geography and population, we face unique challenges to ensure that all Canadians, no matter where they live, have affordable access to the intelligent infrastructure. Throughout our history, we have made special efforts to extend access to communication networks and services to the rural, remote and northern areas of our country – through the extension of traditional telecommunications and broadcasting services, satellite communications, and most recently, broadband.

We have also taken special efforts to ensure that barriers related to income, disability, language, and culture do not deny Canadians access to communication networks – for example, by connecting schools and libraries to the Internet, by creating Community Access Points and by targeting the needs of aboriginal Canadians and those with physical disabilities.

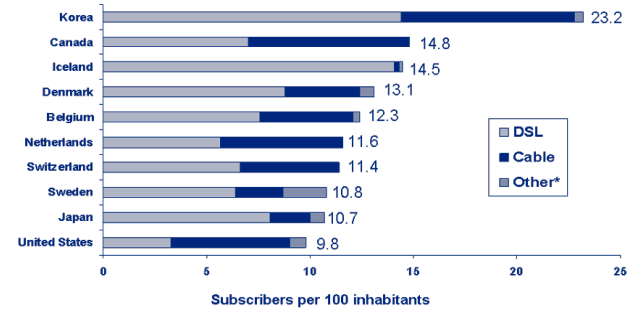
Ubiquitous broadband access will help to stimulate the growth of a host of new, high-bandwidth applications relating to the business, education, and health care sectors, and provide revenue streams for future investment in network development. Moreover, widespread connectivity will optimize

Figure 9: New Applications Require More Capacity and Speed



Source: Plannedapproach.com

Figure 10: Broadband Penetration in the Top 10 OECD Countries



* Ethernet LANs, two-way direct satellite, fibre to the home, and fixed wireless.

Source: OECD, ICCP Broadband Update, December 2003

the capacity for the Canadian economy as a whole to fully capture the full growth, productivity and wealth potential of the e-economy. As we roll out the intelligent infrastructure, therefore, consideration should be given to the initiatives needed to ensure that all Canadians, regardless of where they live or their economic and social circumstances, have access to broadband and its related benefits.

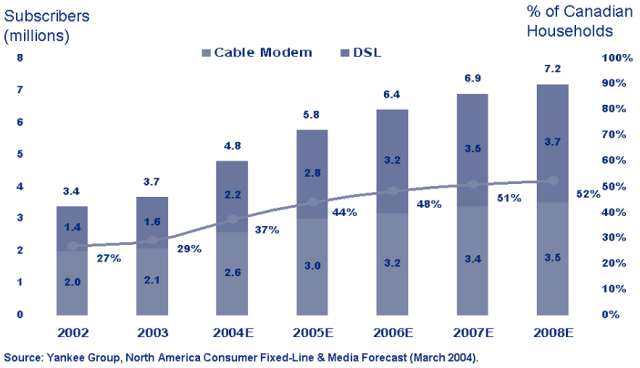
Broadband is a fundamental infrastructure for building Canadian nationhood in the 21st century similar to the role played in the past by other great revolutions in transportation and communications.

This potential will only be realized when broadband networks are available in all Canadian communities, and Canadian residents and businesses have affordable access to broadband services – whether they live in our major cities, in rural and northern areas, or in the smaller cities, towns and villages that lie in between.

– Report of the National Selection Committee for the Broadband for Rural and Northern Development Pilot Project, March 2004

Figure 11: Growth of Broadband Access in Canada

Canadian Residential Broadband Subscribers, 2002-2008



Source: Yankee Group, North America Consumer Fixed-Line & Media Forecast (March 2004).

The Research Challenge. Building an intelligent infrastructure for the e-economy will also require a major, sustained research effort, involving the private sector, government, the academic community and the fourth-pillar organizations that connect them.

To be successful, this research effort must address all of the dimensions of the intelligent infrastructure, including:

- **technological research** on the different elements of the physical infrastructure, including network technologies, services, applications and content, with a particular emphasis on interoperability standards;
- **policy research and analysis** on legal and regulatory issues related to the intelligent infrastructure and the markets and public services that are associated with it, including protecting privacy and network security; and
- **economic, social and organizational research** measuring the e-economy and analyzing its overall economic and social impacts.

The six workshops involving researchers and practitioners held in preparation for the national conference on the e-economy made a good start in identifying research agendas in each of these areas. A mechanism should be found to build on this series of initiatives, as part of a comprehensive e-economy research programme.

