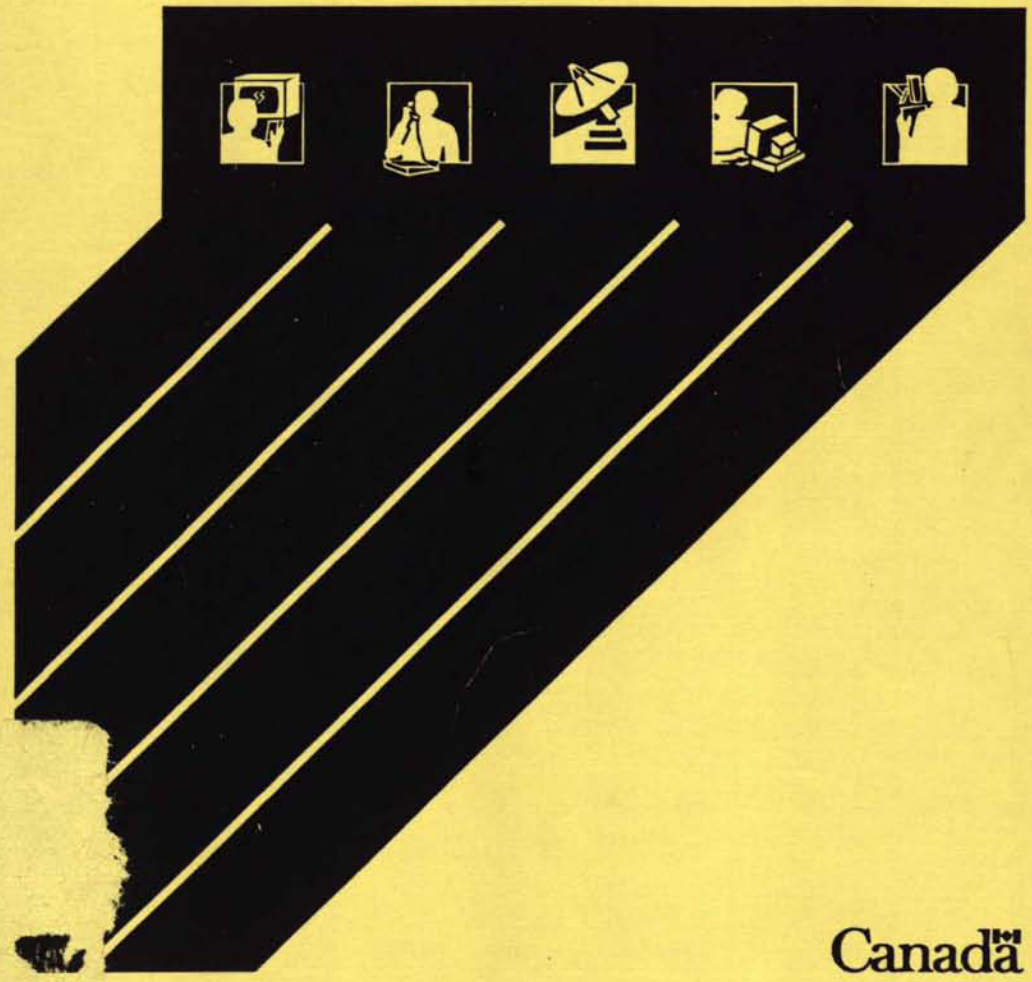
Information Highway Advisory Council

The Economic Impacts of the Information Highway: An Overview



Canada

THE ECONOMIC IMPACTS OF THE INFORMATION HIGHWAY: AN OVERVIEW

Discussion Paper

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Task Force on Growth, Employment and Competitiveness**

July 1995

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INTRODUCTION

This paper was developed from a series of modules prepared for the Task Force on Growth, Employment and Competitiveness of the Information Highway Advisory Council. It provides an overview of the potential economic impacts of information highway development and use. The major topics of the paper are the marketplace, economic growth, productivity and competitiveness, industrial and regional development, and employment.

Simply put, the information highway (IH) is an integrated, high-capacity and interactive communications and information infrastructure. The foundation for this infrastructure -- telecommunications, broadcasting and computer networks -- currently exists in most industrialized countries. The implications of its development are profound, as it is the infrastructure for new economic and social relationships based around the development and use of knowledge. Ultimately, it will have far-reaching effects on every aspect of society.

Information and innovation have always been at the heart of economics, but have only been recognized as so in recent years. Any product or process is a function of the knowledge that went into making it. In today's economy, tremendous adaptation is taking place in all sectors to create new ideas and knowledge. This is seen as the fuel for employment, economic growth and international competitiveness. As the primary conduit for ideas and knowledge, the IH underpins the evolution of industrialized countries towards the knowledge-based society.

The dimensions of economic and social transformation, in Canada and at a global level, are uncertain. As we head into this uncharted territory, it is helpful to have a crude map of what the potential impacts and outcomes may be. This paper is a beginning rather than an ending. Much work remains to be done, particularly in the domain of empirical analysis.

Section I of this paper begins at the level of the market, global in size with ideas as its currency. It looks at the implications for consumers, for firms and for the nature of market activity itself. Section II broadens the discussion to the level of the knowledge-based economy, considering the implications of Section I at the aggregate level, in terms of economic growth, productivity, trade and regional development. Section III considers the issue of employment, a key area of concern for Canada and other industrialized nations. It examines how the knowledge-based society will transform the way we work and learn, and how the labour market operates. Finally, the implications for Canada and how government can respond to a rapidly changing environment is the topic for Section IV. The last section presents the recommendations of the Task Force.

The paper recognizes that the private sector is, and will continue to be, the driving force behind information highway development and use. A market-based approach to facilitating this process is viewed as having the greatest impact on growth, competitiveness and employment. Nonetheless, there is an essential role for government in shaping a pro-

competitive legislative, regulatory and policy environment, using the information highway to improve government efficiency, reforming the learning system, and building consensus on policies in areas such as intellectual property, privacy/security, access, standards and culture.

I. THE NEW MARKETPLACE

A prime concern of economics is the interaction between buyer and seller in a market. As a result of its impacts on markets and transactions, the IH will have widespread effects throughout the economy. The IH underpins an evolutionary transformation of the market that is comparable to the development of currency systems from barter.

The dynamic of any market revolves around *transaction costs* -- the additional costs of identifying, negotiating and completing an exchange. Historically, this cost was high for buyers because of limited information on competitors' prices and quality. The high cost for consumers (in both time and money) of obtaining sufficient information meant that the market was driven largely by producers that supplied a given product to the market for consumers to accept or reject. Information provided by producers, through advertising, was by its nature limited and self-serving. The IH directly affects a frequently referred to cause of market inefficiency -- imperfect information.

