

QUEEN
HC
120
.155
I45
1995

**Impacts of the Information
Highway on Employment and the
Workplace**

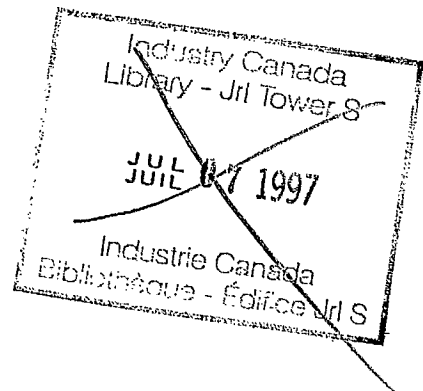
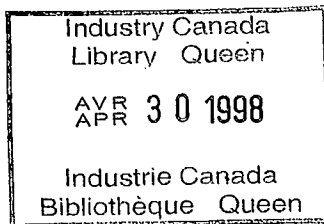


GOSS GILROY INC.
Management Consultants
Conseillers en gestion

Impacts of the Information Highway on Employment and the Workplace

Prepared for:

The Access and Social Impact Working Group of the Federal Information Highway Advisory Council



Prepared By:

Goss Gilroy Inc.
Management Consultants
900, 150 Metcalfe Street
Ottawa, Ontario
K2P 1P1
(613) 230-5577

May 19, 1995

1995
120
I55
I45
1995

1995
120
I55
I45
1995

Queen
HC
120
.I55
I45
1995

Table of Contents

1.0	Understanding the Challenge	1
1.1	The Turmoil of Change	1
1.2	Technological Convergence: The Vehicle of Change	2
1.3	The Information Economy	3
1.4	The Information Highway: A Vehicle for Change	4
1.5	The Federal Challenge	5
2.0	Objectives and Methodology	7
2.1	Objectives of Assignment	7
2.2	Methodology	7
3.0	The Information Highway	10
3.1	What is an Information Highway?	10
3.2	Components of the Information Highway	10
3.3	Access to the Information Highway	11
3.4	Competitive Trends	12
3.5	Emerging Information Highway Applications	12
4.0	Technological Change: Historical Perspectives, Contemporary Problems	14
4.1	Historical Perspectives	14
4.2	Contemporary Arguments	15
4.3	Job Creation or Job Destruction?	16
4.4	Employment Impacts in Telecommunications	21
5.0	Technological Change and Unemployment	25
5.1	International Considerations	25
5.2	The Canadian Situation	26
5.3	Causative Factors of Unemployment Growth	29
5.4	The Impact of Technology on Employment: Empirical Studies ...	30
6.0	Information Technology: Catalyst of Change	36
6.1	Macro-Economic Shifts: From Manufacturing to Services	37
6.2	Polarization of the Workforce: Skills	44
6.3	Polarization of the Workforce: Wages	49
6.4	Training and Educational Considerations	50



Table of Contents (continued)

7.0	Information Technology and the Organization of Work	56
7.1	Overview	56
7.2	Models of Structural Change and Work Organization	57
7.3	Organizational Structural Changes in Canada and the U.S.	59
7.4	The Evolving Flexible Workforce	61
7.5	Decentralization - Information Technology and Organizational Flexibility	62
7.6	Telework	65
7.7	The Implications of Telework	68
7.8	Electronic Surveillance	70
7.9	Summary	72
8.0	Industrial Relations and the Information Economy	73
8.1	The Role of Management in the Information Economy	73
8.2	Information Technology and Collective Bargaining	78
8.3	Employment Standards	83
8.4	Mobility of Work	88
9.0	The Information Highway: Catalyst for Diffusion and New Source of Wealth	94
9.1	The Process of Technological Diffusion	94
9.2	The Bit Tax: An Alternate Source of Revenue	96
10.0	Expert Advisory Panel Summary	99
10.1	General	100
10.2	Jobs and Technology Change	103
10.3	Education and Training	104
10.4	Industrial Relations and the Information Economy	105
11.0	Conclusions and Recommendations	107
11.1	Conclusions	107
11.2	Recommendations	109

Bibliography

Appendix A: Project Advisory Team

1.0 Understanding the Challenge

This report presents the findings of an investigation of the potential impact of the Information Highway on employment and the nature of the workplace. The study was conducted by Goss Gilroy Inc., for the *Access and Social Impact Working Group* of the federal *Information Highway Advisory Council (IHAC)*.

Specific issues which will affect workers and the performance of their duties as a result of the diffusion of information technology were examined, including: employment, education and training, work organization, industrial relations and collective bargaining. The assignment researched the relevant literature and solicited the views of a number of experts in the field of information technology, social policy, economics, and labour.

Due to its abbreviated time frame of only six weeks, the investigation relied heavily upon secondary research sources. While the research attempted to cover each area of concern as thoroughly as possible, it is recognized that there are several areas where further investigation may be warranted.

1.1 The Turmoil of Change

*"It's a transformative technology, as transformative as the steam engine or electricity itself. It turns our society inside out ... we can't predict how this will bring change."*¹

The last decade has been a daunting challenge. Like other developed nations, Canada has undergone more than a recession; it has endured nothing less than a profound socio-economic restructuring, a transition from a products-based to a knowledge-based economy. This transition is said to be "the third and final stage of a great shift in economic paradigms"² -- the third Industrial Revolution.

In corporate boardrooms, on plant floors, and in retail stores throughout Canada and around the world, this revolution has gained momentum. Businesses have been busy restructuring their organizations, reinventing themselves to create new management and marketing structures that can work effectively alongside the extraordinary array of new information and telecommunication technologies being brought on-line. The result has been a radical transformation in the way the world does business, one that brings into question the very role of the mass worker in the new economy. In Canada and other OECD countries, the evidence reveals a workforce in retreat, buffeted by the pace and impact of this change. Forced to compete with automation on the one hand and a global labour pool on the other, many Canadian workers find themselves squeezed closer to the economic margins and facing an increasingly uncertain future.

¹ Arthur Cordell, Special Advisor to the Federal Government on the Information Highway.

² Rifkin, J., "The End of Work," G.P. Putnam Sons, New York, 1995.



Like the process of evolution, the transition to a global information economy has not and will not be smooth. Regardless of how it is viewed, the process is unquestionably reshaping both the nature and the substance of our society. It is changing how we learn, how we interact, and how we live our lives. We can choose to resist it or embrace it -- but we cannot deny it.

In the context of today's global economy, Canada's advantage will be determined more by our knowledge and ideas and less by our natural resources and endowments. Our standard of living will come to depend upon our ability to provide our citizens with the requisite skills and insights to compete in an increasingly technological world, and upon the value we add to the global economy through the application of those skills and insights.

While in many ways we remain a nation in crisis, we have begun to recognize that with each crisis comes great opportunity. It is *how* that opportunity is seized which will determine our success in overcoming our difficulties and defining our collective future.

1.2 Technological Convergence: The Vehicle of Change

*"Early in the next decade the central processing units of 16 CRAY YMP supercomputers, now costing collectively some \$320 million, will be manufacturable for under \$100 on a single microchip ... Meanwhile, the 4KHz telephone lines to America's homes and offices will explode into some 25 trillion Hertz of fibre optics ... Gathering irresistible momentum over the next decade, these forces will blow away the old analogue establishments of television and telephony. Both can survive only to the extent that they transform themselves into digital computer networks."*³

In March 1963 J. Robert Oppenheimer, the director of the Institute for Advanced Studies at Princeton University, along with a group of distinguished scientists, economists, and academics, published an open letter to the President of the United States in *The New York Times*, warning of the dangers of automation and calling for a national dialogue on the subject. Concerned with the displacement of the human element of work by the new computer-based technologies, they warned that "a new era of production has begun. Its principles of organization are as different as those of the industrial era were different from the agricultural era."

More recently, Jacques Attali, a French minister and technology consultant to President Francois Mitterrand, confidently proclaimed the end of the era of the working man and woman. "Machines are the new proletariat," proclaimed Attali. "The working class is being given its walking papers." In the U.S., John Sculley, formerly of Apple Computer, expressed the belief that the 'reorganization of work' as a result of technological change could be as massive and destabilizing as the advent of the Industrial Revolution itself.

³ George Gilder, "The Death of Telephony," *the Economist*, Sept 1993.

The convergence of communication technology with computer technology is a central feature of this structural change (along with globalization of markets, corporate re-organization and mergers, and government policy changes). According to Perez,⁴ this convergent evolution amounts to a change in the techno-economic paradigm. "Propelling this new order is the most powerful juggernaut in the history of technology -- an impending millionfold rise in the cost-effectiveness of computers and their networks."⁵ Whereas in the past, incremental changes in existing technologies caused few problems for society, a combination of radically new technologies such as information technology (IT) involves many social and institutional changes. Some of these changes will be difficult and painful, including changes in the pattern of employment and skills.

Through the process of digitization, telecommunications has now adopted the machine language of the computer, allowing the merging of two previously separate disciplines. Two key factors (the exponentially increasing power of the microchip and the exponentially increasing carriage volume afforded by fibre optics) have brought these technologies to a confluence where we now speak of a new entity, the Information Highway.

Wedded to the telecommunications breakthroughs created by digitization, coaxial cable, and fibre optics, and connected across an array of users including government, corporations, schools, hospitals, laboratories and homes, the synergistic influence of the microchip translates into a nearly limitless social transformation. Technological convergence has propelled the information and communications industries toward a common ground and, almost overnight, promises to radically alter the nature of the economy and the way we live in our society.

To date, the driving force of this change has been the corporate sector, who view information technology (IT) as a *vehicle* for increased productivity and profit, albeit at the expense of jobs. The process has been aided by government through reduced regulations.

1.3 The Information Economy

*"The economic and social transformation brought about by the computer revolution is not just a question of the growth of new IT [information technology] industries; it is a question of the transformation of all other industries and services as a result of the ubiquitous penetration of IT. The computerization of every function within the organization is leading to a new type of corporate structure and a new management style."*⁶

⁴ Perez, C., "Structural Change and the Assimilation of New Technologies in the Economic and Social System," *Futures*, V15, 1983.

⁵ Gilder, G., "The Death of Telephony," *The Economist*, London, 1993.

⁶ Freeman, C., and Soete, L., "Information Technology and Unemployment," Brussels, 1993.

The use of information technology has become a fundamental tool in our economic and social transformation. Information systems are fast becoming the medium through which people will do their work and through which they will live out more and more aspects of their lives. In addition to the familiar products, IT now offers such enhanced services as intelligent networks, online databases, interactive imaging and video, electronic mail, electronic data interchange, electronic publishing and teleconferencing.

As it diffuses throughout the economy, IT is also rapidly changing the nature and patterns of work. New industries and new jobs are being created as old ones are being destroyed. Because of the transparency of time and distance, new models of work are quickly replacing traditional, industry-based models. For example, telework and the growth of the home office workforce can have positive impacts in creating greater flexibility in the workplace by: improving family life; lessening the environmental impact of current work patterns; and creating new employment opportunities, especially for the disabled. But the potential for negative impacts must also be recognized and resolved. These include: isolation in the home, fewer opportunities for workers to organize, job export, and the potential for abuse through longer hours and lower wages.

There is no doubt that the forces propelling us toward an information-based economy are formidable. That is why, if we are to ensure that the ensuing change is a positive one, the process must take place within a framework that addresses a range of social priorities. *In particular, we must address the impact of such technology on the nature of work.* A framework that highlights only commercial interests or underestimates the social ramifications of change will have an enormously negative consequence.

1.4 The Information Highway: A Vehicle for Change

"The basic thrust of the government's approach to the development of the Information Highway must be to ensure that the benefits of technology are distributed as widely as possible and that its negative impacts are minimized ... That is why it is crucial that the government act as a broker to ensure that the ethical, educational and training discussions are at the forefront -- otherwise we will continue to have a growing social and ethical dilemma that technology alone cannot help." ⁷

The term 'Information Highway' broadly describes the infrastructure necessary to transport the vast array of electronic signals used in accessing and sending information with present and future technology. It encompasses all types of electronic media, including voice, text and video. It can best be described as a global information infrastructure -- a seamless web of interconnected networks and services capable of transmitting electronic voice, information and imaging anywhere in the world.

⁷ MacWilliam L., and Turnbull, A., "Socio-Economic Implications of a British Columbia Information Highway," A report for the Telecommunications Workers' Union of BC and the British Columbia Science Council, Goss Gilroy Inc., November, 1994.

Everywhere one turns today, there is talk about the advances that will be brought about by this electronic freeway. Governments, both federal and provincial, have launched inquiries about how best to proceed in developing the system. Who will build the necessary infrastructure? What services should be provided? Who will get access and at what cost? How do we ensure the maintenance of the necessary social policy goals?

Carried along in the torrent of discussion regarding the advantages of an Information Highway is the assumption that the application of the technology will create jobs. While history has proven that technological change has led to long-term job creation through gains in productivity and innovation, we cannot make the assumption that the diffusion of information technology (through the creation of a national Information Highway or otherwise) will serve as a panacea for our current economic difficulties. This is because:

- information technology is far more pervasive than any other technological change experienced thus far;
- it is being introduced much faster than were earlier technologies, leaving society less time to adjust to the inevitable job losses which will occur and less time to train people for the new jobs that might be created; and,
- because it is transparent to distance and time, the technology makes jobs more portable, enhancing the ability to export jobs to low-wage jurisdictions.

To date, the impact of IT on employment has taken a back seat to the discussions about the development of commercial services on the Information Highway. Consequently, little research is available in Canada or elsewhere regarding this important issue.

Yet the employment question remains, perhaps, the most pertinent of all. It should not be dismissed with the simplistic assumption that the outcome will, in the final analysis, be a positive one. Only by exploring the cycle of 'creative destruction'⁸ inherent in the introduction of technology and by examining how its diffusion engages a process of economic restructuring, will it be possible for policy makers to learn how to maximize the beneficial aspects of information technology while mitigating its inherent destructive nature.

1.5 The Federal Challenge

"We are presented with a rare historical moment in which the threat of worldwide conflict seems remote and the transformations of economies and technology are blurring the lines between nations. The modern nation-state, some two hundred years old, is no longer what it once was. Vanishing is a nationalism founded upon the practical necessities of economic interdependence within borders and security

⁸ Creative Destruction is a term used to describe the impact of technology on employment. When a technological innovation is first introduced and diffuses through the economy there is an initial job displacement effect. Job creation takes place only after the technology has induced improvement in product quality and demand, leading to further innovation.

*against foreigners outside. There is thus an opportunity for us, as for every society, to redefine who we are, why we have joined together, and what we owe each other and the other inhabitants of the world."*⁹

There is a growing connection between the capacity of a nation to attract worldwide capital and the amount and kind of investments that the public sector undertakes. In a post-industrial world it is the skills of a nation's work force and the quality of its infrastructure which makes it uniquely attractive in the world economy.

As skills and experience increase, a nation's citizens add greater and greater value to the world economy, commanding higher levels of compensation and improving their standard of living. But without adequate skills and infrastructure, the relationship is likely to be the reverse, a downward economic spiral in which global investment can be lured only by relatively low wages and low taxes.

Properly developed, the Information Highway has the potential to be an instrument of economic and democratic empowerment, an open and interactive 'Commons' that redistributes the power of knowledge from the few to the many. It can become a vehicle through which to: expand our provincial and national economies; create new employment; develop greater access to our educational, cultural and social resources; and extend the very concept of participatory democracy.

For this reason, focusing on the commercial aspects of the Information Highway alone, without recognizing the relevant social policy issues, would be very short-sighted. If the Information Highway is to be accepted and supported by Canadians as a legitimate vehicle for social and economic change, there is a need to ensure that all levels of society will benefit. It is hoped that the findings and recommendations of this report will assist the federal government in mapping out such a course.

⁹ Reich, R., "The Work of Nations," Random House, New York, 1992.

2.0 Objectives and Methodology

2.1 Objectives of Assignment

The objective of this assignment was to provide an analysis of selected socio-economic policy issues, including: employment, training, work organization, industrial relations, and considerations for collective bargaining, which need to be examined in formulating future public policy on the development of a national Information Highway.

Specifically, the study sought to investigate the following:

- areas of projected employment losses and gains;
- future skills requirements related to the nature of work performed;
- widening skills gulf and compensatory benefits of knowledge workers;
- future training and retraining needs;
- the evolving nature of work (telework, home office, part-time work, contracting out, self-employment, and the virtual office);
- the changing distribution of work resulting from the diffusion of information technology;
- evolving organizational structures (management, surveillance, privacy);
- facilitation of employment export through information technology;
- considerations for collective bargaining; and,
- industrial relations (employment standards, legislation).

From the analysis of findings, appropriate policy recommendations were prepared for consideration.

2.2 Methodology

Our approach to the study has been necessarily shaped by the short six week timeframe available for its completion. We have therefore relied heavily on secondary research sources, many of which are international in origin. From the information available, a detailed working paper was developed and presented to an *Expert Advisory Panel* prior to convening a meeting to discuss the findings of the paper and develop policy recommendations for consideration. Panel views were then appended to the working paper and final recommendations developed.

Task 1 - Literature Review

Relevant information on the topics identified in the Terms of Reference was collected through a literature review. The following sources of information were identified:

- information collected in previous GGI studies, including the recently completed study entitled *Socio-Economic Implications of a British Columbia Information Highway*;



- information available through study team members, and from the collections of the Information Highway Advisory Council and its five working groups;
- Internet searches undertaken to identify relevant documentation. This included keyword-based searches of both Gopher and Telnet sites. World Wide Web (WWW) searches were also performed, with search engines such as Lycos, the WebCrawler, Yahoo, and the WWW Virtual Library being utilized. Searches of electronic journals and periodicals were undertaken;
- Canadian federal government libraries (in particular, Industry Canada, Statistics Canada and Human Resources Development Canada libraries) were searched; and,
- where available, information from foreign and international organizations was also obtained, including: the OECD, the International Labour Organization, the International Telecommunications Union, the European Council, the European Information Society Project Office (ISPO), the United States' National Infrastructure Initiative (NII), the U.S. National Telecommunications and Information Administration's Office of Telecommunications Policy Analysis, the U.S. National Technical Information Service, and the U.S. Bureau of Labour Statistics. Information was also collected from the Public Servants Alliance of Canada (PSAC), the Canadian Labour Congress (CLC), and the Canadian Union of Postal Workers (CUPW).

The collected information was organized and summarized by topic area, and relevant issues were identified. The summarized data were carefully referenced, and where varying opinions of impacts were obtained, they were identified together with their rationale.

Task 2 - Expert Panel Session

Once the literature review was completed, a working paper was developed and presented to members of an *Expert Advisory Panel* one week prior to meeting. The deliberation process involved an intensive, full-day discussion on the relevant issues, using the services of a professional facilitator. A taped transcript of panel comments was recorded and analyzed in compiling panel views and recommendations for inclusion in the final report.

The eight candidates recruited for the panel were selected from lists of candidates submitted by both the funding authority and the Canadian Labour Congress. Final selections were based on a number of criteria, including: representation from labour, experience in issues involving the Information Highway and the workplace, education, economics, market issues, government policy, and gender. Membership of the Panel, with biographical information on each representative, is provided in Appendix A.

Task 3 - Analysis of Issues

In order to more clearly define issues and identify possible policy initiatives, the information on each of the topic areas was analyzed in detail and synthesized with the information from the other topic areas.

The importance in viewing these Information Highway issues in the context of the current environment, where technological change is impacting all facets of the workplace, must be stressed. Information technology is only one aspect of the sweeping changes currently impacting society. These changes are, in turn, being driven by a number of factors, none of which can be isolated from the others. Canadian futurist Richard Worzel identified the following 'seven forces' revolutionizing our lives in his book entitled *Facing the Future*:

- global economy;
- population time bomb;
- technology (of which information technology is a component);
- environmentalism and ecology;
- longer lives;
- decline of the nation state; and,
- shattering of society and the isolation of the individual.

While it is difficult (if not impossible) to isolate the impacts of the Information Highway on the workplace environment from other current trends, to the extent possible we have focused on those areas where policy recommendations regarding the Information Highway can have a positive impact on employment and the workplace.

Task 4 - Reporting

The information collected in the study, together with the deliberations of the Expert Advisory Panel, was synthesized to form a comprehensive final report with recommendations for consideration by the Access Social Impact Working Group of the Information Highway Advisory Council.

3.0 The Information Highway

"The information highway system will play a critical role in employment, economic and social well-being, and the exercise of democratic values and citizenship. Without appropriate public policies, we run the risk of creating classes of information 'haves' and 'have-nots', with potentially serious downstream implications" ¹⁰

3.1 What is an Information Highway?

The term *Information Highway* broadly describes the infrastructure necessary to transport the vast array of electronic signals used in accessing and sending information with present and future technology. It encompasses all types of electronic media, including voice, text and video. It can best be described as a global information infrastructure -- a seamless web of interconnected networks and services capable of transmitting electronic voice, information and imaging anywhere in the world.

Many people talk about the Information Highway as if it is something yet to be created. The fact is, the Information Highway is already here. Major components of it have been put in place through the vast networks of fibre optic and coaxial cable used in today's telecommunications and broadcasting services. What remains to be developed is the linking together of these networks and the construction of appropriate 'on-ramps' or access points to the Highway.

A good analogy can be found in the development of the railway system. In the early days, different railways often had different widths, or gauges, between their rails. This meant traffic could not be exchanged from one rail system to the next. The problem was resolved when a common gauge standard was established. Similarly, the various components of our present telecommunications networks must yet be standardized to permit the interchange of electronic traffic between networks.

In the same way, the presence of a super highway is of no use to people if they do not have the necessary vehicles to drive on it or a means of accessing it. For this reason, any discussion of the creation of an Information Highway must, by necessity, involve a discussion of the means of access -- the computer hardware and software needed to cruise this 'electronic turnpike.'

3.2 Components of the Information Highway

The Information Highway can best be perceived as a hierarchy of components, each of them determining the final character of the system. To different people the Highway means different things because, in many cases, they are talking about different things.

¹⁰ Industry Canada, "Canadian Information Highway: Building Canada's Information and Communications Infrastructure," April 1994.



One's perception of the Highway is dependent upon one's mode of access. The Highway is composed of four levels: media, channels, services, and content. The final make-up of the Highway depends on the options chosen within each of the four levels.

Level IV: Content

The actual information transmitted or accessed is referred to as content, including: data bases; text, sound and video transmissions; programming (radio and television, electronic publishing); and community bulletin boards. The ability for OLE (Object Linking and Embedding) technology now allows for the blending of database text with voice and full motion video, components normally associated with broadcasting.

Level III: Services

For a user of the technology it is most often the service or application which is perceived to be the Highway. Examples of services or applications that travel on the Information Highway are: local and long-distance telephone service, electronic mail, video-conferencing, the Internet, electronic bulletin boards, Interac banking services, Electronic Data Interchange (EDI), television and cable television services.

Level II: Channels

The telecommunications and cable networks of today are increasingly 'intelligent'. Computers, the software that drives them and the terminal equipment used, control the way that information is handled, the routes travelled and the transmission protocols used. These are the *channels* through which electronic or optical signals can travel. *Bandwidth* measures the carrying capacity of the channel. Simply put, it is the amount of information which can be pushed through a given channel in a given amount of time.

Level I: Media

Information can be transmitted through a number of different physical media, including fibre optic cable, coaxial cable, copper (twisted pair) cable, and wireless (radio, TV, satellite, microwave) networks. In many cases a signal or service may travel through more than one type of medium from source to destination. The kind of medium chosen depends on the carrying capacity of the medium as well as the cost of installation. Fibre optic cables carrying electronic impulses in the form of light have, by far, the greatest capacity to carry information (bandwidth). This is followed by coaxial cable, the kind used by cable broadcasters to provide local television signals to the home.

3.3 Access to the Information Highway

At present, services such as the Internet, public E-Mail and competitive long-distance services are accessed through the local telephone network. Because almost all traffic between users and non-telecom services must travel through local circuits, the telephone companies' local access network has become a technical *bottleneck*. This situation will likely change in the near future as a result of the recent decision of the CRTC allowing cablecoms to provide telephone services.

Telephone and cable networks are presently connected to homes and businesses totally independent of one another. Copper cable is used in telephone wiring and coaxial cable in cable networks. There has been some discussion about how individual access to the Information Highway should be facilitated (telecom, cablecom or hybrid network).

3.4 Competitive Trends

"To date, Canadian public policy and regulation has generally treated the cable and telephone industries as entirely different species ... the potential convergence of telephone and cable technologies calls into question the continuation of the two solitudes of policy and regulation that have applied to the two industries." ¹¹

Researchers at Bell Northern Research (BNR) predict that increases in user demand will necessitate transmission speeds 20 times greater than the present level by the twenty-first century. Neither telecom nor cablecom networks are currently adequate to handle the anticipated increase in demand over the next ten years. Each type of network has particular advantages and weaknesses. Telephone networks' strength lies in their switching ability; that is, they are able to transfer calls easily between subscribers. Their weakness is in limited bandwidth within the local access loop. Cable networks, on the other hand, enjoy high bandwidth capability with local access but, until recently, have been unable to provide interactive service from one subscriber to another.

Recent technological developments have increased the tendency for the previously distinct markets of telephone and cable networks to overlap. The creation of new markets or territories, such as home shopping, banking, database and E-Mail services, video and audio on demand, and telemetry services, has invited competition between previously disparate networks to claim these territories.

While government policy and regulations have traditionally treated cable and telephone companies as different entities, the emerging convergence of cable and telephone technologies has demanded a second look at restrictions that inhibit networks from diversifying outside of specified areas. Such a review has recently been completed by the CRTC, resulting in a decision which levels the playing field by clearing the way for telecoms to enter the cable TV domain and for cablecoms to compete in the telecom area. As well, it is the general view among senior CRTC staff members that the 'two solitudes' view of broadcasting and telecommunications is coming to an end. Decisions pending from the recently completed CRTC hearings on the issue of convergence may open a new era of competition in a previously tightly regulated environment.

3.5 Emerging Information Highway Applications

To further understand the Information Highway, the following emerging applications have been identified. This list of applications given below has been generated with reference to both provincial and national initiatives within Canada. Foreign initiatives have also been reviewed, including:

¹¹ Local Networks Convergence Committee, "Convergence: Competition and Cooperation," 1994.

- those relating to the National Information Infrastructure (NII) initiative in the United States;
- European initiatives as identified in the Bangemann Report on the Information Society, the Growth, Competitiveness and Employment White Paper, and the Information Society Project Office (ISPO); and,
- Japanese initiatives (such as those sponsored by the Ministry of Posts and Telecommunications).

Although not an exhaustive list of potential Information Highway applications,¹² this listing does illustrate the broad spectrum of activities that the convergence of information and communications technologies (ICT) is touching upon. Furthermore, the variety of sources indicates the truly global nature of the Information Highway.

Emerging applications, which include broadband and narrow band applications, include:

- telelearning/distance learning (including applications for education and training);
- telemedicine (including applications for patients, such as remote diagnosis, and the medical profession, such as virtual hospitals and multi-media training materials accessible on-line);
- electronic delivery of government services;
- electronic business applications based on electronic data interchange (EDI) such as electronic tendering and procurement;
- intelligent transportation system (ITS) initiatives (also known as intelligent vehicle-highway systems - IVHS);
- entertainment services (such as videos on demand);
- home shopping and electronic retailing;
- information database services;
- digital libraries;
- community applications (such as FreeNets); and,
- cultural applications (including on-line museums and cultural information).

It should be noted that many of the current Information Highway initiatives are narrow band in nature, and are commonly available through systems such as the Internet. E-Mail and the ability to access and transfer text and graphical files are driving many of these initiatives. With further development and implementation of the Information Highway, more broad band applications with real-time and interactive capabilities will emerge.

¹² To more fully explore initiatives, see sources such as "Putting the National Information Infrastructure to Work" (1994), by the U.S. General Accounting Office (GAO); "Electronic Enterprises: Looking to the Future" (1994), by the U.S. Office of Technology Assessment (OTA); the European report entitled "Europe and the Global Information Highway" (also known as the Bangemann Report, 1994); "Japan and the Global Information Society" (1994), available through Japan's Ministry of Posts and Telecommunications, and "Socio-Economic Implications of a British Columbia Information Highway (1994)", by Goss Gilroy Inc./Telecommunications Workers Union.

4.0 Technological Change: Historical Perspectives, Contemporary Problems

"If men have the talent to invent new machines that put men out of work, they have the talent to put those men back to work" (John F. Kennedy, President of the United States of America)

4.1 Historical Perspectives

Since the beginning of the industrial revolution people have predicted that machines will destroy jobs. In the 1760s the French physiocrats argued that only agriculture was truly productive -- that the shift of the labour force into other sectors would reduce national wealth. Over the following half century the agricultural share of the French labour force did, in fact, decline; but productivity increases led to average wage growth of nearly 25 percent, while unemployment showed no significant rise.