C. Changing institutional arrangements

To meet the challenges of building physical infrastructure, the institutional structure of the ICT sector and its relationship to its customers will have to change.

Until the advent of the Internet, Canada's ICT infrastructure had been built around different technologies, each of which was designed to provide specific goods and services for particular sets of clients on terms and conditions that were largely set by the producer – whether the product was plain old telephone service, cable television, computer networking, information management, publishing, sound recording or online learning. The institutions that grew up around this infrastructure reflected this pattern of technological separation, service differentiation and central control over the production and consumption of services.

The Internet has broken this mould in two important ways. First, it has made it increasingly possible for any kind of message to be communicated over a "network of networks" that effectively constitutes a single medium. Second, the Internet places control over the production and consumption of services with users operating at the edge of the network and communicating through the end-to-end principle, instead of vesting it in the hands of central network operators and service providers.

The services and applications available on today's Internet are crude in comparison to those that will become available on the intelligent network. Nonetheless, they point the way to a future in which the purpose of infrastructure is to enable users to communicate transparently and seamlessly, regardless of the technologies they are using, their natural language, or their preferred medium of communication.

It is clear that the challenge of developing the intelligent infrastructure in order to capture its enormous business potential will radically transform the institutional structure of the ICT producing sector. It is also clear that the challenge of using the intelligent infrastructure to improve the productivity and competitiveness of private firms, and the efficiency and effectiveness of government services, will likewise radically transform the institutional structures of the private and public sectors.

Following the principle that "the medium is the message", it is likely that the institutional changes required in both these areas will transfer power from the centre of organizations towards the edge – away from institutional hierarchies, towards networked communities of organizations, consumers, users and citizens.

While this general trend is already evident, less clear are the specific strategies of institutional transformation needed to gain maximum benefit from the potential of the intelligent infrastructure in the private and public sectors. It is as difficult today to foresee the long-term institutional changes that will be triggered by the intelligent infrastructure as it would have been to predict the effects of the railway, the automobile or the airplane at the beginning of earlier economic revolutions.

Since experience has repeatedly shown that it is more difficult to change institutions than it is to change technologies, laws and regulations, a national strategy for the e-economy must include a significant component to address issues of institutional transformation in the private and public sectors.

D. Challenge questions:

What strategies are needed to build an intelligent infrastructure?

How does Canada foster investment in the deployment and use of intelligent infrastructure in the short- to medium-term?

- What frameworks are needed to govern ubiquitous, broadband, IP-based multimedia networks at the national and international levels?
- How can universal, affordable access to the intelligent infrastructure be ensured?
- What is government's regulatory and oversight role?

What strategies are needed to stimulate the commercialization of research on intelligent infrastructure, services and applications?

- What measures are needed to promote and encourage understanding and use of intelligent infrastructure services and applications by consumers and businesses?
- What should be the research priorities in transforming business models, organizational structures and production processes?
- What is the role of public–private partnerships in stimulating commercialization and research?
- Does government have a more direct, interventionist role and if so, what is it?

VI. Ensuring Success

A. The way forward

Building an e-economy for the 21st century is a complex challenge. It requires:

- **transforming organizational models, processes and structures** in the private and public sectors;
- **creating a climate of trust** for consumers and businesses at the national and international levels; and
- **building an intelligent infrastructure** that includes networks, services, applications, standards and content that is accessible to all who wish to use its services to further their economic, social and political development.

Succeeding in this enterprise will require partnership and cooperation between government, private, academic and fourth-pillar organizations. Beyond this, it will require an accurate understanding of the challenges we face, and the active engagement of ordinary Canadians, as consumers and citizens. Above all, a national strategy is required to bring all of these elements together in a timely and coordinated fashion.

B. Challenge questions:

What strategies are needed to ensure success?

What overall strategies are needed to catalyze actions that respond successfully to the opportunities and challenges presented by the e-economy?

Are there other factors in addition to those already identified that are yet to be understood or fully harnessed, and that will enable Canada to benefit more fully as we progress towards a mature e-economy?

What is needed to make the e-economy a national priority?

- How can the different stakeholder groups build on the partnership model that was developed as part of the e-Commerce Strategy?
- What additional measures are needed to address the broader challenges of the e-economy?