The IH goes beyond providing more information. Technology and trade agreements have caused the emergence of an interlinked and sophisticated global market, expanding choice for consumers and promoting efficiency and economic growth. The IH forms the backbone for the future growth of global commerce. It is a network that *becomes a new marketplace*.

i) Choice and the Consumer

The IH allows people to purchase traditional products by acting as a medium for communicating, and placing an order, with suppliers. In addition, a new breed of content -- products, services and applications -- is expected to arise. There are two impacts: buying the same things in different ways and buying new and different things.

At such an early stage, it is impossible to say with precision which products and services will ultimately succeed. Success will depend on how well firms can meet the demands of individuals, in terms of selection, quality and price. According to consumer surveys, IH products and services with potential are: entertainment, including a broad variety of interactive, user-driven arts, music, video and games; information sharing, such as news groups and bulletin boards; medical databases and consultation; interpersonal communication, such as voice, video, fax and electronic mail; news gathering and research; educational applications; banking, insurance and securities trading; and monitoring services, including home security, fire protection and home environment regulation. Although many of these

products are not new, to succeed, the new mode of delivery over the IH must provide additional value in terms of price and quality.

The benefits of a new delivery mode may not be so much in lower prices, but in substantially lower transaction costs. For example, the real cost of buying tickets or renting movies includes the cost of time required to pick them up. Delivered over an electronic network, this cost falls close to zero. This is important to consider when products crafted for IH delivery have existing substitutes. The key difference is the means of access and increasingly, the "packaging." With all of these products at one's fingertips, the IH will reduce the cost of obtaining many products and services.

The emerging IH marketplace provides a window into global markets that allows consumers to seek out the full range of available products or services, without having to rely upon producers' advertising. In the past, distance meant that choice was often limited to locally produced products. The IH becomes a single giant market and, based on widespread access, increases *consumer sovereignty*.

The IH will aid consumer decisions by allowing more sophisticated product and service comparisons. A consumer will be able to seek out specific product information in as much detail as desired. Information overload is a problem that can be avoided as software-based "intelligent agents" are developed to search the market on the consumer's behalf. For example, software programs can be told to sort through the masses of data for the lowest price, for available coupons, or to provide a number of options given preset criteria. This makes use of all the information available, but does not require the consumers themselves to commit the time to make the complex array of calculations required to make the best purchase. Furthermore, intelligent agents can learn over time, becoming increasingly sensitive to a consumer's preferences.

The IH strengthens the power base of consumers in the marketplace by allowing *ad hoc* groups to readily form around a common interest. This potential for greater cohesion among consumers shifts the traditional balance away from producers. Firms must now respect the mass power of consumers or face their wrath. Recent examples include the backlash against Intel, after poorly handling public relations over a flaw in its Pentium chip, and the outrage against cable television companies' use of "negative optioning" and new packaging formats when adding new channels. Indeed, these are but the first steps in the emergence of consumers as a powerful force in relations with suppliers. At a global level, better coordination among consumers across borders may also place pressures on footloose multinational companies to behave in socially acceptable ways.

In the new marketplace, there are both opportunities and risks for consumers. The presence of links to bulletin boards on consumer information will ease consumer protection problems. For example, a consumer could link to a database to ensure the credibility of a supplier before making a purchase. Nonetheless, the potential for abuse is large in a global

market. There are always risks, and the best form of consumer protection, in any marketplace, is an intelligent and knowledgeable consumer.

ii) Evolution of the Firm

In the past, production required access to huge amounts of resources, usually making it necessary for an individual to be part of a larger entity. The IH changes the *economics of organization* as more information is readily available and geographical limitations subside. The IH allows producers to have more and better information about markets and particular customers which enables them to put in place responsive strategies to improve sales. This is akin to previous advances in communications, such as the telephone and telegraph, which allowed new forms of organization, like the corporation, to emerge.

For entrepreneurs, the costs of entering the marketplace will fall significantly. Indeed, all that is required is a personal computer, a modem, a network connection and an idea. Because the potential market is the world, small companies can earn large returns by tailoring innovative products and services to *niche markets*. For such firms, even a very small share of the global market can mean considerable revenues. Technology and niche marketing allows flexibility by firms to better match products and services with consumer preferences.

In the past year, the electronic marketplace has begun to take shape. World Wide Web Home Pages on the Internet have blossomed as a regular part of business practice. A Home Page is a location on the network that can act as a tool for marketing, sales, and customer service and support, all with an easy-to-use point and click interface. Pages are linked together through bolded words or graphics (hypertext) that transport the user to another page dealing with the highlighted object. For example, a page on new software products may contain a reference to Cognos. Clicking on "Cognos" transports the viewer to Cognos' Home Page, either on the same server or across the world. The problem with Home Pages is that they are often hard to find without having a specific address. So, on the rise is the electronic mall, which acts as the point of departure for electronic shopping. Several commercial on-line services and markets have sprung up over the past two years.

As the IH unfolds, not all new ideas will be successful. Often, entrepreneurs experience many setbacks before establishing a successful venture. A good example is the early dynamism of Silicon Valley in the 1980s with many new business failures for every success. Allowing the market to reward the winners transfers resources to more productive areas. Nonetheless, such volatility impacts firms and their employees, adding an important human dimension to this process of change.

iii) Market Dynamics

The great promise of the IH to date has been driven by an array of technological developments coming to market and under way in research labs around the world. However, for the IH to succeed as a provider of jobs and economic growth, a *dynamic balance between supply and demand* is required. Both a supplier and a customer base are necessary.

There is evidence that this customer base is developing. The household market for computers, particularly those with multimedia and networking capabilities, is expanding rapidly. The phenomenon of the Internet is growing exponentially, with over 20 million users worldwide, from 1 million in 1988, and is projected to be 100 million by the end of the century. The presence of more ports onto the information landscape stimulates the demand for, and supply of, content. Already, there are over 2500 CD-ROM titles on the shelves and this number is growing rapidly.

Developing a critical mass of users is required to sustain supply. In part, diffusion of technology and content across the consumer sector is tied to the *level of incomes*, which is linked to employment, as well as *price*. As prices fall for IH products and services, the potential market grows very quickly due to the bulge of middle-income consumers. Indeed, lower prices can be viewed as a real increase in income for the consumer. Market-based competition is the best mechanism to stimulate these price decreases and, as a result, strengthen the diffusion of new technologies, services and content.

Another market dynamic is the availability of *new and better products and services* through networks. Innovations change the composition of consumer demand to include, for example, new on-line information services which have blossomed in recent years. These dynamics make it difficult to estimate how consumers will spend their money in the future. Demand for IH products and services, many of which are under development and not commercially available, remains inconclusive. However, it is the essence of economic growth that people consume new and better products, rather than simply more of the same.