In the early 1800s the Luddites, bands of English Artisans, rioted against the threat of mechanization by smashing the looms and spinning jennies (carding machines that prepared cotton fibre for spinning into thread), fearing that automating the production of thread would destroy jobs. Likewise, the introduction of the electric motor in the 19th century and mass production of automobiles in the 1920s were accompanied by the spectre of massive job losses.

In the 1940s cyberneticist Norbert Wiener forecast the invention of the modern computer and wrote, "If these changes in the demand for labour come upon us in a haphazard and unorganized way, we may well be in for the greatest period of unemployment we have yet seen." George Meany, the president of the AFL-CIO, warned that the new labour-saving technologies were "rapidly becoming a curse to this society ... in a mad dash to produce more and more with less and less labour, and without feeling [as to] what it may mean to the economy as a whole."

Technology both destroys and creates jobs. While there has certainly been a period of job shedding during the introduction of new technologies, history demonstrates that the diffusion of these technologies into the economy has, in fact, increased productivity and created new employment in whole new industries, which more than offset the initial, transient job displacements. In the forty years following Wiener's prediction average hourly wages in the United States more than doubled, while unemployment increased by only one or two percentage points.

The problem with technological change is that the jobs created may well be in other industries, other sectors, other geographic locations -- even other countries -- than the jobs that are lost. Workers affected by job displacement often find the need to re-skill, relocate or pursue a career change in order to regain productive employment. It is this 'human dimension' to the problem which is seldom accounted for in assessing the net benefits of technological change.



In most periods, when the rate of structural change has been high, there have been observable shifts in the economy necessitated by adjustments in the nature and composition of the labour force. At the same time, these shifts have been accompanied by rising demand for labour and increased real wages. As a consequence, the job-destroying nature of past technological change has been more than offset by the longer-term, job creating capabilities.

A good example of policy development which reflected the need, at that time, to accommodate technological change, was the creation of land grant colleges in the U.S. In its efforts to help rural Americans make the adjustment from an agricultural to an industrial-based economy, the U.S. federal government passed the Morrill Act of 1862, which provided for land grant colleges. These universities, which were open to people of all backgrounds, were asked to expand beyond the then-traditional areas of educating preachers, lawyers and doctors, to provide education in fields such as agriculture, engineering, and business administration.¹³ Through grants, the Morrill Act also encouraged state legislators, who had been reluctant to invest in technical education, to establish new engineering schools. In addition, under the Smith-Lever Act of 1914, partial federal funding was directed to a nationwide extension program focusing on agriculture and the problems of rural areas. Moreover, as Americans learned that special technical knowledge was the key to prosperity in the modern age, secondary educational institutions were restructured to prepare American youth for an increasingly differentiated set of economic roles. Not only were vocational courses added to the educational curriculum, but the schools themselves were remodelled to conform to the prevailing business standards of efficiency.

While these examples of the past provide reassurance, the question remains whether they are relevant in a contemporary economy that has been beset by sluggish growth and inundated by a quantum leap in the *pace* of technological change. Perhaps Weiner's prediction is only now finding expression through the convergence of information and communications technologies, whose synergistic impact is far more pervasive and potent than any other experienced to date.

4.2 Contemporary Arguments

*"While some employment has always accompanied the introduction of new technology, the additional jobs created directly and indirectly have been sufficient not only to replace those lost but also to expand employment substantially."*¹⁴

Structural unemployment has traditionally been regarded as the consequence of displacement of labour through technological change. Yet there is no *a priori* reason why the introduction of labour-saving technology should have, as a net result, a reduction in the

¹³ Kerr, C. "The Uses of the University," Cambridge, MA, 1972.

¹⁴ Organization for Economic Cooperation and Development, "The OECD Jobs Study," 1994.

total demand for labour.¹⁵ Technological change is a process of 'creative destruction,' which involves job destruction in outmoded technologies and industries, paralleled by job creation in new sectors and occupations.

Contemporary arguments highlighting the negative impacts of the introduction of information technology dismiss the historical perspective as being irrelevant to today's world. The rationale is that, because of its dramatic labour-saving potential and pervasive influence, the rapid application of information technology -- unlike that of previous technologies -- will lead to a dramatic and immediate loss of jobs which will not be matched by consequent job creation impacts. At the same time, the significant job displacement effects which the new technologies create, and the slow response of our education, training and skills development in addressing the emerging skills requirements, increase the 'mismatch' between labour supply and demand.

It is suggested that this mismatch between the supply and demand of skilled labour to meet the needs for absorption of the new technologies is one of the major factors (along with globalization) in the structural unemployment observed today.

4.3 Job Creation or Job Destruction?

While high rates of structural change in the economy result in adjustments in the nature and composition of the labour force, to date these changes have always been accompanied by rising demand for labour and rising wages.¹⁶ It is argued that the additional jobs created have been sufficient not only to replace those lost, but also to expand overall employment and productivity. Evidence of this is cited in a report published by the Organization for Economic Cooperation and Development¹⁷ and supported by numerous other recent studies, as will be discussed later.

Nevertheless, there remains considerable disagreement about the impact of technology on the workforce, particularly with respect to information technology (IT). On the one hand, there have been dire predictions concerning the potential net loss of employment due to IT. This has been particularly true in recent years as widespread technological change has accompanied sluggish economic growth. On the other hand, proponents of IT argue that it increases productivity and economic growth, which will ultimately result in the creation of new industries and new employment opportunities.

¹⁵ Conference Board of Canada, "Jobs in the Knowledge-based Economy: Information Technology and the Impact on Employment," November 1994.

¹⁶ Conference Board of Canada, "Jobs in the Knowledge-based Economy: Information Technology and the Impact on Employment," November 1994.

¹⁷ Organization for Economic Cooperation and Development, "The OECD Jobs Study," 1994.

The Job Creation Argument

The view that advanced technological change is an enabling process is supported by recent evidence which concludes that, on balance, technological change creates more jobs than it destroys. According to the 1994 Jobs Study conducted by the OECD, the results from empirical studies undertaken show no evidence of major job losses as a result of the introduction of new technologies. "At the same time, there is little evidence to suggest that the new information technologies create jobs on a massive scale."¹⁸

Brouwer et al (1993) found that firms with a high rate of IT-related research and development (R&D) experienced above average employment growth.¹⁹ Freeman and Soete²⁰ reported that, despite all the turbulence and restructuring, the IT industries and services have been the fastest growing group of activities in world production, trade and employment.

According to the OECD study, the theory of technological unemployment, where machinery substitutes for labour, is not supported by evidence. The authors argue that there is nothing in the post-war pattern of economic growth to suggest that the present unemployment problems have their roots in technological innovation; if anything, the opposite appears to be the case. "While some unemployment has always accompanied the introduction of new technology, the additional jobs created directly and indirectly have been sufficient not only to replace those lost, but also to expand employment substantially."²¹

Freeman and Soete, in a 1985 study,²² reviewed theoretical literature and empirical studies on unemployment. They concluded that, although many jobs could, and would, be lost through technological change, this could be more than compensated by a process of job creation in new occupations, industries and services. However, it was cautioned that the compensation mechanism was not automatic and that the new jobs created might be different in nature and in geographic location. These conclusions have been supported in a number of other studies, including Schettkat,²³ Gertensberger et al,²⁴ and Cyert.²⁵

¹⁸ Organization for Economic Cooperation and Development, "OECD Jobs Study," Paris, 1994.

¹⁹ Brouwer, E. et al., "Employment Growth and Innovation at the Firm Level," *Journal of Evolutionary Economics*, Vol. 3, 1993.

²⁰ Freeman, C. and Soete, L., *Information Technology and Employment*, 1993.

²¹ Organization for Economic Cooperation and Development, "Jobs Study," Paris, 1994.

²² Freeman, C., and Soete, L., "Information Technology and Employment: An Assessment," Brussels, 1993.

²³ Schettkat, R., and Wagner, M., "Technological Change and Employment: Innovation in the German Economy," 1990.

²⁴ Gertensberger, W. et al., "Impacts of Information Technology on Future Employment," 1990.

More recently, the optimistic conclusions drawn from these studies have been challenged, based upon the pervasiveness of IT in influencing all economic sectors and the current unavailability of employment in the services sector to compensate for job declines in the industrial sectors.

Closer to home, the 1994 Conference Board of Canada report²⁶ and the report to the Science and Technology Review Initiative compiled by the Job Creation and Skills Working Group²⁷ lend support to the earlier findings by Freeman and Soete. Yet, despite their positive predictions, the findings of these studies also highlight areas of significant concern:

- While both theory and evidence indicate that, in the long run, information technology should create more jobs than it destroys, there is a very real concern about a protracted time lag between the cycles of job destruction and job creation. It is recognized that the consequences of a prolonged lag between these cycles must be addressed, along with the fact that the new jobs created may be inappropriate for the displaced workers.
- The problem of a growing educational and occupational 'mismatch' between the job losses and new employment opportunities will require governments to assist in making workers more adaptable through improvements in education and training. This will require a restructuring of our educational curriculum to accommodate information technology as both an educational instrument and learning tool and a commitment to the concept of life-long learning.
- The introduction of information technology has led to a world-wide sourcing of industry inputs which can be expected to increase substantially with a global Information Highway. The effect of globalization of the labour market and the ability to exploit world-wide price differentials could hurt unskilled labour in higher wage countries such as Canada.

Moreover, in Canada the trade deficit in IT, \$4.8 billion in 1993 (i.e., \$11.8 billion in total imports vs. \$7.0 billion in total exports) indicates that many of the direct, indirect and induced jobs associated with sourcing IT are generated outside of Canada.²⁸

²⁵ Cyert, R.H., and Mouwery, D., "The Impact of Technical Change in Employment and Economic Growth," National Academy of Sciences and National Academy of Engineering, 1988.

²⁶ Conference Board of Canada, "Jobs in the Knowledge-based Economy: Information Technology and the Impact on Employment," November, 1994.

²⁷ Job Creation and Skills Working Group, "Science and Technology Review," October 1994.

²⁸ Industry Canada and Statistics Canada, Insight Database, January, 1995.

The Job Destruction Argument

While studies supporting the enabling effects of information technology provide room for optimism, they have failed to address the fundamental question of why the inordinately high levels of unemployment currently experienced amongst the developed nations remains so intransigent. Is it a consequence of the natural time lag between the destructive and creative aspects of the cycle of innovation? Or are other factors at play which serve to exacerbate the job destructive nature of technological innovation while depressing the job creative aspects?

In his treatise entitled *The End of Work*, Jeremy Rifkin²⁹ cites a plethora of examples of recent sectoral job losses, presumably caused by technological change, including:

- the elimination of 9,000 employees at U.S.-based Bankcorp, more than 25 percent of its workforce;
- the Union Carbide decision to trim costs by eliminating more than 13,900 workers;
- GTE's recent decision to cut 17,000 employees;
- the decision by NYNEX Corp. to eliminate 16,800 workers;
- the elimination of 5,000 employees by Stockholm-based ICA because of operations re-engineering;
- the announcement by telecommunications giant NTT of Japan of its intention to eliminate 30,000 jobs (15 percent of its workforce);
- the 1993 announcement by GMC that changes in production would eliminate 90,000 jobs at U.S. plants, on top of the 250,000 jobs lost since 1978;
- the reduction by US Steel of 120,000 jobs to 20,000 jobs between 1980 and 1990; and,
- the reduction in worldwide employment by General Electric of 170,000 jobs (43 percent of its workforce) while tripling sales.

The February 1994 edition of *The Wall Street Journal* reported that "much of the ... service sector seems to be on the verge of an upheaval similar to that which hit farming and manufacturing, where employment plunged for years while production increased steadily ... Technological advances are now so rapid that companies can shed far more workers than they need to hire to implement the technology or support expanding sales." The Journal cautions that, across the U.S. economy, corporate re-engineering could eliminate between 1 million and 2.5 million jobs a year over the foreseeable future.

Even more disturbing is the finding, in a 1993 study by the U.S. Department of Labour, that less than 20 percent of those who were retrained under federal programs for dislocated workers were able to find new jobs paying at least 80 percent of their former salary. Noted U.S. economist Peter Drucker states bluntly that "the disappearance of labour as a key

²⁹ Rifkin, J., "The End of Work," G.P. Putnam Sons, 1994.

factor of production" is going to emerge as the critical "unfinished business of capitalist society."³⁰

According to Rifkin, in the first quarter of 1994 layoffs from big corporations were running 13 percent over 1993, with industry analysts predicting even steeper cuts in payrolls in the future. Rifkin argues that the current wave of technological change is fundamentally different than its predecessors in pace, scope and nature. His thesis is based upon the following observations:

- The impact of previous technological advances, such as the advent of electricity, was confined to a small part of the economy, mainly manufacturing; in contrast, information technology has the potential to impact across *all* economic sectors.
- In the past, when new technologies replaced workers a new sector was always available to absorb the loss; in contrast, today's principal growth area, the service sector, will itself be directly impacted by these structural changes.
- Information technology is being introduced at a much faster rate than were earlier technologies, giving societies considerably less time to replace jobs lost and re-train workers for the new jobs that will eventually be created.
- Due to its transparency to time and distance, IT makes work more portable, allowing jobs to be moved to new jurisdictions where the cost of labour is lower. In essence, the technology not only reduces demand for labour, it also increases its supply.

According to Rifkin, two very specific courses of action will need to be pursued if the industrialized nations are to successfully make the transition into a post-market era:

- productivity gains resulting from the introduction of new labour- and time-saving technologies will have to be shared with millions of working people. Dramatic advances in productivity will need to be matched by reductions in the number of hours worked and steady increases in salaries and wages in order to ensure an equitable distribution of the fruits of technologies progress.
- the shrinking of mass employment in the private sector and the reduction of government spending in the public sector will require greater attention to be focused on the third sector, the non-market economy. Is it the third sector -- the social economy -- that people will turn toward to help address personal and societal needs that can no longer be dealt with by either the marketplace or legislative decrees. This is the arena where men and women can explore new roles and responsibilities and find new meaning in their lives now that the commodity value of their time is vanishing.

³⁰ Drucker, P., "Post-Capitalist Society," Harper Collins, New York, 1993.



4.4 Employment Impacts in Telecommunications

Digitization, the development of fibre optics, and the phenomenon of convergence have paved the way for a host of new, fully-automated services in telecommunications. The advantages of these services, however, have come with obvious human costs. Ironically, the industry that is the creative nucleus of contemporary technological change -- telecommunications -- is the industry most impacted by such change.

In Canada, little recent information on job reductions is available on Stentor or their member telecoms. However, Bell Canada recently announced proposed job cuts amounting to a loss of 10,000 workers over the next three years. As well, BC Telecom, Canada's second largest telecom, anticipates a 21% reduction in its network operations workforce during the 1991-96 period. Expected job reductions include 35% in management, 22% in clerical, 19% in crafts and 23% in the technical area.³¹

In the United States, AT&T is in the process of installing computerized operator services, which will allow it to close 31 offices and eliminate one-third of all operators. This amounts to an elimination of about 6,000 workers replaced by 'voice recognition' technology. Recent evidence of other employment impacts in the U.S. telecom carrier industry is given below:

Table 4.4.1: Employment Figures of Major Telecommunications Companies in the U.S.

	1986	1990	Change
AT&T	316,900	273,700	-43,200
GTE	161,000	154,000	-7,000
Nynex	84,000	79,300	-4,700
Ameritec	71,170	69,437	-1,733
US West	59,221	54,868	-4,353
MCI	17,596*	24,509	+6,913
Total	709,887	655,814	-54,073

Source: Bolton, et. al., "Telecommunications Services: Negotiating Structural and Technological Change," International Labour Organizations, Geneva, 1993. *Pertains to 1988 data.

In addition to the job cuts outlined in Table 4.4.1, the following table provides a list of U.S. companies that have recently announced further proposed job cuts.

³¹

BC Telecom, Industry source.

**Exhibit 4.4.2: U.S. Telecommunications Companies that have
Announced Job Cuts within the Last Two Years**

	Workforce	
	Planned Cuts	Percent
AT&T	26,000	9%
GTE	20,000	15%
Nynex	17,000	22%
Ameritech	11,000	15%
Pacific Telesis	10,000	19%
Bellsouth	10,000	12%
U.S. West	9,000	14%

Source: Business Week (July '94)

In other jurisdictions, Telecom New Zealand is spending NZ\$ 4 billion to phase out its 55,000 party lines and completely digitize its network. The company recently announced proposed cuts amounting to 72 percent of its original workforce, from 26,500 (1987) to only 7,500.³² In Australia, the Telecom industry eliminated 17,000 positions in the last decade with over 6,000 jobs eliminated in 1991-92 alone. A further reduction of 33% by the mid 1990s is anticipated.³³ And in Japan, telecommunications giant NTT has announced its intentions to eliminate 15% of its workforce -- a loss of 30,000 jobs.

Areas of Growth in Telecommunications

While large numbers of jobs are being lost in the telecommunications industry, it is also clear that information technologies are creating thousands of new businesses and new job opportunities. Employment in the U.S. software, data processing and information retrieval industries was reported in Business Week, July 12, 1994 to have grown by 31% since 1988, and to now include more people than the auto industry. Another example cited was the increase in jobs at the Home Shopping Network, which had grown to 5,000 people from 600 in 1985.

The advent and rapid growth in the last decade of facsimile transmissions and, more recently, modem traffic has dramatically increased the amount of information carried by the telecommunications networks. Estimates place the percentage of total long distance

³² Shenker, J., Communications Week International, April, 1995.

³³ Circuit, "Employment in Telecommunications," Australia, 1992.

traffic (AT&T estimate) accounted for by fax at between 10% and 20%, and because of time and language difficulties, approximately 50% of international calls are fax traffic. Modem speed has increased dramatically in the last few years and, coupled with a greater use of Internet and online databases, is leading to greater amounts of digital information being transmitted. However, while such areas are fostering certain economic growth in the industry, attendant job creation impacts are minimal.

While there are jobs being created in the industry, most of these higher-skilled jobs are insufficient in number to replace job losses in the core areas of service. As well, there are few opportunities for the unskilled workers who have been displaced. While retraining may or may not be the answer to providing employable skills to these workers, there continues to be a societal cost associated with lost income taxes coupled with increased social assistance payments.

Summary

The significant job displacement effects which the new technologies create and the slow response to emerging skill requirements creates a 'mismatch' between labour supply and demand.

It is this mismatch between the supply and demand of skilled labour to meet the needs of the new technologies that is a major factor in the structural unemployment observed today.

Despite the ongoing arguments as to whether IT is a net job creator or a net job destroyer, there is one indisputable fact that has been recognized. As a consequence of the impact of technological change, the economy is becoming increasingly polarized between high paying 'skilled' or specialized labour and low paying variable skilled labour consisting of non-standard jobs.

It is the polarization of work and the displacement of workers at all skill levels that are of most immediate concern regarding the impact of information technology.

The bifurcation of jobs and wages into two extremes as a result of technological innovation is shrinking the middle class. A bimodal distribution of wealth and a growing division of communities into the 'haves' and the 'have nots,' with consequential sociological implications, is taking place.

U.S. Economist Peter Drucker warns that the observable shift in the composition of labour demand, away from unskilled labour and toward skilled labour, risks becoming socially divisive. According to Drucker, the critical challenge facing the emergent information society is to prevent a new "class conflict between the two dominant groups in post-capitalist society: knowledge workers and service workers."³⁴

³⁴ Drucker, P., "Post-Capitalist Society," Harper Collins, New York, 1993.

In order to further investigate the relationship between technological change and employment, the following chapter considers recent employment trends and compares Canada's performance to those of the other OECD nations. This discussion will provide the framework for a more detailed analysis of information technology as a catalyst of structural change in Chapter 6.



5.0 Technological Change and Unemployment

*"With 35 million people out of work in OECD countries [which account for 75 percent of world economic activity] and many millions more out of work in developing countries, global unemployment rates remain at their highest levels since the 1930s. The need for employment-oriented policies thus becomes ever more urgent."*³⁵

The last five to ten years can best be described as a period in history of profound structural change at both the political and economic levels. We have witnessed the end of the Cold War and collapse of the Soviet Block, the creation of regional trading blocks through the North American Free Trade Agreement and the Maastricht Treaty, a shift in world market growth to the Pacific Rim, and the globalization of trade afforded by emerging information technologies. We have also seen a worrisome escalation of unemployment amongst developed nations.

5.1 International Considerations

The unemployment crisis is truly global in nature, with few parts of the world having been spared dramatic job loss. Most central and eastern European economies in transition have been experiencing dramatic job losses since 1989. Sub-Saharan Africa has seen sharp falls in both employment and real wages. Latin America, while showing some improvement in employment since the mid 1980s, is still plagued with rates of unemployment that remain inordinately high.³⁶

For the first two post-war decades, unemployment among OECD countries averaged less than 10 million, but between 1972 and 1982 this number tripled. While a common feature has been a slowdown in economic growth since the '60s, this has occurred against a backdrop of wide variations in labour performance, such as the faster growth of service industries and decline in the agricultural and industrial sectors.³⁷

The EC countries, and since the 90s the EFTA countries too, have experienced a prolonged period of jobless growth, with barely any growth over the last 20 years. While from 1985

³⁵ ILO report prepared for the 1995 United Nations Social Summit, Copenhagen, "The Unemployment Crisis: Diagnosis and Remedies," World of Work, No. 10, 1994.

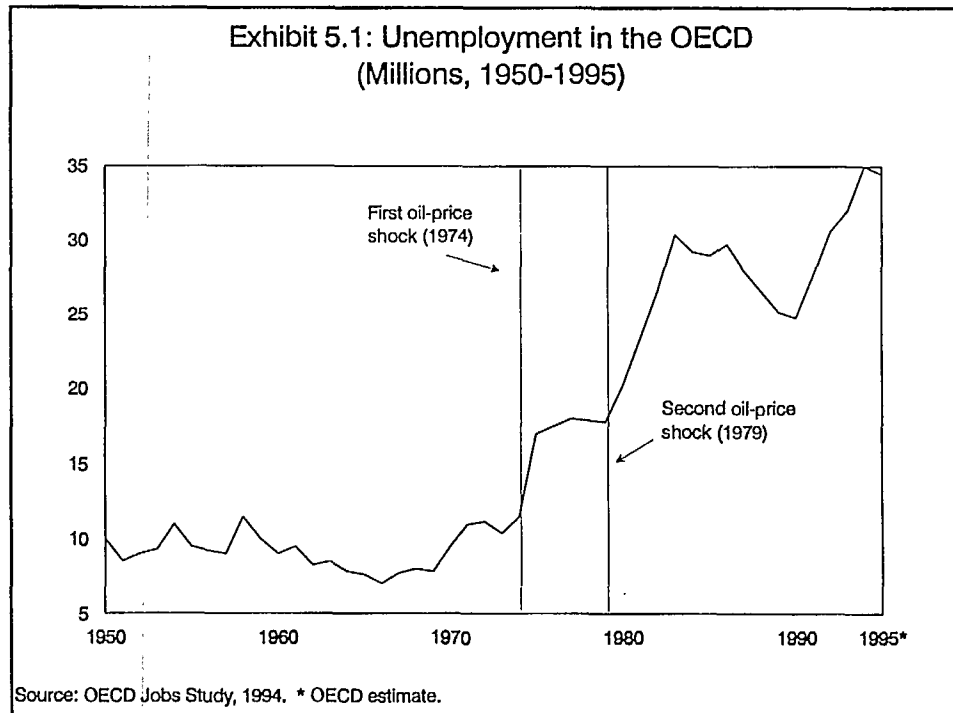
³⁶ ILO report prepared for the 1995 United Nations Social Summit, Copenhagen, "The Jobless Horizon: Unsettling Prospects," World of Work, No. 8, 1994.

³⁷ Organization for Economic Cooperation and Development, "Jobs Study," Paris, 1994.



to 1990 employment grew at an unprecedented rate, the shedding of jobs since then has been so large as to nullify the transient gains.³⁸

The early 1990s, in particular, have been marked by high levels of unemployment throughout the OECD. Since the 1970s we have witnessed a 'ratcheting up' of the level of unemployment between the successive peaks and troughs in economic activity. This suggests that a major part of this unemployment is 'structural,' and is not easily reversed by economic recovery. This trend is illustrated below in Exhibit 5.1.



This is not to say that there has not been significant job creation. The Japanese economy has been characterized by substantial employment growth. As well, South and East Asia, whose extremely rapid employment growth is averaging 2.5 percent per year, has become the new pole of economic growth in the world.³⁹ Having built up their industrial capacities and workforce skills to compete with Western economies, these countries are becoming the manufacturing hub of the industrialized world. While the growing export competitiveness of these countries has been a real threat to jobs and wages in developed countries, it follows that expanding exports to Asia, Latin America and eastern Europe can be some of Canada's most important sources of future job creation.

³⁸ Freeman, C., and Soete, I., "Structural Change in the World Economy," Information Technology and Employment, 1993.

³⁹ Ibid

The U.S., as a technological leader and a region of greater labour flexibility, has also experienced dramatic employment growth over the past three decades, with employment nearly doubling since 1960. The downside of this has been a decline in wages and a reduction in the purchasing power of many U.S. workers. This, in turn, has contributed to a widening of the income gap, such that the U.S. now has the most unequal distribution in income of any industrialized country.⁴⁰

While recovery in employment after the global recession of the early 1990s has been slower in some countries than has been the case in earlier downturns, a recent report by the OECD ⁴¹ concludes that this appears to reflect a weaker initial rebound in output rather than the spectre of 'jobless growth.'

5.2 The Canadian Situation

"The nature of work has changed as result of the development of new technological tools, in particular those associated with the information revolution. In the past, new employment in the services sector replaced much of the work lost through the automation of manufacturing - now the sector of last resort appears to be welfare, which a declining middle class is ever more loath to support." ⁴²

Ideally the new technologies should be bringing important economic benefits to all Canadians. But somewhere there has been a slip between promise and performance; these benefits have not been distributed equitably among all sectors of society. The results are a greater disparity of income and quality of life between the haves and the have-nots, the erosion of the middle class and major increases in unemployment.⁴³ Where, once, priority was placed upon stability and full employment, today the call is for a flexible and compliant labour force with the attendant concept of continual change in the mix of jobs, skills and expectations.

Canada continues to struggle during a difficult period of economic restructuring. As one of the countries where recovery has been underway the longest (including the U.S., United Kingdom and Australia) Canada's initial phase of recovery has been anemic. While experiencing employment growth over the long run, this has not prevented unemployment rates from 'ratcheting up' from one downturn to the next.

⁴⁰ Report prepared for the 1995 United Nations Social Summit, Copenhagen, "The Unemployment Crisis: Diagnosis and Remedies," World of Work, No. 10, 1994.

⁴¹ Organization for Economic Cooperation and Development, "Jobs Study," Paris, 1994.

⁴² Yalnizyan, A., Ide, T., and Cordell A., "Shifting Time," Between the Lines Publishing, Toronto, 1994.

⁴³ Source: Ibid



According to renowned economist, John Kenneth Galbraith, consecutive waves of recession and technological change have, in fact, resulted in creeping unemployment and a growing 'functional underclass.' In the 1940s the unemployment rate in Canada was 2.7 percent, rising to 5.1 percent in the '60s, 9.3 percent in the '80s, and peaking at 11.6 percent in 1993. Two years into recovery, Canada's unemployment rate has fallen only marginally to 9.6 percent (February 1995). According to Yalnizyan et al, "over the last 20 years profound restructuring has turned the labour market into an unemployment lottery." ⁴⁴

This transition is creating hardships for individuals, for businesses, and for the country at large; each increase in the unemployment rate has been accompanied by cyclic declines in family income and greater social unrest. "In the more recent period, if more women had not joined the labour force, real family incomes would have fallen even further." ⁴⁵

The fact that employment in Canada is still below its pre-recession peak raises the question of the extent of this fundamental structural shift in the economy. Employment usually lags behind output growth during the initial phases of recovery and in Canada such productivity increase has not been strong. This is reflected in the poor performance of employment growth.

The data reveal that in both Canada and the United States economic forces are at work which are polarizing society. Canada's middle class is shrinking, with only a few moving up the economic ladder and many more moving down. In 1967 some 27 percent of working Canadians had annual earnings within middle income levels. By 1986 this had fallen to 22 percent, while those with low incomes rose from 36 percent (1967) to 40 percent of the workforce. Accordingly, those with high incomes rose from 37 percent to 39 percent, following a trend similar to that in the United States. ⁴⁶

Statistics Canada confirms that, while income disparities have increased steadily over the last two decades, they have done so most rapidly during the last five years. For example, between 1973 and 1987 the richest 10 percent of Canadian families were the *only* group to increase their share of income, while the poorest 10 percent saw their share plummet by 47 percent. Canada seems to be emulating the U.S. model, where some 18 percent of the workforce is now composed of individuals putting in 40 hour weeks at 'poverty level' wages. ⁴⁷

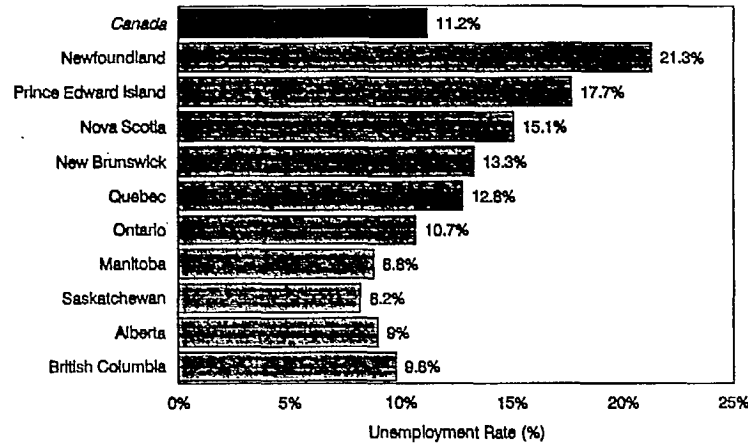
⁴⁴ Yalnizyan, A., Ide, T., and Cordell A., "Shifting Time," Between the Lines Publishing, Toronto, 1994.

⁴⁵ Industry and Science Canada, "The Micro-Economic Agenda: Growth with Jobs," September 1993.

⁴⁶ Yalnizyan, A., Ide, T., and Cordell A., "Shifting Time," Between the Lines Publishing, Toronto, 1994.

⁴⁷ World of Work, "The Unemployment Crisis Diagnosis and Remedies," No. 10, 1994.

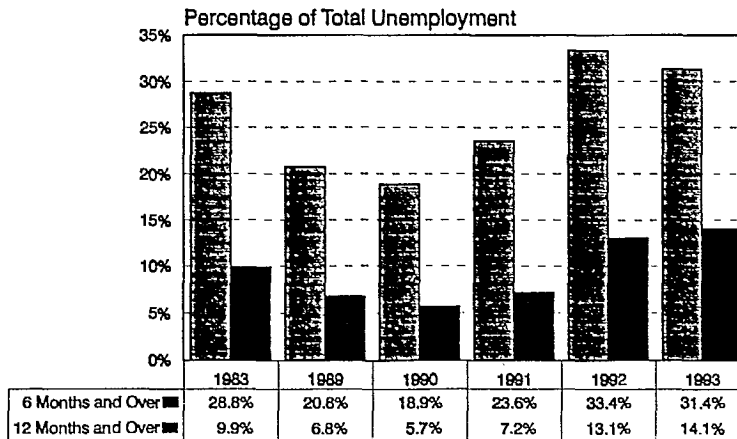
Exhibit 5.2a: Canadian and Provincial Unemployment Rates, 1993



Source: Statistics Canada, Canadian Economic Observer, January, 1995.

In August 1993, 826,000 Canadians (about 5.8 percent of the workforce) gave up looking for work. Even more disturbing is the finding that the percentage of those unemployed for 12 months or over has more than doubled since 1990. Although economic recovery has been underway for some time, the incidence of long-term unemployment is headed in the wrong direction -- up instead of down (see Exhibit 5.2b). Simply put, Canadians who are unemployed are staying that way longer. According to a 1995 Industry and Science Canada report, this could lead to a significant de-skilling of key human resources.

Exhibit 5.2b: Incidence of Long Term Unemployment in Canada; 1983-1993 (As a Percentage of Total Unemployment)



Source: OECD Employment Outlook, 1994.



5.3 Causative Factors of Unemployment Growth

"Without work the vessel of life has no ballast" (Stendhal 1788 - 1842)

In a report presented to the United Nations Social Summit held recently in Copenhagen, the International Labour Organization (ILO) concluded that labour market rigidities, in the form of labour and social policy initiatives, cannot be blamed for the increase in unemployment; nor can unemployment be viewed as simply a cyclical or structural phenomenon. According to the findings, the assumption that increases in productivity lead to increases in employment is "one that does not always add up."⁴⁸

The ILO report suggested that the global unemployment crisis has three causative factors: declining economic growth, structural changes in production resulting from a quantum leap in technological change, and past policy inadequacies which contributed to poor economic performance. In citing "a veritable technological revolution in micro-electronics, computer science and telecommunications ..."⁴⁹ the authors conclude that, while not the principal cause of current global economic dislocations, information technology has indeed played a major role. More importantly, the current and future international environment has been, and will be, to a large extent shaped by this technological revolution.

The report also notes a growing consensus that the market economy is the best vehicle to ensure higher growth and emphasizes that the forces of technological progress and globalization are unstoppable. "Attempts to shelter from their effects through protectionist or autarchic policies are futile and will prove self-defeating."⁵⁰ While the report cautions against the threat of increasing polarization between nations, it suggests that the key to success is to adjust more quickly in order to minimize the period of transition. It recommends that the battle be fought on two fronts: internationally through more effective policy coordination, and domestically through appropriate job creating programs and growth oriented policies (including removal of disincentives to hiring, promotion of the development of small and medium-sized enterprises, and undertaking necessary reforms in education and training).

5.4 The Impact of Technology on Employment: Empirical Studies

In a period of high unemployment it is tempting to consider that technical progress and resulting structural change have been proceeding too rapidly, thereby aggravating the level of unemployment. However, analysis shows that this correlation is not necessarily correct.

⁴⁸ World of Work, "The Jobless Horizon, Unsettling Prospects," No. 8, 1994.

⁴⁹ Ibid

⁵⁰ Ibid

During the 1980s manufacturing employment rose faster in those countries which experienced the highest rate of structural change.

A number of studies stressing the international dimension in the links between technology and employment have shown that accelerated uptake of new technologies which led to productivity growth rates higher than competitors resulted in net employment gains. Conversely, tardy introduction of new technologies relative to other countries was shown to have a dampening effect on employment levels.

The general conclusion, from an employment perspective, is that *it is worse for technological change to occur through price pressure from foreign competitors than to initiate such change indigenously.*⁵¹

In the following section the findings of recent empirical studies on technology and employment, including macro-economic, micro-economic and sectoral analyses, are considered.

Macro-Economic Considerations

Definitive conclusions on the aggregate impacts of technological change on employment can only be captured through studies which examine inter-sectoral or industry-wide relationships between technological change, productivity and employment.

Using a macroeconomic econometric model, a sectoral model and input-output analysis, Meyer-Kramer (1992)⁵² concluded that the employment-displacing effects of technological change are largely compensated by job-creating effects. **However, it was emphasised that employment expansion can only be expected if a number of favourable conditions are met, in particular, *strong aggregate demand.***

With respect to total employment figures, Meyer-Kramer concluded that neither the 'job destroying' nor the 'job creating' hypothesis could be confirmed. The findings conclude that technological change, in particular with respect to information technology, leads to a 'shift' in the structure of employment away from manufacturing and toward services. This job shift also entails a commensurate change in the inventory of job skills, with a tendency toward skills upgrading.

These findings have been confirmed in other studies, including a major study conducted in the U.S. by Leontief and Duchin, who analyzed the likely employment effects of

⁵¹ Organization for Economic Cooperation and Development, "Technology and Jobs," STI Review, No 1, 1986.

⁵² Meyer-Krahmer, F., "The Effects of New Technologies on Employment," Economics of Innovation and Technological Change, Vol 2, 1992.



computer technologies between the years 1980 and 2000.⁵³ Although the widespread use of information technology was expected to reduce labour requirements by five to 12 percent, when final demand and output were considered there was an average projected employment growth of between two to three and one-half percent.

Like previous studies, the Leontief-Duchin study emphasised the significant job displacement effects which new technologies are likely to create. The study cautioned that a high rate of technological change has a severe impact on the 'mismatch' in the labour market, which will produce major changes in the distribution of the workforce in terms of sectors of employment growth, occupations and skills.

Industry and Sectoral Studies

The interpretation of industry and sectoral studies must be done with care as these studies often generalize case-study insights, which can lead to erroneous conclusions. For example, the prediction that a wordprocessor would enable a single secretary to carry out the typing work of three to five persons led to the conclusion that five million typists in Europe would lose their jobs within ten years. In reality, the number of office jobs increased -- albeit the *functions* of the job changed significantly.⁵⁴ The study reported by DeWit (1990), while disputing the 'job-killing' theory of information technology, did provide evidence of the phenomenon of 'job shift,' where lower-skilled jobs (found redundant through the application of information technology) were displaced through the creation of new jobs requiring higher, more broadly defined skill sets. Further evidence of this job shift was documented in a recent study of the British Columbia telecommunications industry (MacWilliam and Turnbull, 1994).⁵⁵

A number of other studies have examined the impact of information technology on employment on a cross-section of industries. Their findings demonstrate that, although technological change induces an initial substitution of labour, price reductions and product innovations eventually compensate for the initial job loss.⁵⁶

The TEMPO program, which consisted of five different branch and sector studies carried out in the U.K., forecasted increasing employment levels in all information technology-related industries. According to the TEMPO study, a crucial role in job creation is played

⁵³ Leontief, W. and Duchin, F., "The Future Impact of Automation on Workers," Oxford University Press, 1986.

⁵⁴ DeWit, G.R., "A Review of the Literature on Technological Change and Unemployment," MERIT, 1990.

⁵⁵ MacWilliam, L., and Turnbull, A., "Socio-Economic Implications of a British Columbia Information Highway," A report for the Telecommunication Workers' Union of BC and the British Columbia Science Council, Goss Gilroy Inc., November, 1994.

⁵⁶ Organization for Economic Cooperation and Development, "Empirical Studies on the Impact of Technology on Employment," OECD Jobs Study, Paris, 1994.

by the services sector (particularly tourism, education, recreation, entertainment and health care) in creating compensating employment for technologically-induced job displacement.⁵⁷

In a large attitudinal survey carried out in all 12 EC member countries (1987 to 1988), the employment impact of the introduction of new technologies was investigated. The findings confirmed that, in those cases where the impact of information technology could be identified, the recruitment of new personnel was the most prominent impact noted. An earlier report on the impact of microelectronics on jobs reviewed studies from 13 OECD countries and concluded that technological change had *not* contributed significantly to the levels of unemployment at the time.⁵⁸

Although such studies paint an optimistic view of the impact of new technology on employment, they cannot be taken as proof that the introduction of information technology leads to net employment gains. In the BC Telecommunications study (MacWilliam and Turnbull)⁵⁹ the authors found that at virtually all levels of the traditional telecom industry the number of jobs was shrinking. While new employment was being created in emerging telecom services, the number of jobs created was insufficient to offset those traditional jobs made redundant by advances in technology. The findings are consistent with those of a recent OECD study of the telecom sector of its 25 member countries. The study reported a consistent decline of 7.5 percent of the telecom workforce over the decade from 1982 to 1992.⁶⁰

The job creating impact of IT, while generally supported by evidence, is not conclusive. *The question remains whether the inevitable processes of innovation and product demand will provide sufficient job creation to re-deploy those workers displaced from redundant jobs -- and whether those workers will have the requisite skills to qualify.*

Micro-Economic Considerations

While the findings from micro-economic studies cannot be extrapolated to represent economy-wide trends, they do provide important insights into the process of technological change at the level of the plant or individual firm. Such studies confirm that the employment-displacing effects of information technology are felt most acutely at the process level of the industry. Although they do not support the hypothesis that the

⁵⁷ Freeman, C. and Soete, L., "Technical Change and Full Employment," Basil Blackwell, Oxford, 1987.

⁵⁸ Organization for Economic Cooperation and Development, "Microelectronics, Robotics and Jobs," Paris, 1982.

⁵⁹ MacWilliam, L., and Turnbull, A., "Socio-Economic Implications of a British Columbia Information Highway," Goss Gilroy Inc., November, 1994.

⁶⁰ Darlington, R., "The Information Superhighway: An International Trade Union View," Postal, Telegraph and Telephone International, United Kingdom, 1994.



introduction of information technology has an overall labour-reducing impact, they do provide evidence that the job creating potential is contingent upon the level of innovation.

Research by Mandeville et al (1983) suggests that competitiveness, output and employment may, in fact, increase with the rapid introduction of information technology.⁶¹ In addition, Brouwer et al (1993) found that, while the growth rate of the R&D intensity of firms had a negative impact on employment, firms with a high rate of information technology-related R&D experienced above average employment growth.⁶²

More comprehensive surveys have concluded that the net effect of IT on employment depends heavily on the conditions within individual firms and industries. A major survey by Northcott (1984) has demonstrated that the overall direct, labour displacing effect of the introduction of information technology is estimated at less than 0.5 percent of total manufacturing employment and less than 5 percent of total jobs lost in manufacturing.⁶³

The conclusion reached by many investigators is that investments in innovation have expansionary effects, increasing aggregate demand and thereby creating job opportunities. *Thus, the initial labour-reducing impact of information technology may be compensated where it is followed by product innovation.* As will be discussed later, this finding has significant relevance with respect to the use of the Information Highway as a tool for technological innovation.

Summary

While the compilation of studies by the OECD provide some element of comfort, the studies have been recognized to have limitations. The implication inherent in the studies that the past can predict the future is debatable. Finally, while the studies provide evidence of projected net job losses and gains, and consequent skill shifts, there is an alarming lack of consideration for the social and economic ramifications of these changes.

Many economists, such as Nobel Laureate Wassily Leontief, maintain that, while technological change is inevitable, the emerging knowledge sector will not be able to create enough new jobs on a sustainable basis to absorb the millions of workers displaced by technological change. This view is, however, not universal. In a recent report conducted for Human Resources Development Canada, Mitchell (1994) has asserted "... that the

⁶¹ Mandeville, T. et al., "Technology, Employment and the Queensland Information Economy," University of Queensland, Brisbane, 1983.

⁶² Brouwer, E. et al., "Employment Growth and Innovation at the Firm Level," Journal of Evolutionary Economics, Vol 3, 1993.

⁶³ Northcott, J., "Micro-electronics in British Industry: the Pattern of Change," Policy Studies Institute, London, 1984.

information economy will create jobs is unquestionable." ⁶⁴ A third avenue of opinion is provided by a recent report on technology and employment in the *Economist* which suggests that the introduction of IT will, in the end, have little effect on the level of unemployment. ⁶⁵

In general, the findings suggest that:

- *the employment impact of information technology will vary considerably according to industry and sector and will be highly dependent upon the degree of innovation and increased product demand resulting from its diffusion;*
- *the mismatch between labour supply and demand resulting from the application of information technology (and confirmed by numerous studies) creates significant job displacement and is a major factor in the structural unemployment observed today.*⁶⁶
- *irrespective of its overall employment impact, Information Technology will have a profound impact on the composition of jobs and the pattern of wages; and,*
- *the inadequacy of current programs in education, training, and skills development in reflecting the knowledge requirements of emerging technologies is a significant impediment to the rapid diffusion of IT.* Addressing this concern through policies which can revitalize and restructure our educational systems and provide the knowledge-based skill sets necessary holds special significance with respect to the use of the Information Highway as a learning tool.

⁶⁴ Mitchell, J., "Social and Economic Aspects of the Information Highway," Human Resources and Development Canada, December 1994.

⁶⁵ The Economist, "Technology and Unemployment," February 1995.

⁶⁶ Organization for Economic Cooperation and Development, "Empirical Studies on the Impact of Technology on Employment," OECD Jobs Study, Paris, 1994.



6.0 Information Technology: Catalyst of Change

"For the optimists, the corporate CEOs, professional futurists, and avant garde political leaders, the dawn of the Information Age signals a golden era of unlimited production and rising consumption curves, of new and faster breakthroughs in science and technology, of integrated markets and instantaneous gratifications. For others, the triumph of technology appears more a bitter curse, a requiem for those who will be made redundant by the new global economy and the breathtaking advances in automation that are eliminating so many human beings from the economic process." ⁶⁷

In the preceding chapter, an overview of unemployment at the national and international levels was provided. Causative factors of unemployment growth were identified and empirical evidence was provided with respect to the influence of technological change on the workplace. This chapter will investigate the specific impact of information and communication technology (IT) as a catalyst for structural change. Arguments will be provided that IT is a synergistic *accelerant* of technological change. Acting in concert with other economic forces, it is more pervasive in its reach, more potent in its impact, and more evolutionary in its nature, than any previous agents of change.

The dynamics of the current wave of technological change sweeping the global economy are rooted in information technology. Like all instruments of technological change, IT is a powerful mechanism -- an 'enabling resource' which cuts across *all* sectors and destroys occupations and jobs at the same time as creating new ones. Information technology affects the structure and organization of virtually all industries that incorporate its innovations. It is *precisely* this pervasive nature, and the pace at which such changes are occurring, that has made IT such a difficult 'beast' to control.

It is notoriously complex to isolate the effects of technology from the overall cyclical movements of economies; the impact of information technology is no different in this regard. However, the empirical data does yield evidence of four discernable trends:

- an accelerating macro-economic shift from a manufacturing to a service-based economy with consequent job losses and job gains;
- an increasing polarization of the workforce into a core group of highly skilled, permanent workers and a larger group of less skilled, contingent workers, with a concomitant increase in wage disparity;
- a growing mismatch between labour supply and demand in terms of skills and qualifications of the workforce; and,

⁶⁷

Rifkin, J., "The End of Work," G.P. Putnam Sons, New York, 1995.



- the movement toward an increasingly knowledge-based economy with a commensurate increase in the educational entry level to the workforce.

These trends are investigated in the following sections.

6.1 Macro-Economic Shifts: From Manufacturing to Services

Growth in Services

To date, the economic result of technological change in IT has been dichotomous: a rapid increase in productivity in the sectors developing the technology, and a dramatically slower rate of productivity increase in the sectors using it. The difficulties experienced by the world's economies to absorb and implement this new technology has hampered its job creation potential and prolonged the recovery cycle.⁶⁸

Evidence demonstrates that the industries and types of workers that will benefit from change are often different from the ones who will lose from it. Inherent in the process of change wrought by the application of IT is a discernable shift in economic activity from the manufacturing to the services sector.

The argument has been presented that IT has now reached a tertiary phase. While in its first stage (1970s) efficiency gains led to an initial shedding of labour; in the second stage (1980s) product improvement had a neutral impact on employment. The third stage, which we are now entering, will usher in a wide range of new product innovations with attendant employment growth.⁶⁹ If this hypothesis is correct, the use of the Information Highway as a mechanism for innovation and absorption of emerging technologies could have positive employment benefits.

Well known Canadian economist, Nuala Beck, has identified four 'engines of growth' in the new economy: computers and semi-conductors, health and medical services, communications and telecommunications, and instrumentation. According to Beck, the new economy is composed of industries which have not yet peaked out structurally (e.g., semi-conductors, instrumentation, pharmaceuticals, biotechnology) and now comprises 58.3 percent of the Canadian economy. The old economy, with industries in structural decline (e.g., oil refining, textiles, steel, breweries and beverages), comprises 12.3 percent of the economy; another 28.1 percent of industries are on the verge of structural decline (e.g., government, mining, insurance, banking).⁷⁰

⁶⁸ Organization for Economic Cooperation and Development, "OECD Jobs Study," 1994.

⁶⁹ Barras, R., "Towards a Theory of Innovation in Services," Research Policy, August, 1986.

⁷⁰ Beck, N., "Jobs with a Future," Engineering Dimensions, January, 1995.

Jobs in the new economy are to be found in the high-knowledge industries such as engineering, education, computer equipment, and scientific and control instruments. Conversely, job losses are being experienced by those industries in the process of structural decline. Some companies reveal startling differences:

- the computer industry now employs more Canadians than the oil and gas industry;
- the Canadian printing and publishing industry employs more people than mining;
- the electronics industry employs more than the primary metals industry; and,
- more Canadians now work as management consultants than as loggers or foresters.

According to Beck, it is a myth to characterize the new economy as a service economy. While services are a predominant sector of growth, there is considerable expansion of the manufacturing sector in information-based goods such as cellular phones, computers, software development, and other value-added, high-tech products.

Countering the argument of 'jobless growth,' Beck estimates that between 1984 and 1993 Canada's new economy created 816,000 jobs; however, Statistics Canada employment figures show that during this time the number of unemployed Canadians also rose from 1.38 million to almost 1.6 million persons. It appears that, while there is certainly job creation taking place in the new economy, the rate of growth is not sufficient to offset both the growth in the size of the labour force and the job losses experienced in the old economy.

a) *International Considerations*

In all OECD countries the composition of production has shifted to services, with a steady decline in manufacturing. Rapid growth is being experienced in finance, real estate and business, as well as community, social, personal and health care services. In a 1992 study of nine countries conducted by the OECD, most parts of the service sector ranked in the top 10 employment growth areas for every country.⁷¹ While growth in the service sector accounts for two out of three new jobs in the OECD, it should be noted that jobs in this sector are often of the low-skilled, low-paid variety and of a part-time nature. Rapid job growth has also been noted in some areas of manufacturing, typically those containing high-tech industries such as computers.

b) *Canada and the U.S.*

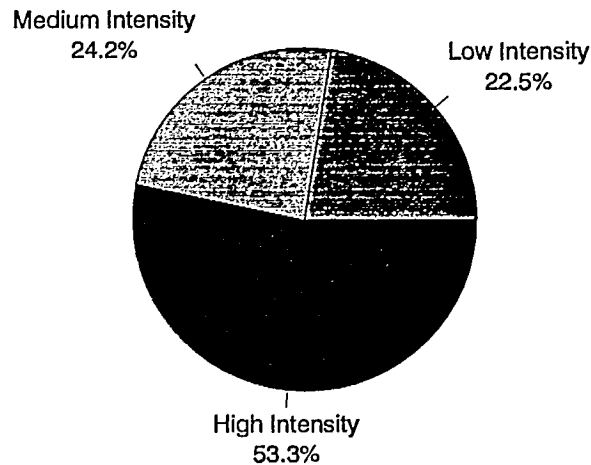
Both Canada and the U.S. show the highest shares of total employment in services of all OECD nations, with a significantly higher share of total employment in finance, real estate and the business services sector, where many jobs are highly skilled and well paid. However, this service sector growth has also been accompanied by a rise in self-employment and other non-standard forms of employment, such as part time and temporary work (implications of this will be discussed in Chapter 7.0)

⁷¹ Organization for Economic Cooperation and Development, "Structural Change and Economic Development," Paris, 1992.



According to the Department of Finance, over the 1984 to 1991 period, knowledge-intensive industries (as determined by the proportion of weeks worked in the industry by people with university degrees) contributed to 53 percent of the total employment growth in Canada (see Exhibit 6.1a). ⁷²As shown in Exhibit 6.1a below, despite having only about one-third of total employment, these knowledge-intensive industries contributed more to employment than all other industries combined. ⁷³

Exhibit 6.1a: Employment Growth in Canada by Intensity of Knowledge Input, 1984-1991



Source: Department of Finance, Economic and Forecasting Division; OECD Jobs Study, 1994.

Like other OECD countries, most employment growth in Canada and the U.S. has occurred in the service-producing industries, particularly in the areas of education, health care, financial and entertainment services. In a recent OECD study, projections on the structure of employment by occupation among member nations were conducted. ⁷⁴ The results are summarized in Table 6.1 below, which outlines Canadian and U.S. employment trends to the year 2000, according to major occupational groups.

⁷² Lee, M., and Potter, M., "Economic Impacts of the Information Highway," Industry Canada, April 1995.

⁷³ Department of Finance, Canada, "Employment Growth in High-Tech and High Knowledge Industries," 1992.

⁷⁴ Organization for Economic Cooperation and Development, "Employment Outlook," July 1994.

Table 6.1: Projected Employment Growth between 1990 and 2000,
by Major Occupational Group for Canada and the United States

Major Occupational Group	Canada	United States
Professional and Technical	20.3%	36.4%
Administrative and Managerial	22.2%	25.9%
Clerical and Related	10.8%	13.7%
Craft and Skilled Manual	-1.0%	13.3%
Production, Service and Labourer	9.4%	22.4%
Sales Workers	6.0%	20.6%
Agricultural and Related	2.1%	3.4%
Total	11.2%	21.8%

Source: OECD Employment Outlook, 1994 (Canadian data from HRDC Canadian Occupational Projection System (COPS); U.S. data from the Bureau of Labour Statistics).

Exhibits 6.1b and 6.1c show the ten Canadian occupations with fastest growth and largest job gains and losses projected to the year 2000. These exhibits clearly demonstrate the growth in 'In-person Services' occupations described by Reich (p. 57). Note the significant downsizing taking place in the occupational groups which are 'shop floor' trades, with narrowly defined skill sets and repetitive tasking.

Exhibit 6.1b: Ten Occupations in Canada with the Highest Net Growth and Loss Rates, 1990-2000 (% Change)



Source: HRDC COPS; OECD Employment Outlook, 1994.

Exhibit 6.1c: Ten Occupations in Canada with the Largest Net Job Gains and Losses, 1990-2000 (Absolute Change in 000's)



Source: HRDC COPS; OECD Employment Outlook, 1994.

In an analysis of U.S. employment trends, Silvestri (1993)⁷⁵ noted the following:

- Service workers are projected to move from second to first place as the largest employment group in 2005 and employment in service occupations is expected to climb by 33 percent. The share of employment in service industries will increase from 16 to 17.5 percent of total employment with more than half of the jobs created in the rapidly growing services industries, including: health services, social services and business services.
- Similar to Canada, the comparative wages of service workers are significantly (40 percent) below the average for all occupational groups. Almost one-third of these employees have less than a high school education and twice as many worked part-time than the average for other workers. The data show that, while jobs are being created, most tend to be of low-skill and low-wage variety.
- Among the major occupational groups, professional specialties, technicians and related support occupations, and service occupations will show the fastest increase. Executive, administrative and managerial occupations are projected to have faster than average growth, while marketing and sales occupations will increase about as fast as total employment. Employment in the professional specialty occupations shows the second largest increase after service occupations, with robust growth in computer-related occupations.

According to the U.S. Department of Labour, there is every reason to believe that the service sector will be a net source of jobs for the future. Between 1990 and 2005 the U.S. economy is projected to gain 23 million service sector jobs while losing 600,000 in manufacturing.⁷⁶ It is estimated that more than 25 million of the projected 26.4 million jobs will be created in the services sector, with fewer than one million jobs in the goods producing industries.

Decline in Manufacturing and Primary Production

a) International Considerations

According to recent findings from the OECD jobs study, the displacement of labour by technology-related productivity gains was the primary factor for employment loss in nine out of ten of the bottom-most industries. Import penetration was a much less important factor for declining employment in these industries, with the exception of textiles. It should be noted that the combination of labour productivity gains and import penetration was particularly pronounced in Canada.

⁷⁵ Silvestri, George T., "Occupational Employment: Wide Variations in Growth," Monthly Labour Review, November, 1993.

⁷⁶ Bowman, C., "Trends in Industry Employment 1990-2005," The Service Economy, Vol 7 (3), July, 1993.



The study found that declining industries are concentrated in low wage, labour intensive manufacturing such as textiles, footwear, tobacco, furniture, electrical machinery, transport, heavy industries, fabricated metals, mineral products and chemicals. For some countries, declining industries also included agriculture, mining, construction and trade.

*b) U.S. Considerations*⁷⁷

Total U.S. employment is projected to increase 22 percent between 1992 and 2005. The economy is expected to continue generating jobs for workers at all levels of education and training; however, the distribution of employment is similar to other OECD countries, with an increasing number of jobs for highly skilled knowledge workers and decreasing opportunities for workers with a high school education or less.

While the number of workers in administrative support occupations is projected to grow, the effect of continued technological change and further developments in automation is expected to mitigate the growth rate, particularly for telephone operators, typists, word processors, and postal clerks. The historic decline in employment for agriculture, forestry, fishing and related workers, operators, fabricators and labourers is expected to slow, while a significant decline in jobs is projected for manufacturing, utilities, government, and communications -- one of the industries fueling the process of change to the information economy.

Exhibits 6.1d and 6.1e below show the ten U.S. occupations with fastest growth and largest gains and losses, projected to the year 2000.

These exhibits, like the exhibits for Canada, demonstrate strong growth in 'In-Person Services' occupations and a similar downsizing of those occupational groups which constitute the 'shop floor' trades.