Enhanced communication and information tends to eliminate the "middleman" and forge closer linkages between producer and consumer. Markets are currently swarming with intermediaries who facilitate transactions while adding little value to the product or service. Distance and information limitations made this economically viable and necessary. For example, stock brokers specialize in information about the stock market and act as an access point for those interested in investing, and take a cut in the process. As the IH breaks down these traditional structures, the price to the consumer will gradually fall. Any intermediary will have to be increasingly innovative in defining its "value-added" to gain a foothold in the evolving electronic marketplace.

iv) Intellectual Property

The nature of information as a product or service raises the issue of *intellectual property rights (IPRs)*. When I purchase an object such as a jacket, you and I are rivals for its use because both of us cannot use it at the same time. If all economic goods were objects, then an efficient outcome requires only a scheme of ownership. However, another economic good, of particular importance to the IH, is a *nonrival good*. This group includes anything that can be reduced to a bit string -- text, video or an idea. We are no longer rivals for its use because it can be infinitely reproduced and disseminated at minimal cost. This undermines an axiom of economic theory -- the notion of scarcity -- and poses a challenge to IPR schemes for information.

Because IPRs grant a monopoly to the owner, so we must consider the spectrum of information goods to which they apply. For some, such as movies, books or recordings, strong IPRs are justified as these goods can be infinitely manipulated, replicated and distributed without acknowledgement and, in the absence of IP protection, will not be supplied to the market. At the other extreme, with respect to public goods such as basic chemistry research or the discovery of a vaccine, ease of replication and dissemination is an asset, and strict rights may not be appropriate.

The cost of producing content, such as software or a TV program, is the cost of the first copy. This cost is virtually independent of the total copies produced, so there are inherent economies of scale. The revenue from such a commodity is directly related to total copies sold and the degree of access to the market. Similarly, existing government information -- data, reports, video and recordings -- is a "sunk cost". There is a strong incentive to allow electronic access, since productive use of government information by the private sector may yield large social benefits. Such information can be an important resource for developers of new content.

Ease of duplication and weak IPRs hamper the willingness of individuals and firms to make large, upfront investments in developing new applications and content. For example, the ratio of pirated to non-pirated software is estimated to be five to one. A dynamic is emerging between producers trying to protect IP and others trying to access, copy or plagiarize such property. Innovative solutions such as increasingly clever encryption schemes are being tried. A lot will depend on the ratio between price and the cost of obtaining an illegal copy. At a price-cost ratio of ten to one, for example, one can expect a lot of piracy, but very little at 1.5 to 1. The implication here is that overpriced content is most susceptible to unlawful use and distribution.

Without a regime of IPRs that balances the interests of owners and users, the full economic potential of the IH, particularly as it relates to content development, will not be realized. However, strengthening rights is not the only way to spur innovation and increase revenues to firms. The answer also lies in finding new ways to make money. For example,

some software and video games are given away, but paying a fee gives access to customer service and upgrades. As well as business and technical solutions to reducing intellectual property crimes, firms, associations and governments are relying on awareness-building, education, legislative reform and increased enforcement.

v) Electronic Payment Systems

The development of electronic payment systems underlies the development of commerce on the IH. Currently, the absence of secure payment systems is an obstacle to increased commercial activities on the Internet. There is a role for government/private-sector cooperation to ensure a secure, efficient and stable electronic money and banking regime.

Several initiatives plan to broker transactions through a third party, such as a bank or credit card company, with which the merchant and the customer both have accounts. Another initiative plans to introduce anonymous electronic cash for use in small transactions. These solutions build on a foundation of direct payment and payroll, electronic data interchange, and credit card transactions. Paper money may never completely disappear, but it will be less used in the future as viable electronic money comes on-line. In all likelihood, a consumer will have *several payment options* just as in the real world.

The basic requirements of an effective electronic commerce regime are confidentiality, authentication of the originator, and integrity -- ensuring that information sent is the same as information received. Security of network transactions and avoiding fraud and counterfeit leads to a dichotomy between *privacy* and *traceability*. Mathematical algorithms make it possible to have completely anonymous digital cash, protecting individual privacy from monitoring, but possibly enabling large-scale criminal activity. Yet, traceability of any sort poses enormous threats to privacy. The seeds of this can be seen in targeted marketing based on demographic or accumulated credit card purchase information. It is apparent that technological possibilities may increasingly clash with fundamental societal values.

vi) The Benefits of Standards

Standards lead to the creation of a market, thereby facilitating economic activity. (An analogy would be trying to foster an electronic appliance market in Canada without agreement on the number and shape of the prongs on an electric plug.) Standards allow compatibility of different products and ease of communication among people with different hardware and software. The primary driver of the movement toward open standards is the emergence of consumer sovereignty. In Canada and elsewhere, customers have come to expect competitive choice, they are no longer willing to buy technology, services and content from only one supplier. For firms, standards accelerate market penetration and the diffusion of new products, services and process technologies (although this requires other institutional

arrangements, such as certification and mutual recognition agreements). Development of common standards reduces barriers to entry and decreases the risk of investing in complex products and systems, particularly for small firms.

Deriving common standards is an immensely complicated process, requiring collaboration between governments, firms and users with sometimes competing interests. While development of standards by consensus is the ideal approach, market forces may lead to a *de facto* or proprietary standard based on early development of new technologies or superior marketing. In cases where a dominant seller, consortium or country dictates the standard, it may be used as a barrier to market entry if the standard is not revealed publicly. Because of lock-in effects, competing standards in a market environment might not necessarily lead to the adoption of the most efficient standard (e.g. Beta vs. VHS videotape formats). Ensuring openness and transparency by publicly distributing standards information, particularly to small firms, facilitates product development strategies.

Governments, regulators and international organizations, particularly in the telecommunications sector, have played a historic role in setting standards to meet social and economic objectives. As the integration of national economies continues, it is critical for Canada to maintain a strong voice in the development of standards at an international level. Historically, as a country with a relatively small and open economy, Canada has been a standards-taker rather than a standards-setter. As such, Canada should continue to adopt *open standards policies* and their rapid development on an international basis, particularly for critical IH interfaces, while not unduly limiting the scope for early developers of new IH technologies to enter the marketplace. International cooperation on standards and other issues underpins the emergence of a global information highway.

II. GROWTH IN THE KNOWLEDGE-BASED ECONOMY

i) Economic Growth

The study of economic growth or wealth generation is concerned with the evolution of economic activities over time. New developments in *growth theory* are centred around explaining growth at a microeconomic or firm level by focusing on technology and the underlying innovation process. Technological innovation responds to economic signals and is a historical process.

The major components of technological progress are advances in ideas and knowledge by individuals. Four levels of innovation have been distinguished: *incremental innovations*, each of which is small but whose cumulative effect is large -- research suggests that over half of all productivity change is due to these myriad small changes; *radical innovations*, which are discontinuous events such as the development of the transistor, which could never have emerged from incremental improvements in the vacuum tube; changes in the *technology*

system; and, changes in the *techno-economic paradigm*. The latter refers to changes in enabling technologies with pervasive effects throughout the economic system. At each level, the distinction between process innovation and product innovation is important, and time is a significant factor.