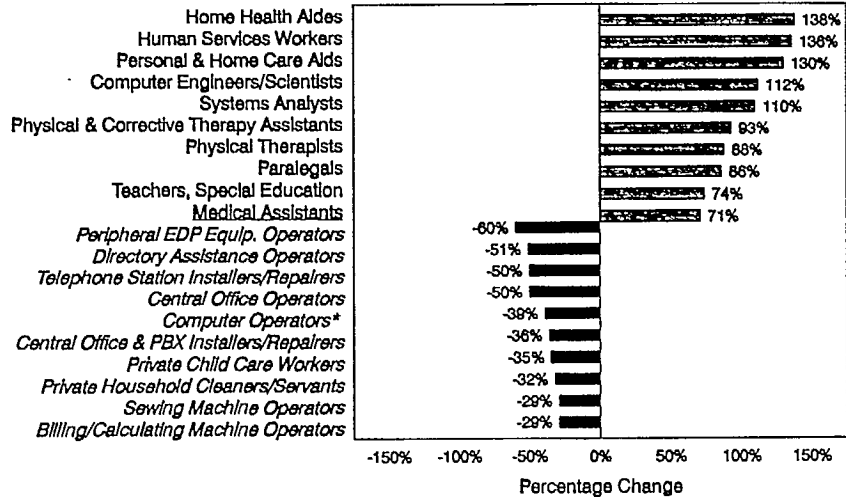
c) Canadian Considerations

An analysis conducted by the Department of Communications (Canada) identified a 'structural crisis of adjustment'⁷⁸ prevalent in the Canadian economy. The study investigated the sectoral impacts of information technology and identified a number of industry sectors which were negatively affected in terms of employment. These included:

⁷⁷ Silvestri, George T., "Occupational Employment: Wide Variations in Growth," Monthly Labour Review, November, 1993.

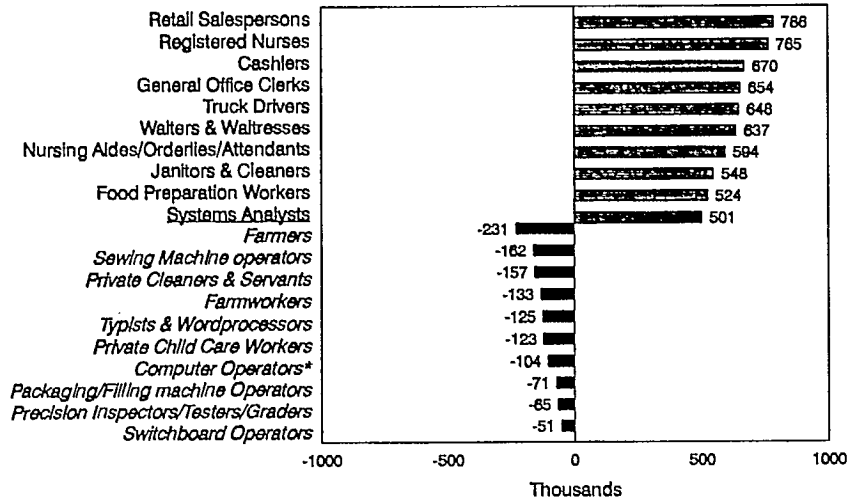
⁷⁸ Conference Board of Canada, "Jobs in the Knowledge-based Economy: Information Technology and the Impact on Employment," November, 1994.

Exhibit 6.1d: Ten Occupations in the United States with the Highest Net Growth and Loss Rates, 1992-2005 (% Change)



Source: U.S. Bureau of Labour Statistics, Monthly Review, 1993; * Except for peripheral equipment.

Exhibit 6.1e: Ten Occupations in the United States with the Largest Net Job Gains and Losses, 1992-2005 (Absolute Change in 000's)



Source: U.S. Bureau of Labour Statistics, Monthly Review, 1993; * Except for peripheral equipment.



- *the pulp and paper industry*: modernization resulted in a substantial decrease in employment (greater than 10%) between 1981 and 1986, and an increase in the proportion of information employment from 28 to 31.7 percent;
- *the motor vehicle industry*: modernization led to an upheaval in production structures, causing total employment to drop by 40% while production increased. As well, the share of information employment dropped between 1981 and 1986, suggesting that a second wave of technological progress is impacting the industry;
- *the aircraft and parts industry*: technologically induced modernization produced a drop in employment but an increase in the proportion of information employment;
- *the resources and energy sector*: the use of IT made a major contribution to increased productivity, translating into significant job losses in mining, petroleum and natural gas, cement, chemical products, pipeline transport, electric power utilities and gas distribution systems;
- *the tourism sector*: the diffusion of IT has led to widespread changes in the way the industry does business, eliminating the need for the customer to use travel agents through direct interface and consequently reducing employment; and,
- *the retail sector*: computerized warehousing and inventory control have increased productivity and reduced redundant jobs.

The Economic Council of Canada reported that the two main growth poles for jobs in Canada consist of a small core of highly skilled, well compensated 'good' jobs and a larger pool of non-standard, low wage and low stability 'poor' jobs. By 1986 the high- skilled jobs accounted for 26 percent of the workforce.⁷⁹ In the U.S., research has shown a similar pattern of change.

6.2 Polarization of the Workforce: Skills

"Twenty years into the revolution, I am weary. I repeated their slogans, touted the virtues of technology and advised others to embrace change. I now realize it was all a big lie ... re-engineering, productivity and global competition don't mean a dedication to excellence, but are a code word for lay-offs. This generation has become the lost generation, demoralized and forsaken on the altar of greed by those whose creed we embraced. As in the 1930s, an entire generation of potential

⁷⁹

Economic Council of Canada, "Good Jobs, Bad Jobs," Ottawa, 1990.

workers wander the streets looking for hope." (David Ewert, Globe and Mail, April 28, 1995) ⁸⁰

The widespread use of information technology has had a profound impact on employment patterns. Forecasts indicate that the new jobs created and the old ones restructured will demand a new mix of skills and be more knowledge-based than in the past.⁸¹ The general trend suggests that the labour market is polarizing into a small, core group of highly skilled, permanent workers and a larger group of less skilled workers with less job security.⁸² Evidence of this trend is supported by numerous studies, including Freeman and Soete (1993),⁸³ the Economic Council of Canada (1990),⁸⁴ Webster and Robbins (1986),⁸⁵ and Zuboff (1984).⁸⁶

Forecasting specific skill needs is complicated by the fact that the job displacements and skill changes that accompany major technological change will unfold in concert with several other factors, such as deregulation, which are also causing major changes in the economy.

OECD Jobs Study

The recent study on jobs undertaken by the OECD recognized a clearly divergent path between skilled and unskilled employment throughout all OECD countries. It should be noted that this divergence became more marked in the 1980s, about the time when IT was influenced heavily by the development of the personal computer. For most OECD countries a trend in the composition of manufacturing employment can be seen, with low-tech, low-skill and low-wage jobs being shed and high-tech, high-skill and high-wage employment expanding.

According to the study, employment in white collar jobs grew fastest over the 1980s and grew slowest (or even declined) in blue collar jobs, with a rise in service sector employment and a decline in manufacturing. In all countries unemployment rates for blue

⁸⁰ David Ewert is an unemployed urban planner living in Halifax. His comments appeared as an opinion editorial in the *Globe and Mail*, April 28, 1995.

⁸¹ National Research Council, "Information Technology in the Service Industry," National Academy Press, Washington, D.C., 1994.

⁸² Reddick, A., "The New Economy?" December, 1993.

⁸³ Freeman, C., and Soete, I., "Information Technology and Employment," 1993.

⁸⁴ Economic Council of Canada, "Good Jobs, Bad Jobs," Ottawa, 1990.

⁸⁵ Webster, F., and Robins, K., "Information Technology: A Luddite Analysis," Ablex Publishing, Norwood, 1986.

⁸⁶ Zuboff, S., "In the Age of the Smart Machine: The Future of Work and Power," Basic Books, New York, 1984.



collar workers have remained one and one-half to twice as high as those for white collar workers. The overall picture that emerges throughout the OECD, is one of long-run decline in the demand for low-skilled workers (partly as a result of outward investment flows by multinational corporations and a shift of some unskilled and increasingly skilled manufacturing and service work to Asia)⁸⁷ and a concomitant rise in demand for higher skilled, high-knowledge workers.

Evidence from Empirical Studies

While the bulk of evidence from empirical studies suggests that technical change will generally increase skill levels and expand the demand for highly trained labour, there is no consensus on whether the introduction of information technology leads to an overall 'upskilling' effect on the workforce. A recent report by Industry Canada cautions that, as a consequence of technologically induced job polarization, there is, in fact, an overall 'deskilling' of the labour force taking place in Canada that is becoming permanent.⁸⁸ Some of the largest employment gains over the last decade have been in low-paid, part-time base-skilled service jobs, leading some to characterize recent employment growth as the 'hamburger flipper' syndrome.

Discernable Skill Shifts

The influence of information technology on the workplace is causing a discernable shift in emphasis in job-related skills from experience and manual dexterity to technical knowledge and cognitive ability. In a recent study on technical change and the demand for skills in U.S. industries, Howell and Wolff (1992) developed an analytical model to measure requirements for cognitive, interactive and motor skills. Their findings confirm earlier studies that information/communication technologies tend to require lower levels of traditional shop floor skills and higher levels of abstract and reasoning skills as well as an upgrading of cognitive skill requirements for the workforce as a whole.⁸⁹

In essence, what appears to be happening is a *divergence* of skill levels according to a knowledge-based hierarchy. On the one hand, low-skilled jobs are becoming even more automated, eliminating the narrowly defined, repetitive tasks and thereby further reducing the basic skills requirements. On the other hand, higher skilled jobs are being further upskilled, requiring a greater knowledge component and a broader set of knowledge-based skills -- in effect, skills polarization.

⁸⁷ Freeman, C., and Soete, L., *Information Technology and Employment*, 1993.

⁸⁸ Industry Canada, "The Micro-Economic Agenda," Ottawa, 1993.

⁸⁹ Howell, D.R. and Wolff, E.N., "Technical Change and the Demand for Skills by U.S. Industries," *Cambridge Journal of Economics*, Vol 16, 1992.

Jobs of the Future

U.S. economist Robert Reich, current U.S. Secretary of Labour in the Clinton Administration, has identified three broad categories of work performed in the information economy. These three job categories, which comprise approximately 95 percent of the economy (but do not include primary production and public service), encompass:

a) Routine Producers: An Endangered Species

Routine Production Services entail simple and repetitive tasks and require a narrowly defined set of manual skills that can be found in many places in the modern economy apart from the older, heavy industries (e.g., data processing, circuit board assembly, assembly-line manufacturing, etc.).

According to Reich,⁹⁰ the economic outlook for routine producers is rapidly deteriorating because of continuing technological evolution and direct competition with routine production jobs in other nations. Routine production jobs have vanished fastest in traditional unionized industries (e.g., autos, steel, rubber), where average wages have kept up with inflation.

b) In-Person Services: Growing but Precarious

In-Person Services also entail simple and repetitive tasks and require a narrowly-defined set of skills, but deal directly with specific customers rather than as part of a manufacturing stream (e.g., waiters, hairdressers, cashiers, hotel workers, house cleaners, mechanics, taxi drivers).

In contrast to routine producers, the growth of in-person services has been substantial. By 1990 in-person services accounted for about 30 percent of the jobs performed by Americans, and their numbers are growing rapidly. In the United States, during the 1980s, well over three million *new* in-person service jobs were created in fast-food outlets, bars, and restaurants. This was more than the *total* number of routine production jobs still existing in America by 1990 in the automobile, steelmaking, and textile industries combined.

Despite rapid growth, in-person services faces fierce competition from labour-saving devices (e.g., automated tellers, computerized cashiers, automatic car washes, robotized vending machines, automated voice simulators), which keep wage levels depressed. Retail sales workers, among the largest group of in-person servers, are similarly imperiled through the development of inter-active electronic shopping now being promoted for use on the Information Highway.

⁹⁰ Reich, R., "The Work of Nations," Vintage Books, New York, 1992.



c) *Symbolic Analysts: The Nouveau Elite*

Symbolic Analyst Services require a broad knowledge base and entail the use of higher-level cognitive and creative skills in the manipulation of abstract concepts and symbols such as data, words, oral and visual representations. They include: scientists, engineers, designers, writers, public relations executives, bankers, lawyers, accountants, consultants, etc. As a consequence of the need to employ intellectual and analytical skills, symbolic analysts generally have college or university degrees, with many holding graduate degrees. Their value and income depends upon quality, originality, and the ability to solve, identify and broker problems.

Symbolic analyst services have grown from eight percent of the labour force in the 1950s to over 20 percent in the 1990s. The most important reason for this expanding world market and increasing demand for symbolic analysts has been the dramatic improvement in worldwide information and transportation technologies. The development of a global Information Highway system has particular relevance in facilitating the growth of this emerging economic 'sector'.

6.3 Polarization of the Workforce: Wages

Along with the increased polarization of skills, a result of the application of information technology, there is a persistent trend showing that earnings differentials widen dramatically from the more to the lesser educationally qualified workers. This gap in the wage differential has widened significantly during the last two decades throughout the OECD. Workers coming into the labour force in the '90s with no qualifications are particularly disadvantaged, both at the start of their career and throughout it.⁹¹

Also notable in the OECD study was the marked reduction in youth wages relative to adult wages, which declined more than 10 percent in many countries. Of particular note is that in Canada the youth wage ratio showed the steepest decline -- close to 20 percent. Wage differentials between men and women continued to narrow or remained constant over the 1980s in most countries.⁹² Interestingly, despite the relative wage increase for women, all countries saw a decline in the unemployment rate for women relative to men.

While Krugman (1994) argues that technological change does not necessarily have the effect of widening the wage gap between the haves and the have-nots,⁹³ the evidence countering this assertion is substantial. Reich (1992) argues that there is good reason to

⁹¹ Organization for Economic Cooperation and Development, "OECD Jobs Study," Paris, 1994.

⁹² In Canada, the average employment income earned by women remains significantly lower than (30 percent below) the average employment income earned by men. Statistics Canada, "Canadian Social Trends," Ottawa, 1994.

⁹³ Krugman, P. "Past and Prospective Causes of High Unemployment," Economic Symposium, Jackson Hole, 1994.

suspect the growing wage gap is not an aberration and will, if anything, grow larger. He cites the fact that, while throughout most of the post-war era wages at different income levels rose at about the same pace, between 1977 and 1990 the average income of the poorest fifth of American families declined by seven percent while the richest fifth became about 15 percent richer.

In 1953 executive compensation was the equivalent of 22 percent of corporate profit; by 1987 it was 61 percent. In 1979, CEOs in the United States made 29 times the income of the average manufacturing worker; by 1988 that figure rose to 93 times.⁹⁴ According to Rifkin (1995), the growing gap in wages and benefits is creating a deeply polarized America, populated by a small, affluent elite and an increasingly impoverished contingent of workers and unemployed.

The 1993 Census Bureau report on poverty in America provided statistical evidence of the growing gap between rich and poor. According to the study, the number of Americans living in poverty in 1992 was greater than at any other time since 1962. In 1992, 36.9 million Americans were living in poverty, an increase of 1.2 million over 1991 and 5.4 million more than in 1989.

While Canada has shown the same trend as the U.S., the impact has not been as marked, likely due to greater labour rigidity through minimum wage requirements and greater protection for workers. However, successive periods of income erosion, between 1980 and 1983 and from 1990 to the present, suggest that downward pressure on wages has become the rule rather than the exception.⁹⁵

It is important to note that the wage gap appears to be directly related to education. While a college degree does not guarantee you a much higher income that it did years ago, *without* a college degree you are not even in the running. In 1980 the typical male college graduate earned about 80 percent more than his high school counterpart; by 1990, that gap had nearly doubled.

6.4 Training and Educational Considerations

"Not only will labour market participants need to maintain generic skills, such as basic literacy, computer literacy, and general science and engineering skills, but also cognitive skills, such as analytic and synthetic reasoning, numerical and verbal abilities, and interpersonal skills (supervisory, leadership and entrepreneurial

⁹⁴ Rifkin, J., "The End of Work," G.P. Putnam Sons, New York, 1995.

⁹⁵ Industry and Science Canada, "The Micro-Economic Agenda: Growth With Jobs," September, 1993.



*abilities). Unlike the skills necessary to fit into the old, mass production economy, these skills are not hostage to any specific industry or technology scenario."*⁹⁶

In today's information economy, competitive advantage is determined more by intellectual creativity and ideas than by natural resource endowments. Canada's future prosperity depends on our ability to develop and exploit advances in science and technology and to expand our trade in the new currency of the information age -- knowledge.

As mentioned previously, the changes occurring as a result of technological innovation are creating new and broader skill requirements, replacing previous skill mixes, breaking down traditional organizational hierarchies, and re-routing the flow of information and decision-making. Yet, traditional attitudes toward training and skills development, and the traditional approaches to education continue to dominate, irrespective of the fact that they are no longer capable of adequately responding to the evolving requirements of society. A recent report conducted by the Job Creation and Skills Working Group for Industry Canada emphasises that the lack of evolution in human resource development and the underlying education and training systems threatens to weaken Canada's ability to benefit from technological change.⁹⁷

Lack of Basic Competencies

There is considerable evidence in all OECD countries of a strong correlation between skills and competencies of workers and the performance of national economies, a relationship which has become significantly more important since the 1970s. The findings of the recent OECD Jobs Study provide evidence of a strong relationship between educational qualifications and the risk of being unemployed. As well, the evidence suggests that the relationship between low attainment and higher unemployment is becoming markedly stronger over time.

It is alarming to note that the provision of further education and training in most OECD countries widens the skills gap. While this appears contradictory, it was found that workers with few initial qualifications are considerably less likely to receive additional training, presumably because they lack the foundational skills upon which to build. This contrast in the relative access to further training is stark and amplifies the handicap of the unskilled worker relative to more qualified workers.

The findings of a recent study of the telecommunications industry in British Columbia provide further evidence of this amplification. The study suggested that one of the fundamental problems with retraining lies in the basic educational level of the current workforce; many of the technical workers in the industry today are likely incapable of adapting to changes taking place due to an inadequacy in basic educational skills (e.g.,

⁹⁶ Job Creation and Skills Working Group, "Science and Technology Review," Industry Canada, October, 1994.

⁹⁷ Job Creation and Skills Working Group, "Science and Technology Review," Industry Canada, Ottawa, October, 1994.

computational skills, problem solving, the ability to comprehend complex instructions, the ability to analyze and synthesize, computer literacy, etc.). According to the report, the lack of a sound educational foundation may render such workers as 'untrainable' in the new technologies. The view was expressed that those workers not possessing such basic skills are simply going to be displaced. ⁹⁸

A detailed study of adult illiteracy in Canada has found that, among working adults who had less than a high school education, 30% had reading skills "too limited to meet every day requirements." ⁹⁹ In the U.S., it is estimated that a fifth of all working adults "... have serious difficulty with common reading tasks. Another ten percent are marginal in their functional literacy skills." ¹⁰⁰ It is estimated that, as the threshold of minimum requirements edge upward, the number of adults in need of basic education, rather than occupational retraining, could reach as high as a fifth of the working-age population.

Skills Upgrading

The volume and cost of retraining workers displaced by technological advance is likely to exceed the capabilities of private industry alone. This suggests the need for a partnership between business and government to ensure future needs of both industry and society are addressed. While industry must, in large, bear the responsibility of providing job-specific skills upgrading, it is incumbent upon the public education systems of Canada to ensure that a strengthening of fundamental competencies are addressed.

The 1994 OECD Jobs Study identified the need to facilitate the school-to-work transition. This would, of course, require the development of new institutions and/or new attitudes on the part of employers, workers, and organized labour. The study brought forward a number of recommendations for consideration, including:

- developing partnerships between educational institutions and employers to facilitate cooperative programs for work experience;
- creating a forum for continuous communication between educators and employers to ensure young people are equipped adequately with the evolving skills sets needed for a smooth transition to the workplace;
- developing a means for the co-financing of education and training, which would reduce employer wage costs while providing a form of educational training allowance for the student; and,

⁹⁸ MacWilliam, L., and Turnbull, A., "Socio-Economic Implications of a British Columbia Information Highway," Goss Gilroy Inc., November, 1994.

⁹⁹ Organization for Economic Cooperation and Development, "Adult Illiteracy and Economic Performance," Paris, 1992.

¹⁰⁰ Ibid



- giving consideration to the adoption of the 'dual' apprenticeship model of education typified in Germany, Austria and Switzerland,¹⁰¹ where young people engage in training organized and run by employers, as well as spend part of the week in educational institutions.¹⁰²

Although various forms of further education and training for upgrading exist across Canada, they have been neither sufficiently broad nor systematic enough to have a significant impact. As well, Canada's prevailing approach to human resource development based on the provision of 'front end' formal education and training prior to entry in to the labour market is less and less adequate in providing the requisite skills and competencies.

There is a recognized need, both in Canada and elsewhere, to improve the functioning of future training markets through the provision of:

- a framework for public information on availability, cost and quality of training opportunities;
- a systematic assessment and means of recognizing the skills and competencies acquired through further training;
- reduction of the uncertainty regarding the investment in further training by changes in financial accounting and reporting practices;¹⁰³
- the consideration of income support for adults with low literacy levels, in order to facilitate training on a long term basis;
- improvement of access to training for small and medium-sized enterprises by encouraging the establishment of training cooperatives; and,
- the provision of opportunities for workers to obtain further educational training through industry and government-sponsored training sabbaticals, with compensatory benefits based on a percentage of salary for the duration of the training period.

¹⁰¹ Of all age groups, young people experience the highest rates of unemployment. Austria and Germany, with their strong apprenticeship programs, are the only OECD countries where young people have lower or similar rates of unemployment as adult workers.

¹⁰² Twelve years after leaving school, only 35% of American workers who did not go on to college had received any kind of post secondary education or training, whereas 82% of German workers who never enrolled in higher education had obtained an apprenticeship or full time vocational education certificate.

¹⁰³ One recommendation made in the recent OECD jobs study is for the capitalization of training costs to allow an enterprise to reflect its training investment as an asset to be depreciated over the life of the training regime. If a trained employee left, the undepreciated value of the "asset" would be written off against income.

Building the Educational Foundation

"Students must be encouraged to explore the changing technologies they will face in the 21st century and they must become skilled in their use. These skills will not result from special classes in computer technology, but rather in a re-structuring of the classroom curriculum ... technology in education is not an option for institutions and government to choose or reject." (Globe and Mail, September 7,1994)

The skills needed in a rapidly changing world necessitate the development of lifelong learning as a central theme in Canada's education and training systems. It is argued that these skills must be introduced early in a student's learning and reinforced throughout primary, secondary and post-secondary education levels. Most importantly, there is a need to reduce barriers to education at all levels. It is imperative that tomorrow's workers and those displaced by technology today are provided with the opportunity to upgrade their skills to allow them to become productive members of society.

Reich (1992) argues that formal education can no longer afford to compartmentalize learning into 'bite-sized' pieces, distinct and unrelated to the others. He stresses that, in an knowledge-based economy, the learning of four basic skill sets must become imperative: abstraction, system thinking, experimentation, and collaboration. "In the real world, issues rarely emerge predefined and neatly separable. The symbolic analyst must constantly try to discern larger causes, consequences, and relationships." ¹⁰⁴

However, caution is advised against a simple knee jerk reaction to the information revolution by making the assumption that everyone will become symbolic analysts. As pointed out by Connors (1993),¹⁰⁵ it is likely that the high-tech parts of the information economy will employ relatively fewer people, and actions to re-shape the curriculum in anticipation of the information revolution are probably inappropriate. Emphasising that it would be advantageous to increase general literacy rates and upgrade basic skill levels, the evidence suggests that a broader, more holistic approach would help provide the basic skills all citizens will require to function in a knowledge-based society.

In their recent study of the provincial telecommunications industry, MacWilliam and Turnbull (1994) noted that, while different in nature, emerging jobs all possess a common element. They all required the prerequisites of higher intellectual, analytical, and creative skills. As well, such jobs necessitate the utilization of a broad cross-section of skills and the need for continual upgrading of skill sets such as:

- increased computer literacy;
- enhanced writing and computational skills;
- enhanced mathematical and scientific skills;
- greater emphasis in critical thinking; and,
- enhanced powers of analysis and problem solving abilities.

¹⁰⁴ Reich, R., "The Work of Nations," Vintage Books, New York, 1992.

¹⁰⁵ Connors, M., "the Race to the Intelligent State," Blackwell Publishers, Oxford, 1993.

While industry's perception regarding weaknesses in the educational curriculum in the areas of technological literacy and critical thinking can be criticized as too limited a view of education, there is general agreement that today's citizen needs a wide range of skills and knowledge to reap the maximum benefits of the economy and contribute their best to society. In this regard, the need for government to incorporate information technology into the educational curriculum, as a basic learning tool and a means of enhancing the curriculum, is paramount in preparing today's student for tomorrow's world.

Rote instruction on software and hardware that will soon be outdated is simply not good enough, nor is a system which produces workers with narrowly defined employment skills. What is needed is a revitalization of the curriculum which incorporates information technology in a balanced perspective of the economic and social goals of education and which provides a sound foundation for life-long learning.

7.0 Information Technology and the Organization of Work

"The rule of thumb is: Get rid of people. People are expensive. So you automate where you can, keep a small permanent workforce, and fill in with temporary workers paid low wages and no benefits. That's where companies find their 'competitive edge' nowadays." ¹⁰⁶

7.1 Overview

Throughout the post-war period until the 1980s (known as the Taylorist-Fordist production period)^{107,108} a relatively stable economic climate was established among nations, with business controlling production and decision making. Large corporations mass produced standardized goods and services, and technology was used to increase productivity and maintain control over the workplace. The division of labour was based on a clear distinction between the various stages of production, sales, marketing and financing, permitting the technical and social division of work. Labour's integration was secured with wages tied to productivity, providing workers with a standard of living based upon their contribution to the process of production. From time-to-time, governments intervened in the economy providing a sound and steady hand smoothing economic cycles, interacting with citizens, building public infrastructure and mitigating labour conflicts.

During the '60s and '70s things began to change. Economic stagnation, the energy crunch, and social crises contributed to a steady decline in productivity and profits for businesses and domestic economies, bringing to an end this period of relatively stable and predictable growth. Since then, 'fast track' technological innovation, changing markets and forces of production, and the changing international division of labour, have contributed to:

- growth in international trade;
- expansion and intensification of multinational companies;
- growth of global economic interdependence;
- increasing international market competition;
- globalization of the labour market, with access to cheaper skilled, semi-skilled and unskilled labour;
- rapid technological innovation;

¹⁰⁶ Winner, L., "the Culture of Technology: Losing the Cooperative Edge," Technology Review, November, 1993.

¹⁰⁷ Boyer, R., "The Capital Labour Relations in OECD Countries: From the Fordist Age to Contrasted National Trajectories," Capital Labour Relations, Harvard University, September 1990.

¹⁰⁸ Naschold, F., "Experiences in Restructuring Work Organization," On Business and Work, Geneva: International Labour Office, pp. 195-253, 1993.



- convergence of computer and communication technologies through digitalization; and,
- rapid expansion of integrated communication networks and systems.

Throughout the 1980s, advances in IT allowed extensive restructuring by governments and large organizations. During this period, the economic policies of the United Kingdom, the United States, Australia, New Zealand and Canada created an environment of low inflation and price stability. During this period, unemployment escalated.¹⁰⁹ For the labour market, this resulted in increased slack and flexibility in the available workforce, thereby reducing wages and price pressures. It is argued that this resulted in a redistribution of capital resources to industry, ostensibly to assist in the process of restructuring.¹¹⁰ Globalization, cost reduction and increased labour flexibility were now in vogue. 'Lean and mean' soon became the economic mantra of the times.

7.2 Models of Structural Change and Work Organization

"The unchallenged prevalence of the production model in the mindset and political discourse of our time, and the model's misapplication to blatantly inappropriate situations, seems to me an indication of just how far technology as a practice has modified our culture. The new production-based models and metaphors are already so deeply rooted in our social and emotional fabric that it becomes almost sacrilege to question them. Thus one may question the value of people ... but not the fundamental value of technologies and their products."

Currently there are three conceptual models which explain how institutions are restructuring and how work is being reorganized. Each has important implications affecting the level of business, government and union involvement and interactivity, for issues such as wages, skills, training, and worker displacement.

Variable Corporatism

Practised by most European countries, *Variable Corporatism* is defined by its characteristics of relatively high degrees of institutional centralization, regional and government-sponsored labour mobility, and a strong trade union tradition with union involvement in decision making. While this model is generally characterised by relative labour rigidity, recent adjustments have been made to provide for greater flexibility in light of growing global competition and an inordinately high unemployment rate throughout the EC. In countries such as France and the United Kingdom, this has precipitated an erosion in the wage-labour relationship. In other countries emphasis has been placed on skills training and the use of traditional unemployment benefits for skill obsolescence. As a result, unemployment in Europe is unequally distributed among the various occupational

¹⁰⁹ Boyer, R., "The Capital Labour Relations in OECD Countries: From the Fordist Golden Age to Contrasted National Trajectories," 1990.

¹¹⁰ Ibid.

groups, especially among the young. However, maintenance of social transfers and public interventions have permitted individual countries to tolerate higher unemployment levels.