The centrality of innovation points to the fundamental role of information, learning and R&D in economic growth, as well as better organizational and institutional structures to accommodate and encourage innovation. Information is cumulative or is at least dependent upon existing knowledge. Information generates or spawns more information. Unlike land, labour or capital, there are no diminishing returns to information as a resource (except information that is time-sensitive).

ii) The Importance of Information Infrastructure

In general, infrastructure acts as a foundation that underlies all economic activity. In the modern economy, based on information, knowledge and ideas, the definition of infrastructure must expand to embody these elements. New infrastructures include the IH, technological infrastructures (such as research facilities and university laboratories) and, perhaps most importantly, human resource development systems.

The IH is an "enabler" because it changes the techno-economic paradigm and expands the productive capacity of the economy's resources. This allows organizations to produce and distribute their output more efficiently, improve quality and develop new products, services and processes. The enabling capacity of information infrastructure impacts aspects of user firms' operations and can lead to improvements in productivity. This offers the potential for increased employment in existing and new firms that are effectively using the IH. These benefits can only be realized if the price of using the IH is affordable and access to the infrastructure is widespread. Consequently, shaping policy for the IH that effectively stimulates use and innovation, while balancing competition and access, is vital.

The development of the IH will be accompanied by major externalities or spillovers. With respect to infrastructure or any public good, positive externalities mean that the overall benefits to society exceed private benefits. Thus, government involvement in facilitating the development of appropriate infrastructure can be justified based on overall economic efficiency and social welfare.

On the demand side, positive spillovers emerge as more users come on-line. These *network externalities* on the IH exist because there are more people with whom to communicate and more information available. This is similar to the development of the telephone, which had increasing value as more people used it. Thus, it may be in the interests of IH providers to price services and content sufficiently low as to generate a significantly large number or "critical mass" of users.

On the supply side, the rollout of new services has mutually reinforcing characteristics. Initial investments in the IH are inherently risky due to uncertainty about consumer demand. Acceptance by a base of consumers is required for subsequent investments, which then build upon previous successful ventures. Any new service that becomes accepted by users complements existing services, increasing the value of the network for new users. This stimulates the introduction of more new services by suppliers as the market size increases. As noted earlier, this inherently volatile evolving dynamic between supply and demand underlies the evolution of the IH.

Another area of positive externalities is the diffusion of information, knowledge and ideas throughout the economy. To capture these spillovers, new forms of cooperation such as the CANARIE project to create a testbed for IH applications, have sprung up. "Clearing houses" to better coordinate information and the modernization of libraries and government labs are also playing a role. This is particularly vital as the knowledge-intensity of all work increases. Over time, it contributes to private and social benefits on both a national and, since information cannot generally be contained within boundaries, global scale. Furthermore, a service that makes the IH easier to use or navigate will have substantial benefits. Such services effectively increase the ability of users to take advantage of the network.

iii) Productivity and Competitiveness

In an increasingly competitive global market, the development of an IH poses many questions for the productivity of Canadian firms and Canada. Productivity refers to the efficiency of converting inputs into outputs. Increased productivity can be quantitative (i.e., more output with the same amount of inputs) or qualitative (i.e., higher quality products or more variety). The challenge is continuous improvement of all organizations, be they firms, schools or government. The development and application of knowledge and new ideas are the major forces driving improvements in productivity. This knowledge is embedded in machinery and equipment, in the human capital of employees, in organizational structures and in relations with suppliers and consumers.

Information technology (IT), a subset of the IH -- primarily computers, software, related services and local networks -- is vital for most of the operations within and outside of any enterprise. The productivity benefits of IT include savings in materials, energy, labour and capital; improved quality; new products and more variety; faster cycle times; efficient small production runs; better external linkages to customers and suppliers; better internal coordination in administration and inventory control; and higher quality of life in the workplace (either physical or virtual). Assessments of actual IT usage by firms and other organizations support the view that optimal deployment of IT has not yet been achieved. The full productivity-enhancing potential of IT -- *enabling effect* -- can only be realized through effective employee involvement, skills development, the adoption of new organizational approaches and through the integration of IT systems.

The integration of IT systems through the IH extends the potential productivity gains. The IH adds value by enhancing the ability of firms to coordinate their information needs and to do so at increasingly faster speeds and across greater distances. Superior connections are enabled between employees, suppliers, operating units and customers. Firms can become less hierarchical through the use of new managerial and organizational approaches. With greater access to timely and relevant information, individuals inside a firm can become more effective, autonomous and empowered. At the same time, ease of communication over networks has the potential to stimulate collaborative innovative activities.

To realize these benefits, regulatory reform toward an open and sustainable competitive framework for the IH is required. This will stimulate a virtuous circle of increased demand and supply. Reduced prices, higher quality and greater choice for services will stimulate applications and content development leading to increased use of the IH. Canadian businesses using the IH, particularly telecommunications, will enjoy reduced telephone rates that translate into higher productivity. Canadian customers of these businesses can expect better service and responsiveness. Furthermore, a competitive telecommunications environment in Canada will serve to attract and retain global companies to locate value-added activities in Canada. Increased demand combined with clear and consistent regulatory rules will encourage additional infrastructure investment and result in a world competitive supply sector in Canada.

In recent years, the term competitiveness has become pervasive, applied to nations, regions and firms. While notions of competitiveness differ among observers, there is general agreement that acquired competitive advantage through innovation and the exploitation of information is more important than nature-given endowments. Robert Reich suggests that human resources are the key to high-wage, high-value employment, affecting its potential for entrepreneurship and for attracting globally mobile firms. Michael Porter emphasizes domestic competition among firms, clustered with related and supporting industries and factor conditions such as infrastructure. Lester Thurow sees the world moving towards trading blocs. As a result, he believes that governments can and will play a strong role to direct capital flows, secure domestic and foreign markets and produce national advantages in technology and know-how.

Firms can use the IH for strategic advantage in the face of increasing international competition. The combination of continuous productivity gain and innovative behaviour and efficiency, together with the discipline of the market, leads to competitiveness. Factors external to the firm are also required, such as a responsive training system and learning culture, high-quality infrastructure and regulatory and business conditions conducive to growth. Ultimately, however, it may be human factors that are most important -- the capacity of individuals to add value to a product or a process.

iv) Expanding Trade Opportunities

Trade liberalization, increased capital flows and the emergence of a global IH are driving the integration of national economies. The nature of trade is being redefined as industrial structures evolve. The exchange of intermediate, rather than final, goods and services is expanding, as are flows of information across borders. This is not a threat to be feared, but an opportunity to be capitalized on. Firms must respond by exploiting global information resources to promote trade opportunities. Information and communications technologies are clearly beneficial to large global firms but also present opportunities for smaller firms to integrate themselves into the global value chain. The IH represents a further step in the sophistication of all firms to link directly with suppliers, consumers and employees.