Neo-Fordism

Practised by Canada and the U.S., *Neo-Fordism* is defined by its application of technological innovation to all sectors (agriculture, resource, manufacturing, service, and information). Driven by market forces, competition, and globalization (labour and market mobility), an important characteristic of this production model is the little amount of union involvement in corporate decision making. Competition, deregulation and globalization are the key variables affecting the mobility of employment and flexibility of wages. Education and skill (reskilling) requirements are upgraded only as the economy shifts, and information technologies are used by management to extend control over more aspects of work. Although this model provides for quick responses to recessions and can make adjustments to structural changes, it also has major drawbacks, including:

- reduced job security;
- variations in average wages;
- polarization of wage rates;
- deskilling of the labour force;
- inadequate skills training and little or no involvement in apprenticeship training; and,
- little long-term investment in human resources.

Flexible Specialization

Flexible Specialization or *Toyotism*, is practised in Japan and is based on labour versatility and an ongoing modernization strategy to provide innovation. The term implies that the introduction of technological innovation will give more control to workers over machines. Characteristics include industry compromises concerning the sharing of surpluses, and the use of subcontracting networks to help soften the impact of economic fluctuations and provide access to an abundance of contingent workers. This model is characterized by weak trade union involvement. Advantages include bonuses to short-term responses and long-term productivity, and product innovation gains. Important adjustment variables include: the internal transfer of workers from job to job, a multiple-skilled workforce, and worker commitment to the organization. Disadvantages include long-term prospects that hinge on favourable global economic conditions. Other drawbacks include:

- a build-up of labour;
- high weekly and yearly worked hours;
- inequality among wage earners; and,
- segmentation of the workforce between large enterprises and subcontractors.

Within the parameters of each production model arise two major issues with respect to the onslaught of technological change:

- How will information technology be used in restructuring work? and;



- How should the dividends of an information society be distributed?

The answers to these questions will provide necessary direction regarding the policy initiatives that will be required in the development of an Information Highway.

7.3 Organizational Structural Changes in Canada and the U.S.

"If the nation's economy is to benefit from advanced technologies, a number of technological, organizational, and institutional criteria must be met. To the extent that policy measures fail to address all these criteria, the chances for success will be diminished. The outcome will resemble less a 'positive sum game' where all are winners, and more a 'zero sum game' in which many are losers." ¹¹¹

Economic and technical changes emerging in the North American economy today are based on extremely weak human commitments. Innovations and restructuring methods praised as 'lean and mean' assume a high degree of fluidity in the bonds that link persons and organizations. Today, companies simply do not hire for the long run and workers no longer enter jobs confident that they will be able to build meaningful careers around them. Because factories and offices can move almost overnight to satisfy changing market demand, communities can no longer rely upon 'good corporate citizens' to offer a stable economic base.

From the standpoint of short-term efficiency and evolving corporate priorities, such flexibility makes perfect sense; however, the long-term costs are proving enormous. According to Winner (1993), "many of the social bonds and personal loyalties that traditionally sustained businesses, families, and local communities are being rapidly pared away." ¹¹²

In Canada, the pace of structural change wrought by technology has been exacerbated by the impact of the Canada/U.S. Free Trade Agreement and by the more recent North American Free Trade Agreement. Private sector organizations, as well as public sector institutions throughout Canada, have been downsizing. Flexibility at the government level is blurring the line of responsibility between the public and private sector, as provincial and federal governments privatize operations and outsource more and more of the work traditionally done by public service employees. In the process, thousands more Canadian workers have been added to the unemployment rolls. To make matters worse, recent public policy changes (a consequence of burgeoning debt) continue to weaken the public programs and institutions that formerly cushioned individuals and communities from the rough edges of technological change.

¹¹¹ U.S. Congress, Office of Technology Assessment, "Electronic Enterprises: Looking to the Future," 1994.

¹¹² Winner, L., "The Culture of Technology: Losing the Cooperative Edge," Technology Review, November, 1993.

Organizational flexibility is the key to this reorganizational process and is an essential part of the strategy of adjustment to constant and pervasive change. Suppliers, customers, management and workers must be able to adapt quickly to respond to market conditions. Such changes increase the range of choices and power of management regarding:

- the centralization and integrated decentralization of production and work;
- changes to labour markets to create a flexible workforce;
- new sectors of production, and expansion to new and niche markets for an array of customized goods and services;
- means to increase productivity and product quality;
- elimination of rigid centralized bureaucratic hierarchies;
- the development of multiple skills in workers;
- the development of team or group work;
- ensuring a commitment by workers to productivity, quality, and profitability;
- greater individual choice in employment and work arrangements;
- the use of networks and cooperation supported by new information technologies, rather than bureaucratic hierarchies, to coordinate and control work; and,
- the intensification of innovative technologies, both automation and information, to produce goods and services and improve efficiencies.¹¹³

At an organizational level, flexibility is part of the philosophy and strategy of constant and pervasive change. New products, suppliers, customers, technology, management and workers must be able to adapt quickly to respond to market conditions. Flexibility at the government level blurs the line of responsibility between the public and private sector. Concurrently, it shifts the responsibility for wage setting, education, training, and health, among others, to the private sector and to individuals. While achieving greater productivity from the perspective of global competition, the incessant drive toward greater organizational and management flexibility will, nevertheless, undermine the collective status and gains made by labour.

With the restructuring of organizations and the continued outsourcing, downsizing and rightsizing that characterises the current business environment, contingent workers (i.e., ad hoc, part-time, contractual, and temporary workers) are increasingly in the mainstream. The traditional employee who worked for one employer for life with an understood relationship (exchanging loyalty of service for salary, benefits, career mobility, and security) is being supplanted. Today, more people work in a variety of settings -- from home, satellite offices, temporary offices, mobile offices and elsewhere through a variety of contractual agreements -- and often without the level of remuneration, benefits and security that was the world they once knew. Such changes pose a significant challenge for organized labour and public policy development.

¹¹³ Thurman, J., "Competence and Choice at Work," in *On Business and Work*, International Labour Organization, pp.4-5, 1993.



7.4 The Evolving Flexible Workforce

*"[F]lexible employment arrangements do not by themselves engender strong worker dissatisfaction, since flexibility can sometimes be mutually beneficial. But the aggregate effects, when looked at from the standpoint of insurance coverage, and pension rights, as well as wage levels and job security, by no means appear positive from the standpoint of the working population as a whole."*¹¹⁴

Important benefits can be realized for institutions that have access to flexible labour markets. First and foremost is the quick reaction organizations can make to adverse economic and political situations, and market conditions. On the other hand, for those in the workforce flexible employment arrangements have both advantages and disadvantages.

The Core Workforce

Organizations that use a flexible labour market model, as depicted in Exhibit 7.4, have an inner ring of *core workers* and outer rings of peripheral or contingent workers. Considered central to the long-term future of organizations, core workers benefit from full-time employment, higher wages, and extensive fringe benefits. This group is more likely to have good promotion and re-skilling prospects. Nonetheless, these workers are expected to be adaptable, flexible and geographically mobile both within countries and internationally.

By and large, these employees work long hours -- more than 50 hours per week -- as corporations are reluctant to hire new core employees to accommodate transient increases in demand.^{115,116} In fact, the current trend in labour markets is to reduce the number of core workers and increase the contingent (peripheral) workforce.^{117,118,119}

Until recently the core workforce, in particular knowledge workers or '*symbolic analysts*'¹²⁰ as described by Reich, were considered to have greater job security. Recent evidence,

¹¹⁴ Harvey, D., *The Condition of Postmodernity*, 1990,

¹¹⁵ Schor, J., *The Overworked American: The Unexpected Decline of Leisure*, Basic Books, 1991.

¹¹⁶ Yalnizyan, A., "Securing Society: Creating Canadian Social Policy," *Shifting Time: Social Policy and the Future of Work, Between the Lines*, p.30, 1994.

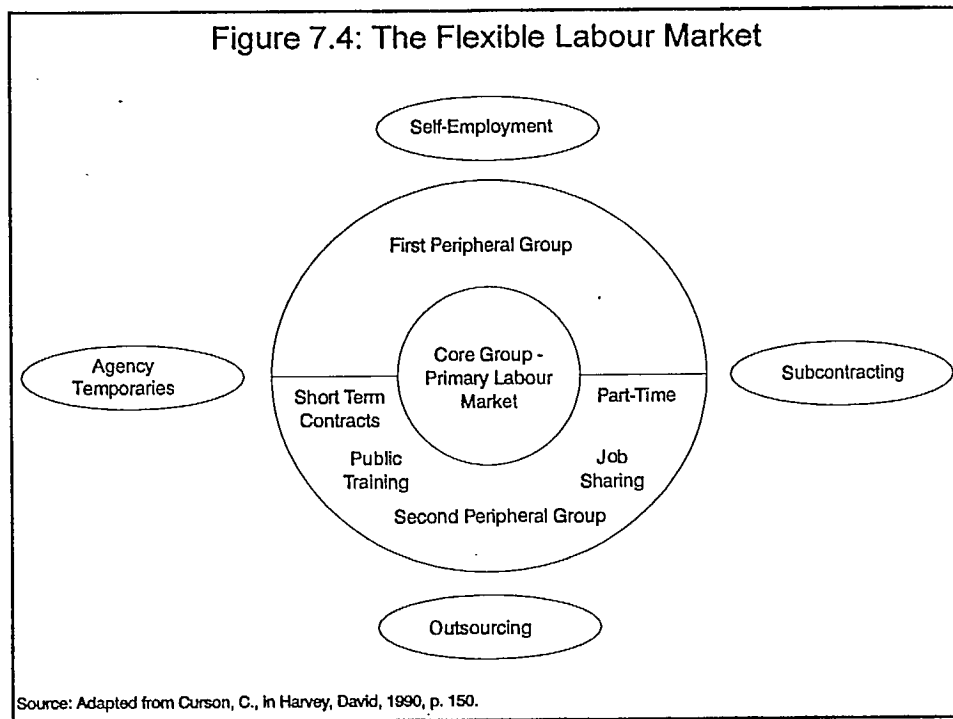
¹¹⁷ Harvey, D., *The Condition of Postmodernity*, p.152, 1990.

¹¹⁸ Naschold, F., "Experiences in Restructuring Work Organization," pp.234-237, 1993.

¹¹⁹ Harrison, B., *Lean and Mean: The Changing Landscape of Corporate Power in the Age of Flexibility*, pp. 3-36, 1994.

¹²⁰ Robert Reich, *The Work of Nations: Preparing Ourselves for 21st Century Capitalism*, pp.171-242, 1991.

however, reveals that flexible labour markets contribute to a situation where middle level and senior management jobs are being cut in business and government, as these organizations restructure, innovate and downsize.¹²¹



The Periphery

Surrounding the inner ring of core workers is a tier of *peripheral workers* which, itself, has two levels. The periphery is divided into two sub-groups:

- full time employees with readily available skills such as clerical, secretarial, routine and less skilled manual work. These workers have lower wages, a higher rate of turnover, and fewer career opportunities than those in the core; and,
- contingent workers, providing organizations with people who work part-time, job share, engage in short term contracts, or are part of public training programs. This group earns much lower wage levels, and limited or no fringe benefits (such as health care coverage, disability and life insurance, and pension plans). In most

¹²¹ Harrison, B., *Lean and Mean: The Changing Landscape of Corporate Power in the Age of Flexibility*, pp. 199-200, 1994.

OECD countries, it is this category of workers in the service sector that has shown the largest growth in the last three decades.¹²²

The outer tier of *contingent workers* may be self employed, work for temporary agencies, sub-contract or be involved in outsourcing. Work and employment are unpredictable and are dependent and conditioned by many extrinsic factors beyond the control of the individual.

Recent Canadian research reveals that in 1994, 32 percent of the workforce was involved in part-time or self-employed work, much lasting less than six months.¹²³ U.S. research shows a similar pattern, with thirty percent of all workers part of the contingent workforce. While it appears that in both Canada and the United States this sector is growing faster than the labour force as a whole, the issue of growth is one that is not without dispute. According to Thomas Nardone of the U.S. Bureau of Labour Statistics, the size of the contingency force in the United States was actually one percent higher in 1983 than in 1994.¹²⁴ Studies examining contingent work reveal a trend towards increases in *involuntary* part-time employment rather than voluntary part-time.^{125,126} These individuals are working part-time *only* because they cannot find full-time employment¹²⁷.

To make labour more flexible and work options more attractive, the U.S. government has reduced its safety net through changes in the minimum wage, social security, public health, and unemployment benefits. As a result, while unemployment rates are lower, the U.S. has the largest wage disparity of any of the OECD nations. The policy has, in effect, created a group of 'working poor.'¹²⁸

¹²² Organization for Economic Cooperation and Development, OECD Jobs Study, pp.188-100, 1994.

¹²³ Akeampong, E., "The Labour Market: Year-End Review," Canadian Economic Observer, March 1995, and Betcherman, G., et al, "Canadian Workplace in Transition," Industrial Relations Centre, Queens' University, 1994.

¹²⁴ Hadjian, A., "The Contingency Workforce," Fortune, January, 1994.

¹²⁵ Harrison, B., Lean and Mean, p.202, 1994.

¹²⁶ Callaghan, P., and Hartmann, H., Contingent Work: A Chart Book on Part-Time and Temporary Employment, Economic Policy Institute, 1991.

¹²⁷ For Canada see Nathalie Noreau, "Involuntary Part-timers," Perspectives, Autumn, pp.25-30, 1994. and, Grant Schellenberg, "Involuntary Part-Time employment," Perspectives, (forthcoming), 1995 where 760,000 Canadians are involved in involuntary part-time work. Seventy eight per cent (78%) are adults (with children) and 40 per cent are primary wage earners.

¹²⁸ Parker, R. "The Labour Force in Transition: Growth of the Contingent Work Force in the United States," The Labour Process and Control of Labour. (ed) B. Berberoglu, Praeger.

The technologies that are now transforming the developed world into a knowledge-based society, have served to exacerbate the pace and consequence of economic restructuring. Concern is now being expressed over the social consequences of contingent work and the utilization of the flexible labour market model in the transition to an information society.¹²⁹ This concern is echoed by labour unions and associations, governments, academia and research institutions regarding its effect on the polarization of occupations and bifurcation of wages.¹³⁰ Such concern raises legitimate and pressing queries about the implications of the development of an Information Highway on workforce restructuring.

7.5 Decentralization - Information Technology and Organizational Flexibility

*"As access to telecommunications, computer networks and satellites becomes general, there is nothing to stop the flow of information jobs abroad ... increasing numbers of some types of white-collar jobs are being exported to developing nations where labour costs and social charges are lower."*¹³¹

The application of technological innovations, particularly IT, in office and service activities is contributing to geographic flexibility and decentralization. This process of decentralization may occur between nations, regions, and between and within cities. Decentralization of office work and services for some institutions has resulted in a shift of some office jobs from urban offices to suburban areas. The rationale for this shift includes: cheaper office rents and land prices in suburban areas, the reduction of commuting time, lower infrastructure costs, and the availability of specific labour markets.

In a globalized market, access to skilled, low-cost labour is particularly important, and the problem is often resolved by the use of IT. This has led to 'offshoring,' the export of specific service activities to areas of low labour rates such as Barbados, Jamaica, Korea, China, India, Ireland, Singapore and the Philippines.^{132 133} Offshoring has also made a second wave of job relocation possible, following the transfer of manufacturing jobs from the industrialised world to the developing world. Companies in Switzerland, for example,

¹²⁹ Ide, T., and Cordell, A., "The New Tools: Implications for the Future of Work," *Shifting Time: Social Policy and the Future of Work*, Toronto, 1994.

¹³⁰ New studies on the growing concentration of U.S. wealth and income have been conducted by Edward Wolff at New York University and Margaret Weir at the Brookings Institute. These separate studies reveal that the U.S. is the most economically stratified of the industrial nations, with incomes becoming increasingly stratified as automation spreads. "U.S. Income Inequality Highest among Industrial Nations," *Globe and Mail*, April 17, 1995.

¹³¹ Veal, S., "White Collar Jobs Go Global," *World of Work*, No. 10, 1994.

¹³² Castells, M., "The Informational City: Information technology, Economic Restructuring, and the Urban Renewal Process," Basil Blackwell, Oxford, 1991.

¹³³ *Conditions of Work Digest*, Volume 9, Geneva: International Labour Organization, p.10, 1990.



where wages are among the world's highest, have been establishing joint ventures in developing countries where skilled workers are now performing work that was previously the exclusive domain of the indigenous 'white collar' worker. According to Veal (1994), an eventual specialization of the world's white collar economy can be expected, with certain countries cornering the market in specific disciplines.¹³⁴

At the local level, organizations often look to suburban areas, particularly in Canada and the United States, to gain access to skilled peripheral workers. A majority of these workers tend to be educated married women who will work part-time or under contract for wages beneath their level of skill.¹³⁵ These contingent workers perform short-term assignments with no guarantee of future employment.

Another mechanism used to minimize labour costs is flexible scheduling, which refers to scheduling arrangements for employees on company payrolls. These employees have a relative degree of job security, and work may be scheduled through different arrangements, including: regular or permanent part-time work, job sharing, flexible hours, compressed work week, phased retirement, and telework.

Problems have occurred with flexible staffing arrangements as work quality, job performance, and continued increases in administration costs have soared. Many large institutions have experienced difficulties in managing a work force not affiliated with the corporation. As a result of these difficulties, the trend in the late 1980s and early 1990s has been toward the use of flexible scheduling arrangements. Many businesses are able to consider flexible scheduling because of changing demographics of the labour market as well as the desire to recruit and retain high quality workers. This approach offers greater control over job performance, quality of work and costs. It is within this changing environment of workforce flexibility that telecommuting and telework have developed.

7.6 Telework

Telework combines the use of information and communication technologies with the concept of the flexible workplace. Positive consequences of this decentralization strategy include increased worker autonomy, mobility, and employment opportunities for various categories of workers without geographic limits. Nevertheless, telework can also generate marginalisation and isolation, and can contribute to worker exploitation. While it can improve ways of working and living, it can also reinforce existing labour market inequalities, erode job security, and even worsen employment conditions in certain occupational and social groups.

¹³⁴ Veal, S., "White Collar Jobs Go Global," *World of Work*, No. 10, 1994.

¹³⁵ Castells, M., *The Informational City: Information Technology, Economic Restructuring, and the Urban-Regional Process*, p.158, 1991.

The interest in telework in the late 1970s resulted from a number of factors.

- the price of computers fell in the 1970s, making home computing a possibility;
- interconnection of telecommunications and computers resulted in the beginnings of an integrated national and international system (telematics); and,
- the international oil crisis of the 70s led to a focus on energy wastes in private and public transport systems.

As a result, new work arrangements were developed as a way to resolve transportation problems.

There are three types of telework: telecommuting, mobile work, and networking.

Telecommuting

Telecommuting or electronic home work, developed to maximize the human and economic benefits that could be reached with employees working at home, uses telecommunication links to connect employees with their employers.¹³⁶ Telecommuting may be conducted on a full-time basis, contracted, piecework or hourly work (full or part time), or on a freelance basis. This type of telework is still centralized; that is, control of operations, management decisions and/or the physical office, are located at the central office. It is usually carried out in the home from one to five days a week. The work may include the use of new information and communication technologies, or it may be performed using minimal office supplies and a telephone.

Two distinct classes of telework include professional, managerial and knowledge work, and middle information and clerical data work. The first group, made up of both male and female workers, maintains a fair degree of autonomy over their work and is usually equipped with new technologies such as personal computers, faxes, modems and/or terminals hooked up to a mainframe computer. Throughout the 1980s and 1990s, there has been an increase in male teleworkers in the professional, managerial, and knowledge group.¹³⁷ This second group, clerical, data and information processing, is predominantly composed of female workers who have little or no work autonomy. This work is often monitored through IT, and improvements in productivity are met with higher productivity expectations. Some of this work is paid by the hour or on a piece-work basis. Research conducted by K. Christensen further divides the second group of clerical home-based workers into three categories: home-based employees, self-employed home workers, and home-based independent contractors.

¹³⁶ Nilles, J.M., Carlson, F. R., Gray, P., *The Telecommunications-Transportation Tradeoff*, Wiley, 1976.

¹³⁷ One reason cited for this increase is an improved corporate attitude towards telework. There have also been increases in self-employed professional and management male workers, particularly in the U.S. Many of these individuals had lost their jobs in the 1980s as a result of delaying/downsizing and are now teleworking.



Home-based employees are employees on an organization's payroll who work at home as well as in the central office. Self-employed home-based workers may be independent contractors, sole proprietors (limited partnership) or be incorporated business persons. The assumption is that home-based independent contractors are self-employed. Yet, recent telework case studies reveal that some employers are using telework programs to reclassify former employees as independent contractors to make them eligible to participate in flexible work arrangements. These so called 'contractors,' in this case, are expected to perform as regular employees. They have limited control over their work and are not permitted to work for other organizations. Remuneration is based on piece-work or on an hourly basis.

Clerical home-based workers are usually female, married, work 17 hours per week, and have children under the age of 18 (only 1 in 4 women have preschool age children). Only 28 percent of these telecommuters (clerical home-based workers) use the sophisticated technologies described in most of the literature on telework.¹³⁸

Mobile Work

Mobile work may be carried out in the home or in remote locations such as satellite offices, telework centres (neighbourhood/suburban), automobiles or a virtual office. Satellite offices are separate units within an enterprise, geographically located away from the central organization, and communication is maintained through electronic communication networks. Telework centres are separate units from the central headquarters which are shared by different users. They may belong to various enterprises, independent entrepreneurs, or they may be shared operations between the public and private sector. The centres are located near teleworkers' homes and may be used for additional purposes, such as teleconferencing and telelearning. Mobile work is conducted by professionals whose work requires travel. The mobile teleworker uses electronic communication facilities as well as electronic mail, data banks and modems to link-up with the central office. Travel and commuting is replaced by computers and telecommunication links. The future of mobile work is likely to be strongly influenced by the development of a national Information Highway.

Networking

Networking is characterized by the diffusion of telework throughout organizations and institutions. Individuals work as advisors and consultants, and traditional office work is replaced by work which is based on computer conferencing networks. Knowledge workers and ad hoc groups come together on particular projects through 'online communities.' These 'online communities' or networks become an important ingredient for the formation of 'virtual' companies, often grouped by specific knowledge projects.¹³⁹ One example

¹³⁸ Christensen, K., "Home-based Clerical Work" No Simple Truth, No Single Reality," 1989.

¹³⁹ Qvortrup, L., " Telework: Visions, Definitions, Realities, Barriers," p.84, 1992.

of networking/online communities is the electronic community of physical oceanographers in California.¹⁴⁰

Research indicates that telework accentuates the distinctions between occupations.¹⁴¹ It also exacerbates skill polarization between those at the upper and lower ends of the occupational scale. As well, there is increasing evidence of widening wage discrepancies. In addition, work control ranges from work autonomy to extensive control through monitoring, piece work, surveillance, and restrictions on personal use of technology.

7.7 The Implications of Telework

The introduction of telework is, by and large, a perpetuation of organizational philosophies, institutional culture and management strategy directed towards flexible work organization.¹⁴² Productivity expectations, control over the work organization and use of core and contingent workers depend upon which model is used (Variable Corporatism, Neo-Fordism or Flexible Specialization) (see Section 7.2).

Some unions have been sceptical about telework, while others have been openly resistant. Much of this scepticism and resistance is based on the world-wide abusive history of home workers. Concern for the social protection of homeworkers has been voiced at national and international levels. This concern results from the vulnerable position of homeworkers, the majority of whom are women, in the labour market. Social protection for homeworkers under existing national laws, regulations and collective agreements is very weak.¹⁴³

¹⁴⁰ Grantham, C., and Hesse, B., "Electronically Distributed Work: Communities Implications for Research on Telework," pp.7-8, 1991.

¹⁴¹ Lars Qvortup, "Telework: Visions, Definitions, Realities, Barriers," in *Cities and New Technologies*, Paris: OECD, pp. 77-108, 1992; Link Resources Corporation, "Telecommuting Case Studies," New York: Link Resources Corp., 1990; International Labour Organization, "Conditions of Work Digest," Vol. 9, Geneva, ILO, 1990; U. Huws, W. Korte and S. Robinson, "Telework: Towards the Elusive Office," the Empirical Study, Chichester: John Wiley and Sons; V. Rideout, "Telework: Work-at-Home, Telework Centres and Satellite Offices," internal working paper for the (former) Department of Communication, 1992; A. Tessier and F. Lapointe, *Telework at Home: Evaluation of a Pilot Project at Employment and Immigration Canada*, Industry Canada, Centre for Information Technology; BC Tel, "BC Tel/Bentall Satellite Office Trial Final Report and Recommendation," by S. Finlay and D. Rouse, July 1992; Public Service Alliance of Canada, "Go Home... And Stay There? A PSAC Response to Telework in the Federal Public Service," 1993.

¹⁴² See D. Tomaskovic-Devey and B. Risman, "Telecommuting Innovation and Organization: A Contingent Theory of Labour Process Change," *Social Science Quarterly*, vol.74 (2), June, pp.367-385, 1993.

¹⁴³ See for example, International Labour Organization, "Social Protection of Homeworkers," Documents of the Meeting of Experts on the Social Protection of Homeworkers, Geneva: ILO, 1990; and European Communities, "Social Europe: Office Automation and Social Change in Europe," Supplement 5/91, Luxembourg: Office for Official Publications of the



In Canada, for example, homeworkers are denied protection of significant sections of the Employment Standards Act and there is a lack of enforcement of those sections of the Act that do cover homeworkers.¹⁴⁴ Other concerns involve the implementation of telework to reduce labour costs and the possible exploitation of those who are most vulnerable (eg., women, elderly, and persons with disabilities). The concerns cover a range of items, including:

- reduced wages;
- de-skilling of teleworkers;
- unequal pay for office and remote teleworkers;
- different promotion criteria for teleworkers;
- physical and mental strain and stress;
- the effects of psychological isolation and alienation;
- progressive increase in work loads (such as in the Japanese production model known as 'kaizen,' where once new productivity standards are met they are increased); and,
- the elimination of union jobs.

Satellite offices and telework centres are viewed more favourably by unions and/or bargaining agents because they can more easily continue to represent their members. In the interim, some unions have responded to telework by negotiating specific telework agreements.

There also exists growing evidence that telework, whether it is carried out at home, at mobile locations, telework centres or in satellite offices, contributes to overwork and unpaid overtime.¹⁴⁵ In other words, telework blurs the separation of work from home life and leisure time.

European Communities, 1992; Jane Tate, "Homeworking in the EC," report of the ad hoc working group, Luxembourg: Commission of the European Communities, 1993.

¹⁴⁴ See, Proceedings from the Conference on Homeworking, "From the Double Day to the Endless Day," Co-sponsored by the International Ladies' Garment Workers' Union, Coalition for Fair Wages and Working Conditions for Homeworkers, Public Service Alliance for Canada, Centre for Research and Work on Society, published by the Canadian Centre for Policy Alternatives, 1992; and "Fair Wages and Working Conditions for Homeworkers: A Brief to the Government of Ontario," from the International Ladies' Garment Workers' Union, Workers' Information and Action Centre of Toronto, Chinese Workers' Association, Parkdale Community Legal Services, Ontario Coalition of Visible Minority, Coalition for Better Child Care, Trinity/Spadina NDP Riding Assoc., Ecumenical Council for Economic Justice, National Action Committee on the Status of Women.

¹⁴⁵ Linda Duxbury, Christopher Higgins, Catherine Lee and Shirley Mills, "Balancing Work and Family: A Study of the Canadian Federal Public Sector," School of Business, Carleton University, December 1991; Public Service Alliance of Canada, "Go Home...and Stay There?" A PSAC Response to Telework in the Public Service, August 1993.

7.8 Electronic Surveillance

Electronic surveillance has been defined as "the computerized collection, storage, analysis, and reporting of information about employees' productive activities."¹⁴⁶ The issues surrounding electronic surveillance are best illustrated by Clement, who notes:

*"the radical innovation that information technology offers managers lies not in its ability to automate production, but rather to generate vast quantities of production information that can be used in turn for controlling the work processes. Information on rates, times, delays, calls answered, keys pressed, messages sent, transactions entered, and so on have for the first time become instantly and cheaply available. When analyzed appropriately, this information about performance of machines and workers can be very valuable for improving management. On the other hand, it provides the basis for surveillance of individuals unprecedented in its scope and detail"*¹⁴⁷

As noted above, computer-based monitoring systems can collect various types of information about employees, including number of keystrokes, types of transactions completed, and time spent on each transaction or task.

Telephone monitoring equipment can allow employers to listen in on employee telephone conversations with customers, while closed circuit television equipment can be used to videotape employees' actions. Telephone call accounting is another form of monitoring whereby telephone systems track information such as the time, date, duration, destination, origin and cost of telephone calls. Other systems such as magnetic 'smart cards' can be used to track the location and movement of employees within facilities.

Computerized monitoring has also been introduced into the trucking business, whereby the number of stops, breaking distance, speed, and amount of time driving of individual trucks can be collected and analyzed by management. Mobile satellite communications systems allow for the real-time monitoring of vehicle locations.

Electronic mail, fast becoming a commonly used form of business communications, is also potentially subject to monitoring, while modern computer network systems provide the potential for monitoring of such things as data files, E-mail messages, and individual employees' time and activities on the network. In his recent article, "Considering Privacy in the Development of Multi-Media Communications," Clement (1994) notes how multimedia applications, including video conferencing -- both of which will be facilitated

¹⁴⁶ Jankanish, M., "Monitoring and Surveillance in the Workplace: Privacy Issues in an International Perspective," ILO Conditions of Work, Vol. 12, 1/1993, and the OTA, "The Electronic Supervisor: New Technology, New Tensions," Washington, D.C., 1987.

¹⁴⁷ Clement, A., "Electronic Workplace Surveillance: Sweatshops and Fishbowls," Canadian Journal of Information Science, Vol. 17, No. 4, Dec., 1992.



with the Information Highway -- bring forth new dimensions pertaining to electronic surveillance.¹⁴⁸

The extent of electronic surveillance is not readily known. One study conducted in the United States estimated that 20 million American workers, excluding telephone monitoring, may be subject to electronic monitoring. The study also suggested that as many as 80% of employees in telecommunications, insurance and banking are subject to telephone and/or computer-based surveillance.¹⁴⁹

More information is available as to which positions and jobs are potentially subject to electronic surveillance. In its study entitled "The Electronic Supervisor: New Technology, New Tensions," the U.S. Office of Technology Assessment (OTA) has identified eight jobs/positions that are most often subject to electronic monitoring, or which lend themselves to monitoring, including word processing and data entry clerks, telephone operators, customer service workers, telemarketers, insurance claims clerks, mail clerks, and bank proof clerks. The monitoring of electronic mail and network activities suggests that other occupations, including those traditionally defined as professional occupations, may also be subject to monitoring.

Reasons for monitoring include:

- it allows for the monitoring of workflows, performance, and levels of customer service;
- it allows for the investigation of thefts and industrial espionage;
- it can prevent harassment;
- it allows management to seek missing or illegal software; and,
- it prevents the personal use of employer equipment.¹⁵⁰

Monitoring and surveillance can also be used to monitor employee performance, allowing managers to provide feedback and make recommendations with respect to improving performance.

As Jankanish notes, however, "while employers tend to put forth business and security-related reasons for monitoring and surveillance, objections to monitoring and surveillance are based on the intrusive nature of the practices on the privacy and dignity of workers."¹⁵¹ The major objections against electronic surveillance include:

¹⁴⁸ Clement, A., "Considering Privacy in the Development of Multi-Media Communications," Computer Supported Cooperative Work, 1994.

¹⁴⁹ "Computers Intruding on Privacy in Workplace," ILO World of Work, No. 10, 1994.

¹⁵⁰ Ibid.

¹⁵¹ Jankanish, M., "Monitoring and Surveillance in the Workplace: Privacy Issues in an International Perspective," ILO Conditions of Work, Vol. 12, 1/1993.

- their use is a violation of basic human rights and dignity, and is often carried out without adequate consideration for such interests;
- computer databases and telephone and video monitoring make prying into the private lives of workers easier and more difficult to detect than ever before;
- monitoring and surveillance give employees the feeling that they are not to be trusted and thus foster a divisive mentality which is destructive to both workers and employers;
- such practices can be used to discriminate or retaliate against workers, which may be difficult for workers to discover;
- monitoring and surveillance involve both issues of exercising control over workers and control over data relating to specific workers; and,
- electronic monitoring can cause undue stress amongst those employees being monitored.

7.9 Summary

Over the past thirty years, and in particular the last ten, a number of lessons have been learned about the opportunities, challenges and problems which arise with the introduction of new technologies in the workplace. To date, these technologies have been introduced in various degrees and using different methods in the various sectors of our economy. Businesses and government are increasingly investing in information and technological infrastructures to link up with and participate in the Information Highway. Government services offered through Canada Infocentres, Appli-Touch for UI applications, and EFILE for electronic tax filing are only a few of many examples where electronic services replace people. Strategies for the development and implementation of the Information Highway have changed the rate of introduction of these new technologies and work practices. The importance of the Information Highway is that it has already, and will increasingly, extend new production and labour force practices deeper and wider into all sectors of the economy, well beyond what is considered the 'information sector.'



8.0 Industrial Relations and the Information Economy

*"there is no scientific law that determines the direction of technological development, so it should be possible to develop technology that is beneficial socially as well as economically"*¹⁵²

8.1 The Role of Management in the Information Economy

The Impact of Information Technology

In recent years, the role of management has changed dramatically. The motivation for this change has been both offensive and defensive. On one hand, companies in the vanguard of change have generated new means of achieving advantage over their competitors. On the other hand, competitors who have been confronted with such changes have been forced on the defensive, responding with measures of their own.

Information and communications technologies are an important component in the business arsenal. They reduce the cost of doing business and increase managerial control over all aspects of a company's operations. They also play a critical role in determining the nature of firms and the structure of markets. Due to their enormous power, new communications and information technologies have redistributed economic power and shifted economic advantage toward those who have initiated their successful deployment.

At the same time, the systematic use of IT has been accompanied by organizational changes designed to tap the full productive potential of the new technologies. These changes have resulted in a process of continuous change in the workplace which has displaced enormous numbers of workers and altered the nature of work for those remaining.

From management's point of view, the shift in the structure of the economy from one dominated by the mass production of material goods to one that is centred on the production of services necessitates the creation of a workforce that is both skilled and flexible. To date, the ramifications of these changes on workers, their communities and on society as a whole are substantial.

During the last 20 years, business has invested heavily in information and communication technologies to boost productivity. Until recently, however, the anticipated productivity gains have not materialized in the service sector. Business analysts have labelled the failure to realize the benefits of new technology as the 'productivity paradox.'¹⁵³

¹⁵² Ozaki, M., "Technological Change and Industrial Relations: An International Overview", International Labour Office, Geneva, 1992.

¹⁵³ Baily, M.N. & R.J. Gordon, "The Productivity Slowdown, Measurement Issues, and the Explosion of Computer Power," Brookings Papers on Economic Activity, 1998, and Brynjolfsson, E., "Is Information Spending Productive: New Evidence and New Results," MIT Sloan School, 1993



There are differing assessments of this paradox. Many analysts believe that IT by itself will not yield substantial productivity gains unless its deployment is accompanied by parallel organizational change. These observers argue that in order to generate the desired increases in productivity, new IT applications must be carefully integrated into the overall organizational environment, taking into account the "way people work, learn and innovate."¹⁵⁴

A wide range of businesses are adopting one or more of the topical managerial approaches -- 'empowering' their employees, flattening their organization, creating self-directed teams, introducing Total Quality Management, re-engineering their work processes, and introducing flex-time, telecommuting, and the sharing of jobs. Despite the upbeat tone of the people who are promoting these techniques, some observers note the dramatic difference between what is promised and what is delivered. Organizational success in the deployment of these industrial relations innovations is often compromised by the fact that some employees concentrate solely on doing their own job, without focusing on the needs of their customers.¹⁵⁵ Other employees end up in jobs that involve little or no discretion so that they cannot engage in meaningful self-management. Still others -- perhaps the majority in today's insecure job market -- spend an inordinate amount of time and effort merely trying to survive the never-ending series of organizational changes.

At the same time, however, the same author argues that the job is "vanishing like a species that has outlived its evolutionary time" and that the 'post-job employee' will need a much more flexible organization than those which exist today -- preferably one whose operations are not constrained by formal job descriptions. While this description seems reasonable from a managerial perspective, it glosses over the profound social dislocations that are accompanying re-engineering and other processes that are causing workforce reductions and insecurity for an increasing number of Canadians.

Management's desire to increase organization flexibility and lower costs is causing businesses to reconsider their traditional management techniques. A great deal of emphasis is now being placed on increasing group motivation, loyalty, commitment, and pride. Employers have reason to believe that encouraging employees to share the firm's goals is not only profitable in the long run, but also necessary for the development of internal flexibility. Loyal, committed workers more readily learn new skills and adapt to incentive-based reward structures.

Workers who have been frustrated with the rigidities that often characterize traditional adversarial industrial relations often greet the announcement of change in their management's approach to running the organization with considerable enthusiasm. However, concern has been expressed that this initial enthusiasm often fades as employees experience the huge gulf between promise and its real meaning on the shop floor: constant organizational turmoil, management's refusal to heed insights generated by classified

¹⁵⁴ Brown, J.S. & P. Duguid, "Innovation in the Workplace: A Perspective on Organizational Learning," Carnegie Mellon University, 1989.

¹⁵⁵ Bridges, W., "The End of the Job," *Fortune*, September 19, 1994

employees, reductions in their real wage, and the increased insecurity of their employment tenure.

Today's joint venture alliances, and outsourcing are manifestations of the new corporate form known as the virtual corporation. IT supports and facilitates these shifts to new ways of managing and doing business.

In the context of these organizational changes, a thin stratum of knowledge-based workers are being increasingly expected to analyze and act on information. This activity has previously been considered the exclusive domain of management. As these workers take over the tasks that management used to control, substantial layoffs of middle managers have resulted. In addition, the roles and expectations of the workers and managers who survive corporate downsizing have been redefined.

In some cases, increased worker training in problem solving is required because the remaining management personnel are no longer sufficient in number to provide the organization with direction. In other instances, workers have been moved to a new location that places them at a distance from their supervisors. In still other cases, IT has made it possible for management and professional employees to retrieve and process information without the intervention of clerical or secretarial assistance.

In recent years, there have been significant developments in union policies on new technologies. As competition has increased in intensity, a growing number of workers and unions have realized that technological innovation is not something to be treated fatalistically. Increasingly, unions are seeking to influence the process of technological innovation so that new technology is introduced in manner which benefits workers (e.g., promotion, training) and minimizes its adverse effects.¹⁵⁶

Certain methods of achieving increased organizational flexibility and reduced costs are clearly traumatic in their implications for the workers and society as a whole. These methods appear to be gaining in popularity as competitive pressures increase. These include layoffs, downsizing and a shift to the use of an increasingly contingent workforce in the form of temporary and part time employees.

By hiring workers on a temporary basis, employers enjoy significant savings on fringe benefits and are free to release these employees when the company's volume of business shrinks. But firms utilizing a contingent workforce have little reason to invest in training and the upgrading of their employees' skills.¹⁵⁷

¹⁵⁶ Ozaki, M., "Technological Change and Labour Relations: An International Overview," International Labour Office

¹⁵⁷ U.S. Congress, Office of Technological Assessment, "Technology and Structural Unemployment: Reemploying Displaced Adults, 1986.

The postwar experience in certain countries, notably Japan and Germany, indicates that higher productivity can be achieved by improving training and skills.¹⁵⁸ While reliance upon a workforce that is contingent and vulnerable is not consistent with the Japanese and German industrial relations models, it remains to be seen whether their approach can be sustained in the face of increased international competition from highly skilled knowledge workers in countries like Mexico, India and South Korea.

In recent years; there has been a marked decline in the ranks of middle management. At the same time, its role has been redefined.¹⁵⁹ These changes are integrally connected with the widespread deployment of IT. IT has facilitated the laying off of substantial numbers of middle managers and caused the resulting 'flattening' of the organization which has received such widespread attention.

Managing in the Information Age

It is widely alleged that traditional management practices are inadequate in the information age, that new methods must be employed to respond to the demands of the new environment, that it will be impossible for an organization to be successfully run if management insists on adhering to outmoded practices. Proponents of this perspective argue that compensation (i.e., wages, benefits and pension) must become contingent upon the success of the organization; that new training programs will be required -- especially those which emphasize teamwork and encourage employees to identify with the purposes of the organization; that internal communications must become more sophisticated; and that career paths and the notion of job security will have to be re-thought.

The following chart, excerpted from Business Week,¹⁶⁰ provides an idealized version of the industrial relations changes which result when IT is deployed in the workplace:

¹⁵⁸ Sorge, A et al, "Micro-electronics and Manpower in Manufacturing: Applications of Computer Numerical Control in Great Britain and West Germany, 1983.

¹⁵⁹ Dopson, S. & R. Stewart, "Information Technology, Organizational Restructuring and the Future of Middle Management," New Technology, Work and Employment, 1993.

¹⁶⁰ Treece, J.B., "Breaking the Chains of Command," Business Week, 1994.

When Information Technology Alters the Workplace

Managers Must...

- ▶ instill commitment in subordinates, rather than rule by command and control
- ▶ become coaches, training workers in necessary job skills, making sure they have resources to accomplish goals, and explaining links between a job and what happens elsewhere in the company
- ▶ give greater authority to workers over scheduling, priority-setting, even compensation
- ▶ use new information technologies to measure workers' performance, possibly based on customer satisfaction or the accomplishment of specific goals

Workers Must...

- ▶ become initiators, able to act without management direction
- ▶ become financially literate, so they can understand the business implications of what they do and changes they suggest
- ▶ learn group interaction skills, including how to resolve disputes within their work group and how to work with other functions across the company
- ▶ develop new math, technical, and analytical skills to use newly available information on their jobs

Management theory increasingly recognizes that managers do not have the kind of detailed, job-related knowledge that is possessed by the front lines workers who are constantly interacting with customers. It follows that workers, who are closer to the task, are better qualified to make crucial task-related decisions than managers are. The theoretical corollary is that managers must encourage workers to think on their own and to voice their opinions when they believe the manager is wrong. While this differs radically from traditional management views, there is still a gap between this theory and the one-sided managerial decision-making, which continues today.

"The manager's purpose in the new age is not that of a taskmaster, but to provide the employees with vision and direction, and then to get out of the way and let them reach these goals."¹⁶¹

IT has had, and will continue to have, a major impact on employer-employee relations. Management theory has it that this interaction is one "balanced by trust, cooperation, and delegation of authority on the one hand, and monitoring and accountability on the other. Depending on the work environment, information technology can shift the balance in either direction."¹⁶² In order for the semblance of balance to exist, however, there must be a force capable of influencing management's decision-making power. In the absence of such countervailing power, IT offers employers the opportunity to carry out the traditional monitoring of workers' performance more efficiently, as well as to extend monitoring practices to areas of work that have traditionally been done without monitoring (e.g., trucking, delivery, dispatched repair work.)

¹⁶¹ Runge, L.D., "The Manager and the Information Worker of the 1990's," Information Strategy: The Executive's Journal, Summer 1994

¹⁶² U.S. Congress, Office of Technological Assessment, "Electronic Enterprises: Looking to the Future," 1994.



8.2 Information Technology and Collective Bargaining

*"Collective bargaining is ... an attempt by labour and management to introduce changes through the medium of a collective agreement. These changes regulate the interaction and establish the terms between employer and employee for the duration of the agreement."*¹⁶³

Given the vast changes that are currently taking place within the Canadian economy, including those associated with the development of the Information Highway and the use of information technologies, collective bargaining and unions can play an important role in terms of mitigating negative impacts resulting from the introduction of new technologies. In this regard, it is noted that governments play a leading role in setting the terms and conditions that apply to workers generally.

This section deals with the Information Highway, collective bargaining and unions by focusing on technology change provisions which exist in Canadian labour codes. Proactive approaches which have been undertaken by unions in the face of technological change are illustrated with a view of creating alternative models which can be utilized by other unions.

It should however be stressed that collective bargaining is only effective for those covered under collective agreements. Mechanisms such as employment standards (which are discussed later in this section) must be considered for those outside of collective agreements, including those in traditional employee-employer relationships and the self-employed.

Labour Code Provisions Concerning Technology Change

At the federal level, provisions exist in the Canada Labour Code which stipulate how technological change can be implemented into a workplace. The federal Code defines technological change as:

*"the employer's introduction of equipment or material not previously used in the operation and a change in the manner in which the employer carries on the work, undertaking, or business that is directly related to the introduction of the equipment or material."*¹⁶⁴

The Code stipulates that if a collective agreement exists, an employer who proposes to introduce a new technology (or technologies) into the workplace must give written notice of the pending change 120 days before the anticipated introduction of the technology, if it is likely that the technology will affect the terms and conditions of a significant number of employees covered under the agreement.

¹⁶³ B. Downie, "The Negotiation Process", from Labour Relations in Canada, Scarborough, Ontario, 1990.

¹⁶⁴ "Canadian Master Labour Guide: A Guide to Canadian Labour Law", 1993.

This written notice, prepared by the employer, must describe the:

- nature of the technological change;
- proposed date the technology will take effect;
- number of employees involved; and,
- technology's likely effect.

Furthermore, the employer must also provide a description of the nature of the technological change being implemented, the individual employees likely to be affected, and the reason(s) for the change. Collective bargaining can ensue if the technological change substantially and adversely affects the employment of a significant number of employees covered under the collective agreement.

Thus, the notification of technological change, as specified in the Canada Labour Code, and subsequent collective action which can ensue, illustrates the role that collective bargaining can play when new technologies, including Information Highway applications, are introduced into the workplace.

However, it is important to note that the effectiveness of technological change provisions and ensuing collective bargaining is limited to the extent that, while technological change provisions exist in the Canada Labour Code (which covers federally mandated employment sectors), similar provisions are provided in the provincial labour codes of just four provinces: British Columbia, Manitoba, Saskatchewan, and New Brunswick. It is further noted that the protection afforded workers under the jurisdictions that do have provisions is limited.

While outside the mandate of the federal government, discussions concerning the need for similar legislative provisions within the remaining provincial labour codes could be considered as an area where the federal government could initiate discussions and provide leadership, especially in terms of implications resulting from Information Highway-related applications. Unions which are active in these other provinces can also play a role in ensuring that technological change provisions are included in collective agreements, and that discussions concerning labour code provisions are initiated.

Unions can also be active in mitigating the negative impact of technology changes, including those related to the Information Highway, through the collective bargaining process. Examples where union actions have mitigated the potentially negative impacts on their membership resulting from the introduction of new technologies include the Canadian Union of Postal Workers and the introduction of video encoding systems (VES) at Canada Post, and efforts of the Communications Workers of America (CWA) and technological change at NYNEX.

The Canadian Union of Postal Workers and VES Technology

Concerning Canada Post and the introduction of VES technology, the Canadian Union of Postal Workers (CUPW) took a proactive role in researching and communicating to its



members VES technology and the potentially adverse effects such technology would have on its workers.

The VES is a system which captures an electronic image of a letter rejected by a mechanized sorting machine. This image is then displayed to the VES operator, who either types in the letter's postal code or types in the letter's street address, allowing the correct postal code to be obtained, thus allowing the letter to be correctly sorted. The VES-coded mail then goes back into the mail sorting process and eventually gets delivered. Because VES operators work with an electronic image of the letter, the work can be performed anywhere where the VES operator can receive the image (which requires a T1 line for data communications).

As CUPW notes, with the Information Highway, this could be in the postal plant across the country or half-way around the world. "Remote coding technology could allow Canada Post to contract-out coding work to any private firm which can set up a T1 connection with the mail processing plant ... under the terms of the North American Free Trade Agreement, the corporation would have to entertain bids from contractors in the United States and Mexico if it wanted to contract-out the work."¹⁶⁵ In other words, the work could potentially be 'off-shored' to a location that has lower wages.

With its knowledge of the VES technology, and with the support of an informed membership, CUPW successfully negotiated a collective agreement in 1994 which included a stipulation that VES would not be contracted out. Furthermore, the collective agreement also stipulated that in general, the adverse effects of technological change would be eliminated. In particular, Section 29.02 of the agreement states that:

*"In carrying out technological changes, the Corporation agrees to eliminate all injustices to or adverse effects on employees and any denial of their contractual or legal rights which might result from such changes."*¹⁶⁶

The Communications Workers of America (CWA) and NYNEX

Recent collective bargaining efforts by the CWA and NYNEX also indicate how efforts by unions can mitigate the negative consequences of technological change. In a presentation to the 1994 LabourTech Conference, Barbara Easterling, Secretary-Treasurer of CWA, outlined their union's strategy in dealing with technological convergence within the telecommunications industry.

Utmost in the union's strategy was an understanding that "just maintaining the status quo for CWA was not a viable option." As Easterling notes, "we cannot stop an employer from laying off workers, but we can win alternatives to downsizing that will lessen the impact

¹⁶⁵ "CUPW, "The Video Encoding System Opens the Door to Low-Wage Work, Contracting Out", from "Security in a Changing World", 1994.

¹⁶⁶ Collective Agreement Between the Canadian Union of Postal Workers and Canada Post Corporation, 1994.

on our members." The collective agreement, which the CWA negotiated 16 months before the expiry of its contract, contained certain innovative provisions, including:

- employees with five years of service would be eligible for a two-year educational leave of absence. They would retain all benefits, receive up to \$10,000 in educational assistance per year and would be guaranteed a job on their return to work.
- CWA members would have preferential hiring rights for any new subsidiary created by NYNEX, or in a company acquired by NYNEX where they have controlling interest. The union would be granted recognition.
- all craft employees would be eligible to take a two-year Associate Degree in Telecommunications Technology. They would work four days a week and go to school the fifth day. They would receive a full week's wages and lifetime experience credit would be given toward completing the degree. Upon graduation, the new 'super techs' would receive about a 5% percent wage increase. Remedial training to qualify for the program would be provided to those who need it.
- a generous early retirement package would be offered to all employees through 1998. Six years would be added to service and age, plus a supplement of 30 percent or \$500 monthly, whichever is greater, until age 62. The package also includes lifetime health care benefits and \$3,000 for tuition reimbursement for one year.
- the company would create a central job bank listing available jobs and locations. Employees who have to move would receive an \$8,000 move allowance.
- skills assessment, out-of-home courses and correspondence courses would be offered at company expense. Courses would also be offered during working hours to help employees upgrade skills and to prepare them for company positions.

Thus, like CUPW, the CWA took a proactive approach to its collective bargaining and secured certain innovative solutions for mitigating against the potentially negative aspects of technological convergence and change. Experience suggests that it would be desirable to *require* this form of substantive consultation in all codes (federal and provincial).

The Role for Unions Outside of Collective Bargaining

As noted above, unions can play an active role in mitigating potentially negative impacts of new technologies introduced into the workplace by initiating discussions concerning the need for technological change provisions in provincial labour codes and by ensuring that technological change provisions are included in collective agreements in the provinces where such provisions do not exist.

Unions can also play a role in terms of mitigating the negative impacts of technological changes (including those related to the Information Highway) by being active in the

decision-making process surrounding the implementation of new technologies. As the Canadian Labour Congress notes, there should be "some form of worker involvement in, and control over, the process of technological change."¹⁶⁷

Unions have had input where the introduction of new technology enhances the well-being of workers and the efficiency of industry alike, and negative impacts are mitigated. For example, unions in Germany consider their role in the technological change process as one where their efforts, combined with those of management, ensure that technology remains "compatible with society."

Other efforts are also being made to increase labour's involvement in the overall decision-making process. For example, labour-management cooperation plans have been put forth as an approach whereby labour unions and workers themselves have greater input to company decisions. In their report entitled "The New American Workplace," the AFL-CIO Committee on the Evolution of Work advances labour-management cooperation as an opportunity where "workers, through their unions, would be given a decision making role at all levels of the enterprise, and the rewards from the new system would be shared equitably through negotiations."¹⁶⁸

In the United States, the establishment of the Office of the American Workplace (OAW)¹⁶⁹ also illustrates attempts at fostering labour-management cooperation. While viewed with considerable suspicion by organized labour, the OAW has been mandated with developing initiatives for promoting innovative workplace practices and cooperative labour-management practices. The OAW works with a variety of organizations, including state and local offices, to develop ways in which firms can integrate innovative work systems and human practices with new technologies and production methods. Among the OAW's priorities are:

- the building of a clearinghouse to help companies and employees learn from the experience of America's most successful companies;
- develop "partnerships with business and labour organizations to identify and promote high-performance work practices, employee ownership and new roles for labour unions"; and,
- "promote the use of new measurements of workplace practices to allow investors, managers, and board members to better determine the economic impact of high performance work practices."

These cooperative approaches are not without their critics however. Experiences with General Motors has led some union representatives to question whether cooperative agreements are not "just sugar coating that makes it easier to swallow the bitter pill of

¹⁶⁷ Canadian Labour Congress, "Tech Change: A Handbook for Union Negotiators".

¹⁶⁸ Kelber, L., "LabourTalk: The Future Workplace", Sept. 5, 1994.

¹⁶⁹ U.S. Congress, Office of Technology Assessment, "Electronic Enterprises: Looking to the Future", 1994.

downsizing,"¹⁷⁰ leading to capitulation as opposed to cooperation. In Canada, the federal government's announced plans to lay off 45,000 employees -- the largest lay off in Canadian history -- and Bell Canada's announced intention of laying off 10,000 of its employees, has led labour organizations to further question cooperative approaches.

Furthermore, the idea of increased labour-management cooperation tends to contradict current management efforts to lay off, downsize, re-engineer, contract-out, and increasingly use a contingent workforce. As Kelber notes: "why would corporations want to share their authority with a union, whose primary function is to improve the wages and working conditions of their employees?"

However, regardless of the views concerning increased labour involvement in the planning and introduction of new technology, efforts can be made (whether they be in the collective bargaining process or as revisions to technology change provisions in labour codes) to ensure that sufficient labour input is provided so that "technology may be introduced in such a way as to benefit workers and minimize its adverse consequences"¹⁷¹ on society in general.

8.3 Employment Standards

While the collective bargaining process can provide opportunities to limit the adverse effects of technological change on employees, they are limited to only those workers who are covered by collective agreements. While in some European countries, collective bargaining agreements can cover over 90% of a country's workforce, in Canada only 38% of the workforce is covered under collective agreements. Furthermore, while the overall rate of coverage is 38%, as illustrated in Exhibit 8.3.1, the rate of unionization also varies by size of firm.

As such, mechanisms other than collective bargaining (e.g., employment standards legislation) must be considered as methods which can be used to mitigate the adverse effects of technological change on the 62% of the workforce that operates outside of collective agreements.

This section provides an overview of employment standards, and highlights issues pertaining to the Information Highway, including operational definitions of teleworkers and the workplace, and the exclusionary nature of some legislation.

¹⁷⁰ Leary, E., and Menaker, M., "Jointness at GM: Company Unionism for the 21st Century", LabourNet, 1994.

¹⁷¹ Ozaki, M., "Technological Change and Industrial Relations: An International Overview", International Labour Office, Geneva, 1992.

Exhibit 8.3.1 Unionization Rate by Size of Firm (1991)

Size of Firm	Unionization Rate
Less than 20 Employees	14.7%
20-99 Employees	26.5%
100-499 Employees	44.2%
500 or more Employees	55.2%

Source: Jackson, A., "Unions, Competitiveness, and Productivity: Towards a Labour Perspective," School of Industrial Relations, Queen's University, 1993.

Overview of Employment Standards

Employment standards are designed to accomplish two goals:

- provide protection to individual workers; and,
- create a level of certainty in the labour market by ensuring that employers meet certain basic/minimum employment/labour standards.

The standards themselves apply to various aspects relating to the realm of work, including:

- minimum working age;
- the keeping of personnel records;
- hours of work;
- minimum wages;
- overtime pay;
- payment of wages;
- vacations with pay;
- statutory holidays; and,
- leaves of absence (including education leave).

With the development of the Information Highway, and the emergence of telework and teleworkers, certain issues pertaining to the application of employment standards need to be addressed. These issues include:

- operational definitions of a 'teleworker' and the 'workplace' and their implications re: coverage under employment standards legislation; and,
- coverage of employment/labour standards themselves as they relate to teleworkers.

The implications of the Information Highway and teleworkers must also be considered for specific employment standards and related legislation including Employment Standards Acts, Worker's Compensation Acts, Workplace Acts, and Health and Safety legislation.

Two employment standards, maximum hours of work and overtime pay, are discussed in this section in an attempt to illustrate some of the issues as they relate to 'teleworkers'.

Operational Definitions of a 'Teleworker' and the 'Workplace'

The operational definition of a 'teleworker' is an important issue which must be addressed as it relates to employment standards. In particular, the definition of a 'teleworker' in legislation relating to employment standards must be compatible to that of an 'employee' and existing definitions of 'homeworkers'.