While the process of change at a global level is driven by economic and technological forces, the barriers to growth are political, legal and cultural. Different beliefs and attitudes across countries lead to different forms of capitalism and governance. Understanding what the barriers are, and developing mechanisms to address them, are key areas for public policy in a globalized trading regime. As a trading nation, Canada must be an active participant in the development of the innovative institutional arrangements required to eliminate barriers that arise from differences in areas such as intellectual property, standards, consumer protection, payment systems and the protection of indigenous content.

Continued participation in global policy fora like the G-7, the Asia-Pacific Economic Cooperation forum, the International Telecommunication Union, the World Trade Organization and the Organization for Economic Cooperation and Development are required to safeguard Canada's international position. Through multilateral agreements, Canada must ensure that electronic access to export markets is not undermined by traditional barriers or new forms of protectionism in different guises. Restrictions on access to and the use of global information infrastructures must be minimized if commerce is to proliferate on the IH and serve as a stimulus for trade and growth.

v) Attracting and Retaining Global Firms

Multinational enterprises, or global firms, contribute to domestic growth, employment and productivity. Indeed, four of the top five Canadian exporters are foreign-owned global firms. In addition to these direct effects, global firms provide advantages to Canada as a mechanism for the diffusion of new technologies and organizational structures from abroad.

It is important for Canada to retain its global firms and to influence the location decisions for high-wage activities. While the levels of taxes and wages are important to location decisions, modern globalized production entails other considerations. The system of education and training affects the availability of skilled human resources, and is thus a primary requirement of a global firm.

A strong attractor is competitively-priced access to the global IH. This is vital to the competitiveness of global firms, allowing the firm to coordinate its various operations located in different parts of the world. This represents a significant cost of doing business, and it is in the interest of the firm to use the lowest-cost services. The quality and range of advanced services available is also significant as they allow firms to use more creative means of managing their organizations, communicating with suppliers and servicing customers. Conversly, the danger is that a global IH allows such firms to move some operations to countries other than Canada.

vi) Stimulating Regional Development

The growth of Canada's regions is largely a function of the same elements of economic growth described above -- high-quality infrastructure and expanding trade at a macroeconomic level and pervasive innovative behaviour at a microeconomic level. Thus, we know that regional success requires the creative use and development of new technologies and information by firms, and that human resource development is a key component. There is no escaping the fact that sustainable regional development must be based on competitive products, services and processes.

Historically, in both Canada and other countries, various levels of government have played a more or less active role in attempting to influence the development of disadvantaged regions. Infrastructure has been a force uniting Canadians, from the Canadian Pacific Railway to the Trans-Canada Highway to coast-to-coast telephone and satellite communications. Historically, the availability of infrastructure has affected the location decisions of people and firms. Widespread access to high-quality, reasonably priced information and telecommunications services is a necessary condition for creating small firms and attracting large global firms to a particular country or region. Rapid development of such an infrastructure confers a competitive advantage on the region. Thus, information infrastructure has both an *economic* (location decisions) and a *social* dimension (unity). The province of New Brunswick is a good example of a region exploiting the potentials of the IH for competitive advantage.

Enhanced information links alleviate disadvantages related to distance from major markets, suppliers and employees. This applies to production, consumption and investment activities, as well as learning and training. The self-employed can work over networks with no loss of functionality, but with lower costs of living and a superior environment. The on-going development of human resources, without the barrier of distance, is likely to be the strongest advantage of the infrastructure for stimulating regional development. Through the IH, regions will have access to the highest quality distance education and educational software. Imparting fundamental skills, such as computer literacy, is a key ingredient to allowing local populations to take effective advantage of the infrastructure.

Location decisions are in turn affected by the presence of skilled human resources. An advantage for firms is lower costs of living in these regions, meaning lower labour costs without affecting the relative wages received by workers. However, such jobs can be moved elsewhere, to other regions or offshore.

In order to survive, any region needs an economic base. The elimination of the natural resource base in many regions implies an urgency in the transition to a knowledge-base. Otherwise, net migration flows will be outward and communities will shrink and disappear. Changing employment patterns through the effective use of the IH, particularly with respect to the transportability of intellectual work, provides a window of opportunity for Canada's regions to share in the prosperity of the information society. It allows for the re-emergence of "cottage industries" by drawing on local competencies and encouraging the re-location of professionals from urban to rural areas. Although not a panacea, it does represent an important potential ingredient for improving the growth and employment opportunities of previously disadvantaged regions.

III. EMPLOYMENT, LEARNING AND THE LABOUR MARKET

i) Adjusting to Structural Change

Two major and interconnected forces are at the heart of a wave of structural change throughout the economy. The first is globalization -- the emergence of production and competition on an international scale. The second is the evolution and convergence of computing and communications technologies underlying the development of the IH. Structural change leads to the obsolescence of some jobs, but creates many opportunities for new ones to emerge. The challenge for Canada is to respond effectively to these structural changes -- recognizing that the status quo is not an option.

In the midst of global change, opportunities arise to expand into new markets, to develop new products and services and to create new processes to improve efficiency. These opportunities reflect the potentials of new technologies and create a gap between how things are done and how things could be done. Reducing this gap, realizing the potential, requires human, organizational and institutional flexibility and adaptation.

Effective social and economic transformation requires the active participation of individuals, most importantly, having a job. In industrialized countries, the bulk of such employment must be high-wage so as to sustain and improve standards of living. High wages are increasingly based on the creation and use of knowledge to add value to a product or service.

The processes of job acquisition, creation and loss are dynamic phenomenon with fundamental human implications. There are innumerable factors which influence both the

supply side and the demand side of the employment equation. The development and use of the IH is a key factor that can have a profound impact on both sides of the equation.

Technological change both destroys and creates jobs. However, history demonstrates that the use of new technologies, including IH technologies, has lead to productivity increases and created new employment, often in whole new industries, which has more than offset the initial job losses. The result for some people will be job dislocation - the problem of a growing educational and occupational "mismatch" between the job losses and the new employment opportunities. The key to success, according to the UN's International Labour Organization, is to adjust more quickly in order to minimize the period of transition.

Many people are concerned about the impact of the knowledge-based society on their jobs and the social impacts of transition. In the 1990s, unemployment is a serious economic and social problem confronting Canada and most other OECD countries. While unemployment poses a significant economic cost, many of the costs to society cannot be expressed in purely economic terms. These include social tensions exacerbated by personal dissatisfaction at not having a job, drug and alcohol abuse, crime, xenophobia and an increasing income dualism between those with and those without jobs.

Canada has not adjusted its economy to the new environment. Since the 1960s, the unemployment rate has ratchetted upwards from 5 percent of the labour force to slightly more than 9 percent today. This has happened despite having the highest job creation rate among the G-7 countries over the past 20 years. Several factors help explain this seeming paradox. The growth rate of the labour force has exceeded that of jobs, due to the increased participation of women and immigrants, as well as baby boomers. Disincentives such as payroll taxes and passive unemployment insurance have also been cited. These structural factors mean that the *duration* of unemployment has risen quickly in the past 20 years, although the *incidence* of unemployment has actually fallen. The traditional correlation between employment and economic growth has broken down, as upswings in the business cycle can no longer be counted on to reduce unemployment.

ii) Sectoral and Economy-wide Impacts

Extensive studies by the OECD and others estimate that IH development and use will have a net positive effect on employment, based on assessments of the historical impact of telecommunications and IT development and application. However, job losses are anticipated in the short term in certain sectors of the economy due to adaptation and learning effects. Employment gains will be most evident through product/service innovations rather than process innovations. Final demand and increased output are also key considerations.

To grasp the implications for employment, we must look at the following elements around which the IH can be expected to evolve:

(a) Supply: Building infrastructure
(b) Supply: Content development
(c) Users of the IH -- every sector in the economy.

(a) Supply: Building Infrastructure

The IT and telecommunications sector comprises computers and peripherals, software and related services, telecommunications equipment and services, cable television, electronic parts and components, consumer electronics and instrumentation. In 1993, the sector produced $50 billion in goods and services in Canada. The telecommunications services segment was responsible for $18 billion of these revenues and the IT industry $32 billion. Total employment in the IT and telecommunications sector was 484,000 in 1993. The sector contributed approximately 6.2 percent to Canada's GDP in 1992.

In the short to medium term, the IT and telecommunications industries will continue to be active in building the IH. In terms of services, monopoly segments such as local telephone and cable TV are experiencing some job losses as competition emerges. In general, however, firms in the telecommunications services sector and cable-TV sector will continue to lay broadband cables and install new wireline and wireless switching mechanisms, transmission equipment and access technologies. Correspondingly, the manufacturers of telecommunications equipment can expect growth in revenues driven by the investment plans of these service providers. The telecommunications equipment sector is the only IT sector in which Canada holds a substantial trade surplus. This indicates the international competitiveness of this sector and suggests continued growth as the IH evolves.

A key element of the supply sector is the development of computer equipment and peripherals, including the development of kiosks, terminals and set-top boxes which act as a precursor to video-on-demand and other "infotainment" services into the home. Whereas the trend until now has been business applications, much of the future growth in the computer industry will likely be fuelled by consumer demand. Currently, between 25 and 40 percent of Canadian households are estimated to have a computer, and one-third of these have modems. The computers and peripherals sector employed 12,000 people in 1993, with almost $3 billion in total shipments. Employment gains in those firms developing innovative products are anticipated as the IH evolves. Canada's competitive position in this sector is buttressed by the presence of leading global firms.

As increasing numbers of consumers come on-line, demand will continue to rise for more user-friendly applications and interfaces to the network. A whole range of "enabling software" needs to be developed for navigating the seas of information on the IH. Developing

new software tools to complement existing or new computer systems requires an entrepreneurial attitude to recognize and capitalize on new opportunities. This is a niche area of considerable promise for Canada's 13,000 innovative software firms. New jobs in software-related R&D, marketing, and management may emerge based on the strengths of small and medium-sized firms in this dynamic market segment. Success in the global market implies potentially significant employment opportunities over the longer-term.

Future growth of Canadian supply sectors will arise if Canadian firms can compete successfully in the global market. Indeed, the Canadian market alone is simply too small to support the ongoing R&D of Canadian firms. Exporting is a necessity rather than a luxury. The international competitiveness of these firms is tied to the same conditions which affect the success of all firms, namely, quality and availability of human resources, availability of financing, a progressive business climate and quality of infrastructure.

(b) Supply: Content Development

In general, the IH will be driven by the content carried over the network -- services, applications and information. Content and new services are being developed in a variety of areas and across different media -- sophisticated video games, multimedia software packages, increasingly diverse television programs, films and on-line information services. This vast domain of diverse worldwide conent is frequently identified as the most promising area for growth and expanded employment.

Three key areas of demand for content and new services are likely to be education and training, health care and leisure and entertainment. In a sense, each of these areas is waiting for low-cost broadband capacity for a big surge in growth. Diversity of enterprises (software firms, information services companies, film studios, etc.) and alliance activities signify that this is an exciting field for innovative content and service applications. Government can play a role in stimulating multimedia content by releasing its data -- film, sound, text -- to the private sector.

The Canadian arts and culture sector is an important source for much of the content that will be supplied on the IH for Canadian and world markets. This sector comprises written media, film, broadcasting, recording, instrument manufacturing, stage performance, libraries, visual arts and other sub-sectors. In 1992, the revenue of the arts and culture sector was $16.2 billion. The largest segments were written media ($4.3 billion) and broadcasting ($3.1 billion). The arts and culture sector is estimated to have employed 460 000 Canadians in 1992. Its contribution to GDP was 2.7 percent. Aside from its economic contributions, the content produced by this sector contains cultural aspects that contribute to national identity.

In the near future, advances in technology will enable the production of low-cost, high-quality multimedia content. Access to the IH at competitive prices and adequate intellectual

property protection, reduce content production and distribution costs, enabling diffusion in a global market. Since there are few barriers to entry -- the only requirements are a network connection, a computer, a modem and an idea -- there is a large potential for entrepreneurship. Developing Canada's content industry is desirable as it results in jobs that are high-wage and high-skill. These jobs rely on labour-intensive human creativity, which is not easily made obsolete by new technology. Canada already has a world-class, competitive pool of talent and is well-positioned to take advantage of these opportunities.

Overall, Canada's strong supply sectors will be further solidified by investments in the development of a domestic IH. Since Canada is already competitive in these sectors, those building the infrastructure would tend to purchase their goods and services. The result is a virtuous circle of strengthened competitive advantage as demand fostered by the development of the IH promotes upgrading and innovation in both infrastructure and content. Further, larger companies, acting as primary suppliers to the IH will, through outsourcing components, stimulate the growth of smaller supply companies.

(c) Users of the IH

Firms using the IH can be found in virtually every sector of the economy. These range from resource companies to manufacturing firms to companies in the service sector. The service sector, representing over 70 percent of Canada's GDP and employment, is the largest user of IT and telecommunications, as measured by capital investment.

Since knowledge is a firm's key resource, as firms move toward handling increasing volumes of information, employment should increase in generating, analysing, processing and disseminating information. Also, local and wide area networks demand skilled personnel to manage and maintain efficient flows of information. It is expected that in those sectors using IT, the number of employees required to install, maintain and further develop information systems will climb. Development of the IH encourages two broad employment impacts: increased demand for IT workers and increased knowledge-intensity of all jobs.

The ability of the IH as a tool for coordination in communities lowers costs in the growing "social sector," which includes nonprofit organizations, health care practitioners and care for the disabled. This sector tends to be highly labour intensive, and may be a source of socially important employment growth. For example, as the population ages, jobs will be created to take care of seniors.