In situations where a 'teleworker' is not included under definitions pertaining to 'homeworkers', or where incompatibilities exist between the definition of a 'teleworker' or 'homeworker' and an employee, minimum employment standards would not be applicable. As McGrady and Jamieson note:

*"The risk of teleworkers, and homeworkers generally, being considered independent contractors, is significant and must be taken into account in any home work arrangement. Homeworkers may appear more like independent contractors because their workplace is outside the company's central location, and they can perform their work in a somewhat autonomous manner. If considered an independent contractor, any benefits or protections that an employee may have under protective legislation, such as the Employment Standards Act or the Workers Compensation Act, would generally be lost ... therefore, it is vital to ensure that any home work arrangement maintains the individual's employment status."*¹⁷²

In Ontario, although homeworkers are defined under the Employment Standards Act (Section 1), the definition does not explicitly cover the production of *services* in the home (such as data or word processing)¹⁷³ as opposed to the production of goods. As a result, the standards as set out in the Act can be circumvented if the definition of a homemaker is narrowly interpreted to exclude teleworkers.

Thus, attempts must be made to ensure that both federal and provincial employment legislation apply equally to teleworkers as they do to the traditionally defined employee and current homemaker definitions, so as to ensure that teleworkers benefit from the same protection as their counterparts. As Oldfield states "in order to recognize new forms of home work, definitions in legislation should be broadened to include clerical work, professional work, and forms of home work yet anticipated."¹⁷⁴

¹⁷² McGrady, L., Jamieson, E., "Home Work: Reinventing the Company Town," McGrady, Askew & Fiorillo, Vancouver, B.C., 1994.

¹⁷³ Coalition for Fair Wages and Working Conditions for Homeworkers, et al., "A Briefing Note Prepared for the Government of Ontario," "From the Double Day to the Endless Day, A Conference on Homeworking", 1992.

¹⁷⁴ Margaret Oldfield, "The Electronic Cottage -- Boon or Bane for Women?" Seminar on Gender and Economic Restructuring, University of Waterloo, 1991.



A similar situation exists with respect to the definition of the workplace. As Williams points out, "the principles of privacy under Canadian law often mean that legislation regulating work places is not applicable to a work site which is not under the direct control of the employer."¹⁷⁵ Thus, with respect to definitions applying to teleworkers, attempts must be made to ensure that federal and provincial employment legislation does not limit the protection granted to teleworkers due to a narrowly interpreted definition of the workplace.

Coverage for Teleworkers

As noted above, narrow interpretations of teleworkers, as compared to homeworkers and traditional employees, can exclude them from the protections granted through employment standards. However, even when teleworkers are accepted by definition as homeworkers, specific regulations can exclude teleworkers from the protections granted through employment standards.

For example, in the Province of Ontario, Regulation 285 excludes homeworkers (and by extension teleworkers) from minimum standards with respect to maximum hours of work, overtime pay, and statutory holidays.

Thus it has been advocated that legislation should include teleworkers (and homeworkers) as opposed to excluding them. This follows a recommendation put forth concerning the Ontario situation, which stated that "all existing regulations under the Employment Standards Act which exclude homeworkers from labour standards should be repealed such that homeworkers are entitled to protection related to maximum hours of work, overtime rates and statutory paid holidays."¹⁷⁶

It should be noted that collective bargaining can also be used to protect the rights of teleworkers for those covered by collective agreements.

Issues Relating to Specific Standards

In an attempt to illustrate some of the issues arising as a result of the emergence of teleworkers, two employment standards, including *Maximum Hours of Work* and *Overtime Pay* standards, are discussed below. This discussion illustrates the conclusion developed by McGrady and Jamieson that "overall, home work and the legal issues surrounding it are clearly in their developmental stage,"¹⁷⁷ with several issues yet to be resolved.

¹⁷⁵ Gordon Williams, "Unions and telework," Work Well Publications, Victoria, B.C..

¹⁷⁶ Coalition for Fair Wages and Working Conditions for Homeworkers, et al., "A Briefing Note Prepared for the Government of Ontario," "From the Double Day to the Endless Day, A Conference on Homeworking", 1992.

¹⁷⁷ McGrady, L., Jamieson, E., "Home Work: Reinventing the Company Town," Mcgrady, Askew & Fiorillo, Vancouver, B.C., 1994.

With respect to federal legislation, the Canada Labour Code states that standard working hours shall not exceed eight hours per day and 40 hours per week (excluding management and certain professions). Similar provisions exist at the provincial levels.

Given that most jurisdictions have a standard 40 hour work week, overtime is defined as hours worked in excess of that standard, to be paid at a legislatively mandated rate of pay. For example, the Canada Labour Code specifies that within the federal jurisdiction an overtime rate of one and one-half times the regular wage must be paid for all hours worked in excess of eight hours per day and 40 hours per week.

These standards are important to consider in context of telework in that recent reports suggest that teleworkers work more hours per day than they would in a traditional work environment. A recent study focusing on telework in the federal government noted that men and women who telework and/or have flexible work arrangements, work more hours per day (2.4 hours per day) than do those who are not teleworkers.¹⁷⁸ Furthermore, as McGrady and Jamieson note:

*"A variety of reports on homeworkers identify the difficult blurring for home workers that occurs between work, family and leisure activities. Without a standardized work time, and because of time-savings that result from not having to commute to work, home workers tend to either work longer hours, or suffer from the confusion and stress that can occur by trying to delineate between work and leisure."*¹⁷⁹

In such cases, the potential exists for more than the standard hours per week being worked, in which case overtime pay would be required. While this may seem straightforward, as noted by the Public Service Alliance of Canada, not all homeworkers claim this overtime.¹⁸⁰ As well, many teleworkers may not be aware of the provisions which would entitle them to overtime pay.

An International Ladies Garment Workers Union's study into the working conditions of Chinese-speaking homeworkers in the Toronto garment industry¹⁸¹ also illustrates some of the issues relating to employment standards:

¹⁷⁸ Duxbury, Linda, "Balancing Work and the Family," Carleton University School of Business, as cited in "TECHnotes", June, 1992.

¹⁷⁹ McGrady, L., Jamieson, E., "Home Work: Reinventing the Company Town," McGrady, Askew & Fiorillo, Vancouver, B.C., 1994.

¹⁸⁰ PSAC, "Homeworking (Telework) for Federal Public Servants".

¹⁸¹ Cameron, Dr. B., and Mak, T., "Working Conditions of Chinese-Speaking Homeworkers in the Toronto Garment Industry: Summary of Results," from "A Conference on Homeworking - From the Double Day to the Endless Day," 1992.



- only nine of the 30 homeworkers surveyed earned the minimum wage or above. One worker was earning \$1.00 an hour, two were earning \$2.50 an hour, and three were earning \$3.50 an hour. Overall, the average hourly wage was \$4.64;
- of the thirty homeworkers interviewed, only one was paid vacation pay;
- only one of the homeworkers said that their employer had a provincial permit to employ homeworkers;
- the interviews revealed that on average, homeworkers worked 46 hours per week. The minimum number of hours worked was 16, the maximum was 82;
- during their busiest periods, homeworkers worked an average of 70 hours a week. The number of hours worked at such times ranged from a low of 36 to a high of 100 hours a week; and,
- none of the overtime hours were remunerated at overtime rates of pay.

The above discussion implies that it is important that teleworkers be aware of the relevant employment standards, workers' compensation legislation, and health and safety legislation, and efforts be made to ensure and enforce that teleworkers be covered by these standards.

8.4 Mobility of Work

Globalization and the Location of Work

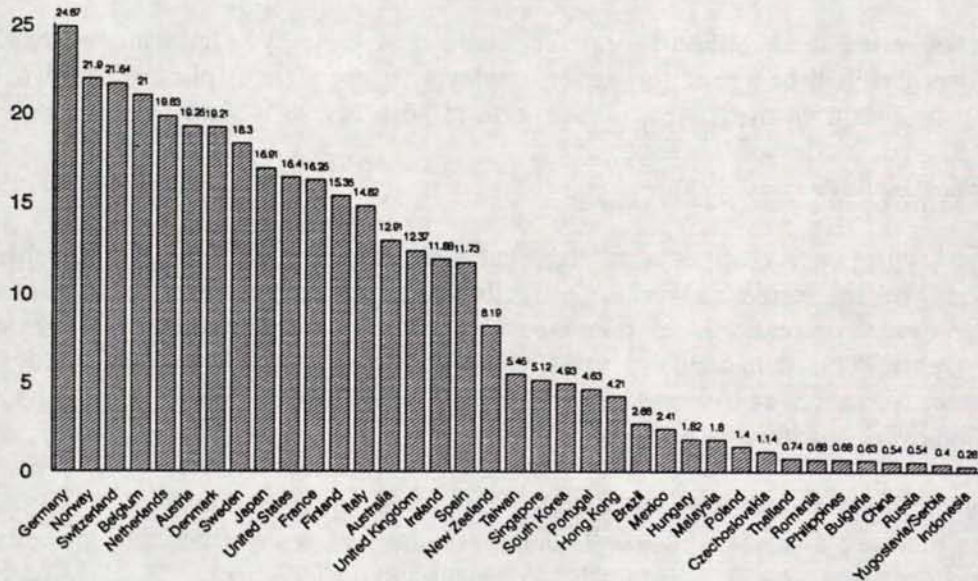
One of the major factors influencing the location of work is globalization, which has resulted in increased competition from developing countries. Over the last 40 years, developing countries have gradually built up their industrial capacity and now export manufactured goods in competition with the traditional industrialized countries. This has led to increased pressure for real wages of unskilled labour in western countries to be equalized with those in developing countries. A comparison of the vast difference in manufacturing labour costs is provided below in Exhibit 8.1.¹⁸²

As a result of this vast cost differential, developed countries have had the following alternatives:

- try to prevent competition from the developing countries by means of import restrictions;
- allow real wages to decline substantially, thereby preserving competitive advantage;
- move out of products using unskilled labour; and,
- preserve competitive advantage to the extent possible by upgrading technology and productivity.

¹⁸² Please note that Canadian data was not included in the World of Work study.

Exhibit 8.1: Manufacturing Labour Costs
(U.S. \$'s Per Hour, 1993)



Source: ILO, World of Work, No. 8, 1994.

All these approaches have been adopted to some extent. While there has been a reduction of unskilled wages and fringe benefits in developed countries, it has been small in comparison to the real gap in wages with developing countries. There has been a switch out of labour intensive, low-skilled products, as well as efforts focused on upgrading skills and technology to keep ahead. In "The New International Division of Labour", Stewart (1994) states the *only* strategy that is consistent with full employment and high real wages is one that involves continuous upgrading of technologies and skills.¹⁸³ In essence, the developed countries have to earn that pay differential. However, as indicated below, the validity of Stewart's statement may already be in doubt.

The threat from the newly industrialized countries is heightened by the fact that several of them (e.g., Taiwan and Korea) are rapidly acquiring a comparative advantage in technology intensive sectors as well. Moreover, the advent of IT makes a second wave of relocation of jobs possible, following the transfer of manufacturing jobs. These involve the transfer of information jobs which is facilitated by computer networks and telecommunications. Some companies are already taking advantage of the educated workforce and lower wages and social charges in some developing countries, to export white collar jobs. Examples of such countries are India and the Philippines. In essence, the process of globalization may

¹⁸³ Stewart, F., "The New International Division of Labour," ILO World of Work, 1994.

be viewed as a dramatic increase in the supply of labour and especially of cheap, but not necessarily unskilled labour.

The environment of continual structural change, attributable at least in part by IT, implies that workers will be forced to change employer, occupation or place of residence perhaps many times during their lives, if they wish to have access to paid employment.

Worker Mobility

The organizational changes attributable at least in part to IT (e.g., displacement of low skilled workers, increased workforce flexibility, reliance on project teams, and the concept of the virtual corporation), suggests that the workforce will be more mobile than it has been in the past. This is particularly true for the knowledge worker who, being highly skilled and well educated, can change jobs easily with concomitant financial benefit to a variety of employers worldwide.

However, for the unskilled worker often displaced by the introduction of IT, there is little or no mobility available. Unemployment, reduced wages and benefits, or entry into the contingent workforce are frequently the results of displacement. The mismatch between the skills of the displaced workers and the much higher skills demanded of the knowledge worker mean that we have a situation involving relatively high unemployment with a sizable number of available skilled jobs.

OECD information¹⁸⁴ indicates that Canadian workers with tenure under one year constituted 23.5% of the workforce, while their average tenure was 7.8 years. These figures placed Canada in the midst of OECD countries, with comparable figures for the U.S. and Japan being, respectively, 28.8% and 9.8% for tenure under one year, and 6.7 and 10.9 years for average tenure.

While high worker mobility allows companies to downsize through attrition, it also results in the loss of job specific skills and transaction costs for workers and employers. It can also result in employers being less willing to invest in employee training.

Low worker mobility can provide a basis for increased productivity by enhancing the motivation and commitment of workers to corporate goals and reducing their resistance to change, and by providing incentives for employers to train their workers. Since worker flexibility is required to some extent to adjust to changing demand, there is a likelihood that a dual labour market of contingent workers will emerge, with these workers bearing the brunt of adjustment.

Mobility has implications for worker benefits, such as pension plans and disability coverage, which are not always available or affordable to workers who are not considered to be employees.

¹⁸⁴ OECD, "The OECD Jobs Study - Evidence and Explanations Part II," 1994.

*Worker Mobility and the Self-Employed*¹⁸⁵ - *A Profile of the Self-Employed in Canada*

Historically, today's current levels of self-employment as a percentage of total employment in Canada are relatively low. For example, in 1931, 26% of Canada's workers were self-employed compared to 15% in 1994.¹⁸⁶ High levels of self-employment in 1931 were attributed to the relatively high employment levels in agriculture, a sector characterized by high levels of self-employment. In particular, 26% of Canada's labour force was in agriculture in 1931, with 57% of agricultural workers being self-employed. With agriculture's declining importance as an employer, self-employment as a percentage of overall employment has also decreased.

However, the 1994 level of 15% is higher than the 10% level recorded in 1971, indicating an upward trend in levels of self-employment. Crompton notes that the reasons behind increases in self-employment and reasons for becoming self-employed are as varied and complex as the entrepreneurs themselves, creating a heterogeneous 'brew' that makes it extremely difficult to generalize about motives. Several factors may play a role in the decision, including: the shift from a goods to a service producing economy (with its attendant changes in business practices and technology), improved educational qualifications, the nature of work, government and tax incentives, market demand, the presence of a working spouse, a preference for working without a boss, all these and others may play a role in the decision."¹⁸⁷

As Crompton notes, part of the explanation behind the increase in self-employment is recent industrial restructuring in the economy and the shift towards the production of services. Combined with the shift towards flexible operations and contingent workers, the demand for self-employed workers has increased.

Crompton's study profiles the growth in self-employment within high self-employment (HSE) service industries such as: construction, transportation, trade, insurance and real estate, and community, business and personal services. *As illustrated in Table 8.1, the number of self-employed within these industries have increase 130% between 1971 and 1991, with some sectors such as community, business and personal services witnessing increases in the number of self-employed of 248%.*

¹⁸⁵ Statistics Canada provides a working definition of self-employed workers, which states that "the self-employed are those whose job consists mainly of self-employment. This includes owning and operating a business or professional practice, alone or in partnership; operating a farm; working on a freelance or contract basis to do a job; providing meals and/or rooms and/or daycare services in one's own home; operating a direct distributorship selling or delivering products such as cosmetics; and fishing with equipment owned in whole or in part ownership with others. These self-employed workers may or may not have paid help; they also may or may not be incorporated." (Statistics Canada Perspectives, Summer 1993).

¹⁸⁶ Akyeampong, E., "The Labour Market: Year-End Review," Canadian Economic Observer, March, 1995.

¹⁸⁷ Crompton, S., "The Renaissance of Self-Employment," Statistics Canada Perspectives, Summer, 1993.

Issues Pertaining to Self-Employment

With the recent trend in the number of self-employed, which can be argued will continue in the future as a result of continued technological change and flexible workforce arrangements, several issues arise. Among these are:

- the question of self-employed workers continuing to be excluded from protections granted to traditional employees through federal and provincial employment standards legislation;
- the question of the self-employed experiencing limited coverage relating to benefit plans such as disability coverage and pension plans which may not be available or affordable to the self-employed; and,
- limited access to worker subsidized training and education opportunities.

Table 8.1: Self-Employment By Industry

Industry	Total Self-Employed 1971 (000's)	Total Self-Employed 1991 (000's)	Percentage Change Between 1971 and 1991	Absolute Change Between 1971 and 1991 (000's)
Construction	78	176	124%	98
Transportation	30	57	89%	27
Trade	144	237	65%	93
Insurance and Real Estate	11	27	143%	16
Community, Business and Personal Services	92	320	248%	228
Total HSE*	355	817	130%	462
Total Non- Primary	540	1,109	106%	569

HSE = High Self-Employment Industries.

Source: Crompton, S., "The Renaissance of Self - Employment," Statistics Canada Perspectives, Summer, 1993.

Among the responses which could be considered by governments, in order to address the above issues, include:

- legislative changes to existing federal and provincial employment standards legislation extending protection to the self-employed;

- developing portable pensions and benefits plans which could be used by self-employed workers;
- establishing government supported trusts for self-employed workers; and,
- developing government subsidized training and education initiatives.



9.0 The Information Highway: Catalyst for Diffusion and New Source of Wealth

9.1 The Process of Technological Diffusion

"This is not a technology issue, the technology will take care of itself -- this is a social and ethical issue -- it's about how we will use this technology to meet society's needs" (British Columbian citizen)¹⁸⁸

International competition has put a premium on the role of knowledge and on the acquisition of IT-based skills; however, the employment-creating impact of information technology will only be felt when the technology has been made widely available to all economic sectors (diffused) and used in the development of more efficient products and services (absorbed).

Unfortunately, in Canada, productivity growth resulting from the application of IT has been disappointing. Such growth has failed to meet expectations. Meanwhile, the economy has undergone a period of extensive restructuring as a response to technological change. The consequence of this productivity lag has been a worrisome increase in the level of unemployment.

A recent Conference Board of Canada report points out that the difficulties of diffusing and applying the new information technologies have been seriously underestimated. The findings suggest that the period of transition requires major structural changes and these, in turn, require an equally profound transformation of the institutional and social framework.¹⁸⁹

Despite the potential for widespread and rapid diffusion of IT, the pattern has been variable across countries, industries and occupations. A recent analysis of these patterns conducted by the OECD¹⁹⁰ identified a number of causative factors, including:

- significant differences in the abilities of firms and industries to incorporate the technology within their management framework;
- reduced scope for applications and poor economies-of-scale in small enterprises;

¹⁸⁸ The quote is an anonymous extract from extemporaneous comments made by British Columbians surveyed on their opinions regarding the creation of a provincial Information Highway. Source: MacWilliam, L., and Turnbull, A., "Socio-Economic Implications of a British Columbia Information Highway," November, 1994.

¹⁸⁹ Conference Board of Canada, "Jobs in the Knowledge-based economy: IT and the Impact on Employment," November, 1994.

¹⁹⁰ Organization for Economic Cooperation and Development, "Technological Change and Innovation," OECD Jobs Study, Paris, 1994.



- skill shortages in personnel, lack of training time, and resistance to change in incorporating the use of new technology;
- rapid evolution of new generations of products that continuously demand the learning of new skills;
- existing infrastructural standards which are not compatible across systems;
- the lack of open architectural standards to allow global applications; and,
- lack of adequate utility infrastructure for universal access to high bandwidth.

The evidence is compelling that the positive employment impact of information technology will be expressed *only* when the technology is widely used in the form of more efficient processes and more innovative products and services. According to economist Richard Lipsey, the inherent difficulties in enhancing the innovative and job creating aspects of the emerging technologies suggest "a place for public policy to assist in speeding up the diffusion rate."¹⁹¹

A National Information Highway: An Instrument of Diffusion

As noted by Freeman and Soete (1993) widespread diffusion of new technologies is imperative in providing the impetus for significant job creation. "Long wave economic booms are necessarily based on very pervasive technologies with numerous applications and new opportunities throughout the entire economic system."¹⁹² *It therefore seems reasonable to suggest that the enabling aspects of IT could be catalyzed through a process of accelerated development of a national information infrastructure.*

This presents a strong argument for the development of a high capacity, ubiquitous utility network -- a national Information Highway -- as a means of accelerating the diffusion process. The advent of a national information network would enhance both the diffusion of the technology and the development of end-use applications. This would, in turn, help minimize the time lag between the job destructive and job creative phases of technological change.

It follows, then, that the current federal policy to construct a national information infrastructure should aim at accelerating the demand curve of IT by making the technology as available as possible through the widespread development of utility and information infrastructure. The question as to *how* this development process should proceed -- and how it can be used as a new source of wealth creation -- is critical.

¹⁹¹ Lipsey, R., "Globalization, Technological Change and Economic Growth," *Canadian Business Economics*, 2 (1), 1993.

¹⁹² Freeman, C. and Soete, L., "Structural Change in the World Economy," *Information Technology and Employment*, 1993.

9.2 The Bit Tax: An Alternate Source of Revenue

"The wealth is there. Whether it is in the traffic on the various electronic highways or in the content that is carried in them, it is there. The problem is to find the method by which human needs and wants can be met in this changing economic environment." ¹⁹³

As Canada prepares to enter the next millennium, it finds itself buffeted by profound transformations in the nature of work which have literally changed the form and substance of society. Where the old economy was one of things, the new economy is one of intangibles, of knowledge, images, concepts and digital slices of reality. With this new economy comes a new source of wealth -- the billions of bits of digital information that pulse across the nation and the world twenty-four hours a day.

Ironically, the wealth created by IT is bringing about many disparities. As mentioned previously, Canada seems to be moving toward a two-tiered society with a bimodal distribution of skills and incomes, separated by an increasingly widening gulf. The problem is that the production of wealth flowing from the electronic transfer of information is not being adequately captured by the indigenous economy. Society is not efficiently consuming the wealth created by emerging technologies and it is the poorer for it. "The challenge, then, is to ensure full access to the new wealth of nations and use it for socially desirable ends." ¹⁹⁴

Beyond the National Economy

The process of globalization is reliant on the development of an infrastructure of instantaneous communication through the conversion of information into streams of digitized bits. Globalization has undermined many traditional tax bases (such as succession duties, corporate taxes and income taxes for the wealthy) which has significant implications for domestic fiscal policy. As a result of the advances of communications technology, capital is now too easily moved to seek venues of maximum profitability. At stake is the future ability of national economies to maintain sufficient economic power to enable them to develop social policies that will ensure the needs of their citizens are met. It is therefore reasonable to suggest that society must find a means through which the wealth generated by IT can be maintained and re-distributed, so as to reduce the social and economic disparities created by the very forces which first produced them.

¹⁹³ Cordell, A., and Ide, T.R., "The New Wealth of Nations," a paper prepared for the annual meeting of the Club of Rome, Buenos Aires, November, 1994.

¹⁹⁴ Ibid.



A New Tax Base for a New Economy

The move to a new economy should elicit careful consideration of the creation of a new tax base, one that is easily identifiable and that lies at the heart of this new economic order. Cordell and Ide (1994) have argued that it is the flow of digitized bits of information through the online transactions of voice, data and video images that should form this tax base. "Just as the old economy can be found in railway freight cars and in 18-wheeler trucks, so too can the new wealth be found 'riding' the flow of digital information pulsing through the networks ..." ¹⁹⁵ They have proposed the creation of a 'bit tax' (a bit being the basic unit of information of all modern computers and a growing proportion of electronic transmissions), to be applied to all interactive transmission of digital information.

Culpepper (1994)¹⁹⁶ has pointed out that one trillion U.S. dollars in transactions take place daily on the world's currency markets. He has suggested that a one-half percent tax on the face value of foreign exchange transactions would yield some \$5 billion daily, of which Canada's share would approximate some \$35 billion annually -- enough to eliminate the federal deficit.

To provide some perspective to the immense volume of digital information transfer, consider that during peak periods in North America one trillion (1.0×10^{12}) bits of information per second are transferred on telephone networks. Conversion to fibre optics will expand this to 1.0×10^{18} bits per second by today's technology. Bell Canada, for example, recorded long distance and local revenues of \$6.35 billion in 1991, and this is only a fraction of the returns possible as new interactive services become available to the general public.

It is not difficult to see that a taxation system which can access the productivity of such massive information transfers through a levy on the carriage volume of information, would create an immense source of revenue for the government. This revenue could, in turn, be used to buy down Canada's burdensome debt, mitigate the effects of structural change or improve the quality of life of the nation's citizens.

A Means of Social Transfer

One of the principal uses of the bit tax could be to address the growing structural unemployment that has characterized the globalization of economies. According to Rifkin (1994), the shrinking of mass employment in the private sector and the reduction of government spending in the public sector will require that greater attention be focused on the third sector of the economy, the social sector. It is here, where traditional fiduciary arrangements give way to community bonds and where the giving of one's time to others takes the place of market relationships, that the new wealth created by a bit tax could best be put to use.

¹⁹⁵ Ibid.

¹⁹⁶ Culpepper, R., Financial Post, July 6, 1994.

The revenues created by the application of a bit tax could be used to harness the talents and energies of both the employed and unemployed toward the rebuilding of local communities and toward the creation of a third economic force which flourishes independent of the marketplace or the public sector.

Examples of initiatives for which this tax revenue could be used include:

- the provision of capital funding for community re-construction projects;
- the provision of shadow wages to encourage greater participation in volunteer efforts;
- the provision of social wages as an alternative to welfare for those permanently unemployed who are willing to be retrained and placed in jobs within the third sector; and,
- the provision of funds for community-based educational and skills training programs.

Martin Khor, Director of the Third World Network, cautions that *the redistribution of income is the key to advancing the social economy*. According to Khor, if you have not solved the problem of the social distribution of income, then you cannot solve the issue of the development of the third sector. However, with a new tax base that taps the heart of the new economy, the key to income redistribution is at hand. Through application of a tax on the new 'currency of exchange' in the information economy and the judicious redistribution of its gains, society can begin to lay the foundation for the long-term transition out of formal work in the market economy and into service work in the social economy.

10.0 Expert Advisory Panel Summary

This section summarizes the main findings of the expert advisory panel meeting, which was convened to discuss relevant issues related to the impact of the Information Highway on employment and the work place. A working paper, which consisted of the previous nine sections of this report in draft form, was provided to the panellists prior to the meeting as a backgrounder for the discussions. The primary focus of the meeting was to provide input to the policy recommendations component of this report.

The eight panellists were selected from lists of candidates submitted by both the funding agency and the Canadian Labour Congress. Final selections were based on a number of criteria including: representation from labour, experience in issues involving the Information Highway and the workplace, education, economics, market issues, government policy, and gender. Membership of the Panel, with biographical information on each representative, is provided in Appendix A.

All panellists expressed concern that while wishing to contribute to the report, they did not want their participation in this study's expert advisory panel to be viewed as legitimizing the report or the overall IHAC process.

The panellists stated unequivocally that this study is dealing with very important issues which have far reaching consequences that cannot be done justice in the short timeframe available to the Panel and for the preparation of this report. They stated that there is a pressing need to involve many more people in the process and to have much more active consultation with the public. The panellists were unanimous in recommending further consultations be undertaken.

The panellists requested that their comments be prefaced by the following points:

- It is the polarization and atomization of work and the definition of work itself and the displacement of workers at all skill levels that are of the most immediate concern regarding the impact of IT;
- It is not possible to solve structural unemployment problems through a discussion focused only on the mismatch between supply and demand. Labour supply and demand problems represent only small numbers at the cutting edge of technology. The discussion must evolve beyond supply/demand economics to the larger context of structural unemployment;
- Investment in IT must be for social/public investment reasons and for labour market reasons. This investment should attempt to deal with barriers such as gender, class, race and age; and,
- The notion of the unfettered market as the best vehicle to ensure growth must be rejected, while there exists is a need for regulation.



The comments presented below are summaries of the main points covered in the Panel discussions.

10.1 General

Public Input

There was considerable discussion concerning the best mechanism to undertake the further consultations recommended above by the panellists. There was general agreement that a Public Forum on the Information Highway should be established, which would be responsible for evaluating the needs and concerns of all Canadians, and assessing the public response to the federal government's vision for the Information Highway. The panellists stated that the Forum should be established prior to IHAC submitting its final report.

The Forum, according to the panellists, should have more broadly based representation than IHAC, which is largely comprised of industry. The Forum should also consider the broader range of issues that are covered in this report. It was stated that "the structure should be changed from stakeholders to people who represent the broader public interest ... to ensure that it represents the needs of all Canadians." The Burger Commission that studied the MacKenzie Valley Pipeline was cited as a good illustration of the type of Forum that should be established.

In the longer term, there was a view that there would be a need for a continuing body to oversee Information Highway development and operation; however, it was generally viewed that this body would be an outcome from the Public Forum, once it had completed its consultations.

Public Leadership

The panellists discussed at length the impact of IT on employment and the workplace. One of the panellists stated that "I don't think anyone knows what is going on. People are clinging to theories and ideologies that don't seem to work. People feel disenfranchised ... People know there is a problem, but they don't know what to do about it."