In the private sector, traditional medium- and low-skill industries, and protected sectors, are most vulnerable to job losses. These sectors will be able to increase employment only if they can increase their output in global markets. Increasing competitiveness entails, among other things, the use of new process technology, which is largely labour-saving, and the recognition and exploitation of core competencies. Since employment growth requires that

increases in productivity be accompanied by expansion of output and final demand, the presence of an IH contributes to job creation by giving these sectors a tool for expanding sales in the global market. Nonetheless, as Canada adapts to global competition from lower wage countries, medium- and low-skill industries will shrink relative to other sectors.

Among virtually all advanced countries, it is primarily the high-skill sectors that have experienced employment growth. Successful firms in these sectors have the characteristic of continuous innovation. They employ new process technologies to improve productivity and responsiveness. The job losses resulting from these process improvements have been more than offset by the increased demand for new product and service innovations. Government can play a vital role by adopting business frameworks that allow these firms to grow, reforming education and promoting the development of appropriate infrastructure. Growth in high-value, high-skill, knowledge-intensive employment contributes to maintaining Canada's standard of living.

iii) Strategic Advantage through Learning and Training

As the intellectual content of all new goods and services expands, the demand for new skill sets grows. This inherent dynamism underpins the importance of a culture of lifelong learning. At the core of the emerging knowledge-based society, the single most important process is learning and training and the ability to apply the skills developed. The drive to upgrade skills has become a necessity - it is vital to adjusting to change. This includes learning activities within firms, retraining efforts, and the school system from kindergarten to university. Knowledge and human resources are critical factors in the new economy and play a large role in determining competitive advantage.

Employability is increasingly linked to education. Since 1975, employment growth has increased the most for those with university degrees and has declined for those with less than high school education. For 1994, it is estimated that 99.3 percent of Canadians entering the labour force with some form of postsecondary education found employment. Projections for the year 2000 estimate that about 45 percent of all jobs created will require 16 or more years of education. The jobs of the future will be based on adding value through the creation and application of knowledge. Such knowledge is acquired through a continuous process of learning and training.

There are ongoing efforts in Canada to bring the system of learning closer into line with work requirements, while striking a balance with general liberal education. The challenge for all learning organizations is to ensure that the formal system provides a solid foundation for further training, and that opportunities and funding exist for further training. This is the foundation upon which a lifelong learning culture must be developed, and where the most successful introduction to the IH for learning and training can occur. Also, as education and entertainment merge, and education in the home becomes more prevalent,

learning is further stimulated. Over time, this is how the IH can make the essential link between schooling and jobs.

Widespread access to the IH allows learning and training opportunities on demand for anyone, anytime, anywhere. This flexibility of access can be enhanced by user-friendly interfaces to the network, intelligent systems to retrieve pertinent information and multimedia formats to effectively convey the information. This attribute of the IH to extend education to people in remote regions also addresses the needs of, for example, single mothers living in unsafe urban areas. However, at present, the high price of telecommunications services makes widespread access a goal rather than a reality. To address this problem, the Canadian Radio-television and Telecommunications Commission recommended reductions in telecommunications rates for educational and health services.

In the private sector, the IH provides a mechanism through which firms can coordinate their training activities. Networks allow the easy formation of consortia to design, manage and implement a tremendous variety of high-quality training applications. Training modules, once created, can be accessed by large numbers of people on a "just-in-time" basis, irrespective of distance at virtually no incremental cost. This allows firms to continue to develop their most important resource -- people -- to stay competitive in the global marketplace.

iv) Knowledge and the New Workplace

Since 1975, employment growth has come disproportionately from knowledge-intensive sectors. According to the Department of Finance, over the 1984 to 1991 period, knowledge-intensive industries contributed 53 percent of total employment growth in Canada (knowledge-intensive is defined by the proportion of weeks worked by people in an industry with university degrees). Such sectors are now estimated to represent a third of total employment. Furthermore, the knowledge-intensive group of industries is far less sensitive to business cycle fluctuations than the medium- or low-knowledge group.

The growth in employment in the knowledge-intensive sectors has occurred at the same time as increasing job losses in low-skilled sectors. In general, preserving and expanding employment requires ongoing investment in people. The drive to upgrade skills is becoming a necessity both for individuals with and without jobs. The IH is an important tool which provides the data and information upon which knowledge and personal competencies or occupational skills are fostered. With the appropriate knowledge and competencies not only are individuals enriched they are also empowered. As employees, their bargaining power within the firm or organization increases. As *The Economist* notes: "In the workplace of the future, the fiercest competition may not be for customers, but for the hearts and minds of employees."

In the knowledge-based economy the nature of work is changing. The need for constant innovation to remain competitive is forcing organizational change in the workplace. Team-based approaches and participative decision-making bring together the diverse specialized skills required by organizations with the individual's desire for more autonomy. In addition, employment-sharing through reduced work weeks, flexible work hours and working at home provides flexibility for the company and more personal time for the employee. In general, the longer-term impacts on the workplace will likely be both socially disruptive and beneficial depending on the rate and manner of their implementation.

The changing workplace, enabled through IH technologies such as videoconferencing, document sharing and e-mail, can alter patterns of work and behaviour. A move to empowerment and decentralized decision-making is occurring, not out of altruism, but because front-line employees have superior business information on clients and can respond faster to both crises and opportunities. Although the changes may improve efficiency, they may reduce employee morale and motivation. Such changes must seek to empower and enrich employees rather than reduce them to cogs in a machine. They may also conflict with labour standards and collective bargaining. Thus, active employee involvement in shaping the changes is essential. The IH offers added flexibility and new options for improving the workplace, but their successful implementation lays in cooperation, sharing and participation.

v) A More Efficient Labour Market

One of the promises of the IH is more efficient matching of job searchers with potential employment vacancies. Gathering timely and accurate employment information can be as difficult for the job searcher as is "broadcasting" the information by the employer. The IH reduces the time and costs of this search. At a kiosk or at home, with a point and click menu structure, a job seeker can readily locate a position on an employment database, and forward an electronic cover letter and resume. The firm can set criteria for sorting through potential applicants electronically.

The IH can alleviate the stress on a labour market that has been slow to respond to the increasing diversity of skills supplied and demanded. Postings of skill requirements by firms can be collated to form broader skill profiles for, say, university or college students, who can use this information when selecting courses. To bolster economy-wide productivity through enhanced labour mobility and reduce unemployment, it is important to find innovative ways to use the IH to improve the efficiency of the labour market.

IV. IMPLICATIONS FOR CANADA

The main conclusion of this paper is that economic growth, improved competitiveness and increased employment are largely dependent on the framework within which consumers and firms make decisions. Operating within this framework, the private sector is, and will continue to be, the driving force behind IH development and use.

If the knowledge-based economy represents a structural shift to a new society, then the frameworks of that society should be reformed. The impact of the IH will be so pervasive that all levels of government -- federal, provincial, territorial and municipal -- should review their legislation, regulations and policies with a view to identifying and eliminating obstacles to the use and development of the IH. Removing unnecessary impediments to the growth of the IH will generate benefits throughout society.

Establishing a progressive environment is a necessary but not sufficient condition to ensure the evolution of an IH in Canada. There must be a dynamic balance between supply and demand. On the demand side, there is a role for government as an active user of the IH. By aggressively using the IH the government will stimulate private-sector activities and investment. Such actions should not be based on the picking of winners, but on sound business decisions to use the IH to improve efficiency and enhance services to the public. On the supply side, the government is awash in content. It is necessary to find ways to get that content out so that it can be used by the private sector to exploit business opportunities and generate new employment.

The development of new applications and content promises to be a major source of economic growth and increased employment. The environment is changing and the balancing of economic, social and cultural goals requires innovative new approaches which will stimulate the production of content in Canada. Reforms could unleash the opportunities flowing from content and applications development for the IH by minimizing regulatory burdens on emerging content products and services, such as multimedia, programming and software. In general, the emphasis should be on reducing impediments to the development and export of content products and services in which Canada has a comparative advantage. This requires a primary emphasis on market mechanisms to ensure that the benefits of choice and competition are realized. Where market forces are insufficient to realize social objectives, such as indigenous content development and its exposure and access to the IH, other mechanisms may be appropriate. Furthermore, targeted support for Canadian content development, where applied, should be transparent.

In order to ensure widespread access to Canadian content for Canadians, innovative market-oriented approaches must be relied upon to the greatest extent possible. For example, it would be helpful to encourage the adoption of nation- or province-wide learning and training curricula content standards for all disciplines in order to create a sufficiently large market for domestic content producers. Thus, policy should emphasize a demand-pull versus a supply-

push approach to Canadian content development for the domestic market. The challenge is to strike a balance between cultural development and competition -- in effect, a new competitive model.

The liberalization of the telecommunications and broadcasting environment is likely the most important step required to realize the economy-wide benefits of IH use and development. Following a transitionary period toward market-based pricing, a framework of open and sustainable competition for the IH will lead to the lowest price, highest quality and greatest variety of services. Canadian firms using the IH benefit from reduced costs, improved links to suppliers and more effective organizational approaches that encourage empowerment, creativity and continuous innovation. It also serves to attract and retain global companies to locate value-added activities in Canada.

To put this in terms of overall economic benefits, the information industry represents approximately 10 percent of Canada's national output, while the firms and individuals that use its products and services represent 90 percent. Clearly, if one is interested in overall economic growth, improved productivity and increased national employment, the emphasis should be on the 90 percent of the economy who are users or customers. Over time, the enabling effect of the IH can be more fully realized by all firms leading to improved competitiveness and increased employment. The result will be a virtuous circle contributing to the improved competitiveness of the other 10 percent. Generating use of the IH requires striking a policy balance between access and competition.

Open international standards enhance access to different networks and sources of information, establish a level playing field for the diffusion of new products and services and extend productivity benefits on a global scale. These are enormous economic benefits. Government and industry should promote open standards policies and their rapid development on an international basis.

Structural change and employment shifts are an inevitable part of the move to a knowledge-based society. Government must respond by ensuring that learning institutions can provide Canadians with the skill sets to meet the challenge. In general, the IH should be used to promote closer linkages between learning, training and employment institutions and opportunities. Educators and business could jointly develop learning modules and certification mechanisms around their areas of practical expertise and should encourage the development of network-based, co-operative, vocational and apprenticeship programs. Lastly, it is important to find ways to foster widespread use of the IH by governments and firms as a means to find employees and, in so doing, improve the efficiency of the labour market.

The dimensions of economic and social transformation are uncertain. A collaborative, public-private-sector strategy for the development and use of the IH must be based on a solid quantitative and analytical foundation. This requires the development of new tools for measuring the knowledge-based economy. To better understand structural change,

employment shifts and the enabling effect, government, industry and international organizations should continue to research the economic and social impacts of the IH in order to provide a solid empirical and analytical basis for concerted action. These studies can be utilized on an on-going basis for seeking out new opportunities and reforming public policy.

V. RECOMMENDATIONS OF THE TASK FORCE

The following recommendations emphasize changes to foster a dynamic and progressive business environment. Any changes must respect Canada's core economic, social and cultural objectives.

1. *Fostering a Dynamic and Progressive Environment - All levels of government should examine legislation, regulations and policies in order to eliminate unnecessary barriers and promote the use and development of the information highway by individuals and firms. Areas of priority attention are: teleworking and home-based businesses, consumer protection and encouraging financing.*

2. *Setting the Example - Government should use the information highway to boldly and innovatively deliver services to Canadians. Government must disseminate its own information as aggressively and as widely as possible to those who can develop new applications and content.*

3. *Choice in Content - Government should develop new approaches for the promotion of Canadian content in a manner consistent with Canada's cultural objectives, the realities of a competitive global marketplace, the tremendous economic opportunities of the information highway, and in a way that encourages emerging and existing content providers.*

4. *Emphasizing Competition - Market demand must be the focus of evolving information highway competition. To this end, a reformed regulatory system should:*

    i) *encourage the rapid entry of new suppliers;*
    ii) *reflect convergence and promote synergy by, where possible, integrating information industry regulations;*
    iii) *review foreign ownership policies in order to promote investment and competition in Canada; and*
    iv) *after open and sustainable competition takes hold, which we recognize may take some time to achieve, move rapidly toward general marketplace rules. Limited regulation will still be required in areas such as network interconnection, access to "bottleneck" facilities, the elimination of cross-subsidies and number portability.*

5. *Standards - Together, government and industry must:*

   i) promote open standards policies and their rapid development on an international basis, while not limiting the scope for early developers and adopters of new information highway technologies to enter the marketplace;
   ii) ensure a well-functioning market on the information highway by maintaining a strong national voice in global standards setting initiatives;
   iii) ensure transparency by distributing standards information; and
   iv) support interfaces that are elegantly simple to use.

6. *Measuring the New Economy - To better understand structural change, employment shifts and the enabling effect (productivity enhancing capacity of the information highway), government, industry and international organizations should continue to research the economic and social impacts of the information highway in order to provide a solid empirical and analytical basis for concerted action.*

These recommendations were approved by the Information Highway Advisory Council at its meeting on April 21, 1995. The members of the Task Force represent many different firms and organizations. The following is a list of its members:

Irene Seiferling (chair) - Consumers' Association of Canada
Pauline Couture - Pauline Couture & Associates
Peter Flynn - EDTEL
Brian Milton - Stentor
Elizabeth Roscoe - Canadian Cable Television Association
Barb Stanley - Fundy Cable
Miriam Tuerk - Bryker Data Systems
John Warner - Canadian Business Telecommunications Alliance, IBM
David Watt - Unitel
Debbi Bryson - Human Resources Development Canada (ex-officio)
Mark Potter - Industry Canada (staff)
Marc Lee - Industry Canada (staff)
Rick Domokos - Industry Canada (staff)

The Advisory Council will be releasing its final report in late summer 1995.