The panellists agreed that public leadership is required. While one panellist stated that "we are making it up as we go along. I don't think anybody knows what is going on. It doesn't help to ask government to do something because they don't know what to do. We are in a social learning process," the majority noted however that there are a wide range of things that government could do to minimize the problems associated with the information revolution.

The intent should be to maximize the job creative aspects, as well as the creative and democratizing aspects of IT. It was viewed that government should intervene in the market to ensure that social priorities are developed and addressed. It was suggested that social impact statements be prepared as part of proposals before government bodies, such as the CRTC, similar to the environmental impact statements that are now required to accompany major infrastructure proposals.

Regulatory Framework - Rules of the Road

The panel supported regulation of the Information Highway to "compel service providers to offer decent rates and ensure the accessibility of the highway is universally available." The intent was to manage the deployment of the Information Highway to provide equitable access at affordable cost, and to be beneficial to as many citizens as possible. It was noted that the federal government acted in the past to regulate the telephone industry because it was viewed as being for the public good.

Panellists stated that a regulatory framework is required to set the rules for the Information Highway. It should include the following:

- Who has access to the highway;
- Who owns it; and,
- Who governs it.

It was noted that "We live in a regulatory regime, so this should be regulated as well." Using the analogy of a highway, the following "rules of the road" were noted:

- What are the rules of the road, when you are on it?;
- How do you get on the highway, i.e., where are the on-ramps?
- How you pay for and maintain the road?; and,
- Who constructs the road?

It was further noted that the rules should be developed to ensure that personal privacy is protected, job destruction is minimized, and the implementation is orderly.

Revenue Generation

Two approaches were advanced for the generating revenue in relation to the Information Highway:

- the concept of a "*bit tax*," which taxes the productivity of networks through their volume of traffic, was advanced as a method of taxing wealth created from the Information Highway. This tax could be used to support social programs that are being jeopardized by the inability of governments to afford them; and,
- a "*training levy*" was suggested as a method to address the problem that firms do not undertake extensive training because they fear that a trained employee would leave the firm to work for a competitor and they (i.e., the firm funding the training) would therefore be unable to reap the benefits of their training expenditure. The training levy, which was viewed as being fiscally neutral, involves firms paying into a fund (e.g., percentage of their payroll costs, or increased Unemployment Insurance premiums), which is then granted back to the firms when appropriate training is undertaken. Concerns were noted that administratively, this scheme might be complicated to implement.



Leveraged Development

Use of the government's purchasing mechanism was noted as a means for leveraging private corporations to act in the general public interest. It is noted that the federal and provincial governments are the largest customers of telephone companies, and that through their purchasing power, they could "leverage a social policy onto a commercial enterprise." This 'social requirement' would be added to the procurement request, and would therefore result in the private firms (in order to get the government service contract) moving into areas where they would not otherwise go due to cost minimization and revenue maximization factors.

One panellist noted that "The irony is, if we push them to provide this service to the four corners of the country, it will be in their best interest, because it will create a mass market for the carrier." It was noted that this form of leverage has already taken place in New Brunswick and Nova Scotia in relation to the Information Highway.

Globalization

The panellists saw the development of the Information Highway as part of a process of globalization. A number of concerns were raised including the downward harmonization of labour and other standards, reductions in real wages, the unregulated mobility of capital, and the shifting of labour markets.

In terms of the downward harmonization of standards, it was noted that this would result in the "frittering away of environmental standards, health care, etc." What is required, it was emphasized, is an *upward* harmonization and not a downward harmonization in standards. It was stated that a "developed nation is about universality ... As you start to dismantle this, you are no longer a developed nation anymore." With a global workforce, "we need to adopt the policies of the developed nations and not slip down to the lowest common denominator."

It was proposed that 'global rules of conduct' are required as globalization develops. In particular, panellists noted that for the Information Highway, "we should establish [within Canada] its own national regulatory framework and then make links to other countries to show them the possibility of their following our example." The panellists stated that the rules of the road should be standardized for *all* nations.

While it was suggested that there is a need for an international code of conduct for transnational corporations, another panellist noted that an international convention is needed so that "when you make your products and ship them to Canada, they are not going to have been made by child labour or prison labour. We have to sensitize people that we are witnessing a lowering in our standard of living if we trade with nations that allow such labour practices to occur."

Distribution of Benefits

The panellists felt strongly that there would be no 'flow through' of benefits from IT, without compelling public leadership. One panellist asked "How do you get at the benefits and wealth of this technology so people can enjoy it." The 'bit' tax noted above was advanced as one method of capturing a proportion of this wealth.

It was noted that transfer programs in Canada have mitigated the gap between rich and poor, and they are "what has helped the bottom from falling out in this country, as it has fallen out south of the border." It was further noted that "Canada has a fabulous track record on this front and this differentiates us from the U.S."

Problems of Economic Indicators

Concern was expressed that the economic indicators used to measure growth are out of date. They were designed for the Industrial Age, when things being measured were tangibles; whereas now, the economy is largely made up of intangibles. It was noted that in terms of GNP or GDP, we are not growing as fast as we once were; however, in terms of the growth in the real wealth of society, it is difficult to determine, because of this measurement problem.

10.2 Jobs and Technology Change

Value of Work

It was noted that technology has contributed to productivity improvements and has at the same time, resulted in increased unemployment and a diminishing number of jobs which receive a pay cheque. It was contended that the benefit of this increased productivity should be shared by distributing it more evenly through a shorter work week and reduced unemployment.

The Panel raised and discussed a number of fundamental questions regarding work:

- What is the future of employment?;
- What is the function of work in the society of the future?; and,
- How are we going to distribute income in society?

The panellists concluded that while there remains a lot of work to be done, society values certain jobs with a pay cheque. Perhaps the solution is to place an economic value on those volunteer jobs in the social sector, such as helping people with disabilities, parolees, youth, the environment, the community, etc.

Mismatch of Labour

The panel agreed that skill shortages are not a major factor in the economy as a whole. They expressed concern that structural unemployment was being mixed up with the needs

of new technologies. They noted that there is a paradigm shift in the way things are produced. At present, it was stated, there are just too many people for the amount of work that needs to be done, which has nothing to do with skill. If there are skill shortages, they are only small in number and on the 'cutting edge' of new technology.

The panellists challenged the notion that investment in IT would create jobs in sufficient scale to address the unemployment crisis. It was stated that the Information Highway may result in "a small job creation" but it will not "address the structural problem for the larger population."

It was noted that there is sufficient investment in the Information Highway, that the Information Highway is more of a social policy than a jobs policy, and that the Information Highway is about society adapting to modernism.

10.3 Education and Training

In discussing the need for education and training the panel noted that "We talk of the information age ... [but] we have lots of information. It is now the communication age, or the learning age. We need to define this massive change in education and training. The important part is how you access the information that is available."

In terms of using IT to help with learning, it was pointed out that there is very little knowledge on the topic. It was noted that studies "measure the technology, but not the learning process." The Panel agreed that there is a distinct need to undertake foundational (i.e., basic) research on how IT can contribute to the learning process.

The Panel noted that to date, the emphasis has been on building the technology (i.e., hardware and software); whereas, the human side should be receiving considerably more attention. The Panel also noted that software cannot substitute for teachers. They recommended that more investment should take place in individuals. Moreover, there is a distinct need to ensure that there is money for education and training in areas related to the Information Highway.

Education

Education was viewed as being critical in preparing the next generation for the workplace. The panel agreed that the central premise of education is good teachers, educational opportunities (e.g., small classes), and a system directed at fostering critical autonomous citizens.

Due to the fact that another Working Group is examining education, the Panel, while viewing education as a critical issue, focused their attention on other issues. However, it was noted that because commercial interests are not going to pay to provide education, this will continue to be a primary role of government. Concern was also expressed that youth are locked out of the Internet because of its cost, and that they should be given access. Moreover, it was noted that a child from a non-reading background would be at a

disadvantage vis-à-vis one with computer experience, and would not likely go to a library to use a personal computer.

Training

The panellists noted that due to the fact that the problem of a skills mismatch is a very small portion of the labour market, the role of training and skills upgrading may be a lot smaller than originally thought. It was noted that "The issue of training may be at the cutting edge, but it is a very narrow edge."

Concern expressed over government retraining policy, was reflected in the statement that "The issue of training may be the crucial issue only at the cutting edge; but, it's the prescriptions for that cutting edge that are driving our social policy response to the massive underlying problem of the job-shedding impact of IT."

Concern was also expressed over problems of basic literacy and the fact that when people lose their jobs, it is extremely difficult to retrain them if they do not have the basic educational tools needed in an information society.

10.4 Industrial Relations and the Information Economy

The panellists referred the study team to the recent HRDC report entitled 'Report of Advisory Group on Working Time and the Distribution of Work' (Dec. 94), as a primary source of appropriate recommendations pertaining to industrial relations and the information economy.

Distribution of Working Time

The Panel provided a number of suggestions for recommendations on working time including:

- a reduction and more equitably sharing of working time;
- a reduced work week;
- longer holidays;
- sabbaticals;
- training time; and,
- limitations on overtime.

Concern was expressed about the informal and unclaimed overtime that is worked by salaried employees, as they "spend more and more time working in an attempt to appear more and more useful to the system."

Broadening of Employment Standards

The panellists emphasized that the employment standards be expanded to include the new forms of work and location of the workplace with appropriate means of enforcement. It

was noted that work is becoming increasingly atomized, and therefore improved labour standards are required. The issue of monitoring (or inspections) for the home workplace was discussed, without a consensus being reached on what would constitute appropriate monitoring.

The home office was viewed as being problematic, with concerns being expressed about ergonomics, working hours, and the lack of adequate protection for homeworkers in federal and provincial labour codes.

11.0 Conclusions and Recommendations

*"The apostles and evangelists of the Information Age entertain few if any doubts about the ultimate success of the experiment at hand. They are convinced that the Third Industrial Revolution will succeed in opening up more new job opportunities than it forecloses and that dramatic increases in productivity will be matched by elevated levels of consumer demand and the opening up of new global markets to absorb the flood of new goods and services that will become available ... The critics, on the other hand, as well as a growing number of people already left at the wayside of the Third Industrial Revolution, are beginning to question where the new jobs are going to come from. In a world where sophisticated information and communication technologies will be able to replace more and more of the global workforce, it is unlikely that more than a fortunate few will be retrained for the relatively scarce high-tech scientific, professional, and managerial jobs made available in the emerging knowledge sector."*¹⁹⁷

11.1 Conclusions

A Social Policy Response to Technological Change

All schools of economic thought have recognized that the issue of the 'displacement' of labour as a consequence of the introduction of technology must be evaluated in the context of the economy as a whole. Economists from all schools have stressed the importance of the 'compensation mechanisms' in the system, which may generate new employment to mitigate the initial loss of jobs; however, with regard to the impact of information technology, they differ markedly in the assessment of the final consequence.

Yet, to a large extent, the debate whether the introduction of information technology will, in the long-run, create or destroy jobs is a moot point. As argued by the International Labour Organization, the forces of technological progress and globalization are unstoppable and attempts to shelter from their effects will prove futile and self-defeating. Information technology is here; we can choose to resist it or embrace it -- but we cannot deny it.

This report advances the argument that it is society's *response* to the changes wrought by information technology which will, in large measure, determine the nature of its final impact. Such a perspective highlights the importance of policies and institutions aimed at enhancing the diffusion of information technology across the entire spectrum of economic activity and at easing the absorption of IT by firms and final consumers -- an approach deemed necessary to empower the enabling aspects of IT while mitigating its destructive nature. Policies dealing with economic and social changes precipitated by the introduction of IT must therefore recognize and remediate the following concerns:

¹⁹⁷ Rifkin, J., *The End of Work*, J.P. Putnam Sons, New York, 1995.



- the introduction of IT creates a mismatch between the supply and demand of skilled labour that is a causative factor in the structural unemployment observed today;
- it is not possible to solve structural unemployment by focusing only on the mismatch between labour supply and demand as this represents only a small proportion of the workforce at the cutting edge of technology.
- irrespective of its overall employment impact, IT will have a profound impact on the *composition* of jobs and the *pattern* of wages;
- the introduction of IT creates a *bi-polar* distribution of work and income with an elite class of high-paid, high-skilled knowledge workers and a large pool of lower paid, variable-skilled workers with narrowly defined skill sets;
- it is the polarization and atomization of work and the displacement of workers at *all* skill levels that are of most immediate concern regarding the impact of IT.
- the employment impact of IT will vary according to industry and sector and will be highly dependent upon the degree of innovation;
- the enabling aspects of IT will depend upon both the rate and the extent of diffusion and absorption of the technology; and,
- the inadequacy of current programs in education, training and skills development in reflecting the knowledge requirements and learning tools for an information economy, is an impediment to the rapid diffusion of IT.

Policy dealing with the impact of IT should be crafted with the flexibility to accommodate *either* a job creative or job destructive scenario. Simply put, the response should "hope for the best, but prepare for the worst." On the one hand, should the optimist's view prevail, the recommendations would serve to optimize the job creative, enabling aspects of the technology. On the other hand, should the critic's view prevail, the policy thrust would enact the structural adjustments necessary to mitigate the loss of jobs and resultant socio-economic dislocation. What is required is a three-pronged policy thrust which involves:

- the development of physical infrastructures which facilitate the diffusion of IT, including the support of investments which assist the implementation of the most appropriate technological and organizational practices;
- the development of social infrastructures to accommodate increased labour market flexibility (without erosion of the rights and protections of workers or attendant downward wage spirals) and the intensification of efforts in the training and retraining of the labour force; and,
- the development of social policy alternatives to prepare society for an economy where more and more of the workforce may be marginalized from the market and

public sector economies, and forced to employ their skills in the emerging social sector.

The Information Highway: An Instrument for Enhanced Diffusion of IT

The evidence is compelling that the positive employment impact of information technology will be expressed *only* when the technology is sufficiently diffused and absorbed through the development of new processes, products and services. As noted earlier, the enabling effects of technological change are necessarily based on the process of innovation, with the creation of numerous applications and new opportunities throughout the entire economic system. Therefore, if the introduction of IT is to have a net social and economic benefit, conditions favouring the rapid diffusion and absorption of the technology must be created.

Viewed in this light, *the inherent difficulties in enhancing the enabling aspects of IT suggests a place for public policy to assist in speeding up the diffusion rate.* This presents a strong argument for the development of a high capacity, ubiquitous information network - a national Information Highway -- as a means of accelerating the process. It follows then, that the current federal policy to construct a national information infrastructure should aim at accelerating the demand curve of IT by making the technology as widely available as possible through the ubiquitous development of utility and information infrastructure.

Properly developed, the Information Highway has the potential to be an instrument of empowerment, providing access to knowledge to *all* levels of society. It can become a means through which to: expand our provincial and national economies; create new employment; develop greater access to our educational, cultural and social resources; provide for more efficient and cost-effective delivery of public services; and extend the very concept of participatory democracy.

For this reason, focusing on the commercial aspects of the Information Highway alone would prove to be very short-sighted. The development process must recognize and accommodate the relevant social policy issues in its design. If the Information Highway is to be accepted and supported by Canadians as an effective instrument for social and economic change, there is a need to ensure that *all* levels of society will benefit. The following policy recommendations are made to assist the federal government in mapping out such a course.

11.2 Recommendations

The following recommendations consist of those provided by the Expert Advisory Panel supplemented by recommendations derived from the evidence collected, and those provided from the literature and other sources. As such, the recommendations should not be construed as having received final endorsement from the Advisory Panel.

The recommendations have been organized under four categories in order to facilitate their consideration. These categories include: general considerations, employment, education and training, and work organization and industrial relations.



General Considerations

1. *The government should move quickly to establish a clear leadership role in the creation of a vibrant, national information technology industry.* To launch this process the Prime Minister should deliver a Statement of Vision outlining a plan of action on how the government will harness information technology as an enabling resource and a new source of national wealth.
2. *The Prime Minister should appoint a senior Minister as a 'Champion of the Cause' for information technology.* Such a spokesperson is necessary to establish a clear political focus for an initiative of this importance.
3. *In presenting the government's Statement of Vision on information technology, the Prime Minister should announce the immediate creation of a blue ribbon Commission on Information Technology.* The Commission should be mandated to solicit input from the full spectrum of public interest, including non-governmental agencies, labour and community organizations, associations, and the public at large, regarding the needs and priorities in the construction of a national information infrastructure. The Commission should seek out the wealth of opinion and concern that has not yet been adequately addressed regarding the implementation of information technology.
4. *Through the Prime Minister's Commission on Information Technology the government should seek further resolution of the following issues within a social policy context:*
 - universality of access to basic information services;
 - affordability and ease of access;
 - improved accessibility and quality of government services;
 - expansion of educational opportunities through the Information Highway;
 - expansion of skills training opportunities through the Information Highway;
 - development of technological literacy;
 - elimination of regional disparities to information;
 - increased access for persons with disabilities; and,
 - privacy.
5. *The government should create the necessary instrument of governance dedicated to the development of a national information infrastructure, either an individual Ministry or a horizontally integrated Information Policy Directorate.* Whether structured as a single Ministry or an inter-Ministerial directorate, such a body should be under the direction of either a senior member of Cabinet or the Prime Minister's office. As much as possible, the staff and resources necessary should be re-allocated from existing structures. The responsibilities of the new body should include the coordination of policy implementation across government.
6. *The government should create an Information Technology Advisory Council as an external advisory body on information policy. Because of the impact that IT will*

have on youth and their entry into the labour market, it is strongly advised that the perspective of youth be well represented on the Council. The Council should consist of 20 or 30 selected stakeholder representatives from:

- youth, and organizations representing youth;
- government Ministries and agencies;
- private sector service providers (both cablecoms and telecoms);
- labour and community organizations;
- non-government agencies;
- private sector commercial users (e.g., banks, retailers, small business, professional associations);
- public sector users (e.g., educational institutes, libraries and health care institutions); and,
- community networks (freeNets).

Members should be selected for their expertise and experience. Appropriate support services, including research staff, should be provided through a re-allocation of resources.

The mandate of the Advisory Council should be to assist in the development of national information technology policy and to provide a source for ongoing consultation in the development of new initiatives. Specifically, the Council should:

- identify and comment on basic principles of information policy;
- provide advice and recommendations on the development of a national Information Highway;
- create sectoral steering committees to research specific policy areas and provide recommendations to government;
- map out and resolve areas of contestation; and,
- identify areas for strategic partnerships.

The Council should function as a Standing Committee, reporting directly to the Governor-in-Council. It should govern its deliberations in accordance with the objectives as established under a formal agreement or Social Accord.

7. *Through the Information Technology Advisory Council, the government should develop an Information Technology Accord.* As a framework through which all stakeholders can work cooperatively in the building of a national information economy, the Information Technology Accord would seek to:

- implement a process of leveraged development of network infrastructures and applications;
- rationalize the development process to reduce cost duplication;
- facilitate the development of strategic alliances between government and industry;
- work to reduce recognized impediments to development;
- identify legitimate social policy goals and develop objectives to meet them;



- create a comprehensive action plan for the development and deployment of utility and information infrastructure; and,
 - provide a forum for the ongoing discussion of information policy issues.
8. *The government should endeavour to develop information policy in the widest sense, and not restrict itself to the development of the infrastructure.* Policy should deal with a range of social and economic issues that will be of increasing importance in the information age.
9. *The government should be guided by the following principles in the development of information policy.* These principles should be realized at the earliest possible opportunity in the development process:
- All Canadians, regardless of geography or physical disability, should have access at affordable rates to the Information Highway and to a basic level of service that would empower them to benefit economically and socially as citizens.
 - All Canadians should have the opportunity to become capable of accessing and navigating the Information Highway.
 - Access to and use of personal information must be carefully regulated, the principle of informed consent should be enshrined, and mechanisms for the verification of accuracy must be developed.
 - An Information Highway strategy must recognize the need to provide appropriate education for young people and deal with the training and retraining needs of individuals dislocated by technological change.
10. *The government should employ the creation and development of a national Information Highway as a means of facilitating the diffusion of IT throughout the economy.* Construction of a ubiquitous and seamless utility and information infrastructure would accelerate the demand curve of IT by making the technology as widely available as possible. This, in turn, would optimize the enabling effects of IT to create employment and a new source of wealth.
11. *The government should adopt a process of 'leveraged development' of the Information Highway and the IT industry, where the government as model user would wield its aggregate demand for service to influence the development process and ensure that necessary social and economic criteria are met.* The use of aggregate demand to rationalize development of information infrastructure would:
- provide an opportunity for government and industry to collaborate in the creation of a joint Plan of Action for the process of development;
 - allow government to rationalize public investment and avoid duplication of costs and services;
 - leverage the private sector investment in infrastructure development;
 - accelerate the development process and diffusion of technology;
 - reduce job losses currently experienced within the telecommunications industry; and,
 - provide opportunities for job creation.

12. *Through strategic investments in end-user hardware and applications development, the government should work with other levels of government to maximize the ability of Canadians to access the Information Highway.* The creation of electronic libraries, provision of public access nodes, and deployment of multimedia technology in public schools are examples of such initiatives.
13. *The government should consider the development of an information technology initiative to enhance service to rural and northern communities.*
14. *The government should encourage the development of community information networks through the provision of seed capital and leveraged operational funding.* Such networks, focused on the community, but with access to global information sources, would promote individual and community empowerment.
15. *The government should amend the federal Telecommunications Act to provide for the mandatory provision of social impact statements for the development of initiatives pertaining to the Information Highway whenever proposals come before the federal regulatory authority (CRTC).* Technology assessment criteria should be established to determine the best means of achieving a balance of economic and social priorities in the implementation process.

Employment-related Considerations

16. *The government should establish the concept of full employment as a primary policy goal with the objective that meaningful work or education should be available for all those who seek it.* Such a goal should be supported through the creation of a new tax base which recognizes the electronic transfer of information as a new commodity of trade.
17. *The government should work at the international level to develop social charters amongst trading partners to protect against the downward spiral of social deregulation as a consequence of technological change and globalization.* The government is cautioned against the use of the "lowest common denominator" approach to the maintenance of competitiveness, which involves a process of social deregulation through the reduction of labour costs, social benefits and standards of living.
18. *Governments should use their procurement power in the market place to leverage job training and job creation.* Industry and government have a responsibility to attempt to redeploy workers displaced by technological change to the fullest extent possible and to explore opportunities to generate new employment. The aggregate expenditures by governments at all levels create the opportunity and means to influence private sector employers to pursue job creation and training.
19. *The government should launch a strategic response to the global shift in the growth and employment axis from a North American/European pole to an Asian pole.* The



key to countering the global migration of jobs lies in maintaining a competitive edge in the skills and knowledge base of the indigenous labour force. In this regard, the government must:

- work with other levels of government to revitalize our educational systems with the learning tools necessary for a knowledge-based economy;
 - work with other levels of government to provide occupationally specific skills training for displaced workers; and,
 - work with other levels of government to provide a more fluid transition from school to work through the initiation of cooperative work experience and apprenticeship programs.
20. *The government should maximize employment opportunities in the development and construction of ancillary infrastructures to the Information Highway, such as: 'intelligent' buildings, multi-media hubs, and high-tech human transportation systems.* Construction of such assets could be leveraged through government procurement or specified R&D initiatives.
 21. *To optimize the diffusion of IT products and innovations, the government should implement a program of accelerated write-down or capital depreciation of IT-related products for small business.* Diffusion and absorption of IT is more limited in small firms due to the reduced scope for applications and reduced economies of scale.
 22. *The government should develop specific initiatives to provide seed capital and financial support for projects directed toward product innovation in IT.* The development and diffusion of IT-related products and services can be expected to be more employment-generating than process innovation. Projects warranting particular merit would involve cooperative efforts between firms or with technological institutes and universities, and those projects that directly involve end-users in the process of innovation.
 23. *The government should increase its fiduciary commitment to applied Research and Development, particularly with respect to IT.* Traditionally, Canadian industry has not carried out sufficient R&D from a societal perspective. However, many emerging technologies such as IT need only a modest level of support in order to provide competitive advantage.
 24. *The government should use the Information Highway as a tool for matching the demand and supply of labour through the development of a National Employment and Job Search Bulletin Board.* Such a system would help overcome the barrier of distance in locating employment opportunities and in matching available skills with demand.
 25. *The government should use the proposed Information Technology Accord to pursue opportunities for job creation.* Participants in the Accord should be governed by the following:

- the acceptance by industry and government of their responsibility to create employment or retrain workers for employment in emerging technologies;
 - the need for ongoing research to examine opportunities for job creation and implementation of public/private education and retraining programs;
 - the examination of possible solutions to the difficulty in acquiring capital investment to create jobs through new ventures in network and applications industries;
 - the development of tax incentives to stimulate consumer demand for information technology products (including hardware and software); and,
 - the development of pilot job creation initiatives, funded by government and industry, and focusing on the development of long-term job creation made possible through information technology.
26. *The government should develop a suite of specialized services that will empower people with disabilities to play greater productive roles in their communities and seek out opportunities for employment through the use of information technologies.* Such services could be modelled after the WidNet initiative in California and DISC, a Calgary-based information service for people with disabilities.
27. *The government should review and amend taxation policy to ensure that investment in human resources is not disadvantaged relative to investment in information technology.*
28. *The government should facilitate the creation of appropriate investment instruments to ensure that small, high-technology enterprises have access to necessary risk capital.* Small businesses in the information technology field currently have trouble obtaining development capital from traditional lending sources because, among other things, their assets are held in intellectual property rather than capital assets.
29. *The government should rationalize its investment in the construction of a national Information Highway by focusing its efforts on the R&D of new applications and content for use on the Highway through:*
- *reducing regulatory burdens which mitigate against such investments;*
 - *allocating of R&D expenditures toward the development of end-use application; and,*
 - *utilizing its procurement policy to aggregate demand.*
30. *In partnership with provincial governments, the federal government should convene a series of regional conferences for the purpose of identifying private sector and community needs in the creation of public services through the Information Highway.* In particular, the delivery of services in the areas of education and skills training, health care, social services, and small business services should be investigated. In developing an inventory of public service options, the government should recognize the need for close collaboration between end-users and producers to accurately identify the specific services desired and the appropriate mode of delivery.



31. *The government should adopt a new tax base which recognizes information as the new wealth of nations. The tax base should reflect the heartbeat of the new economy, the limitless transmission of information and knowledge in the form of digitized packages or 'bits' of information. Through the application of a tax on the electronic transfer of information or a bit tax, the flow of information in the form of digitized transactions would generate significant wealth accessible by governments.*
32. *The government should utilize the new revenue generated through the application of a bit tax to harness the unused labour of unemployed and under-employed citizens toward constructive tasks outside the private and public sectors. The talents and energies of those with leisure hours and those with idle time could be effectively directed toward rebuilding local communities and creating a third force -- the social sector -- that flourishes independently of the marketplace and the public sector. This third sector of the economy would be one where the giving of one's time supplants traditional market relationships.*
33. *Through revenues generated by a tax on the electronic transfer of information, the government should establish a guaranteed annual income or social wage as an alternative to welfare payments for those permanently unemployed who are capable of being retrained and deployed in meaningful work within the Social Sector.*

Education and Training Considerations

34. *The government should work with other levels of government to revitalize Canada's public education systems in order to provide the learning tools and skill sets necessary for students to cope in a knowledge-based economy. This will require an education system which:*
 - provides a high level of literacy, numeracy and creative thinking skills;
 - encompasses a commitment to life-long learning;
 - develops appropriate initiatives to facilitate the school-to-work transition;
 - enhances the level of scientific and technical knowledge and computer literacy; and,
 - emphasizes the value of cooperative learning and a holistic approach to problem solving.
35. *The government should implement appropriate tax measures to encourage and assist individuals in skills upgrading and life-long learning.*
36. *The government should work with other levels of government to address the occupational mismatch between the skills of labour and the demands created by technological change.*
37. *The government should develop partnerships with the education and training community and industry in order to provide the linkage necessary to make public*

education and training systems more responsive to the changing needs of the workforce.

38. *The government should work with provincial counterparts to alleviate the three most critical problem areas identified as the cause of the high level of adult illiteracy in Canada:*
 - *early school leaving;*
 - *inadequate provision of programs to facilitate the school-to-work transition; and,*
 - *barriers to further education and training and investments in work-related skills.*
39. *The government should develop innovative education and training opportunities for young people, to address the danger of them becoming trapped in low-skill, low-wage jobs.*
40. *The government, in partnership with provincial counterparts, should enhance the availability of education and training opportunities in those areas of the economy demonstrating the largest potential for growth (eg., health services, education, leisure services). Provision of interactive multi-media courses through the Information Highway would facilitate the delivery of such initiatives.*
41. *The government should work with provincial educational and training facilities to develop innovative skills training applications and information content for utilization on the Information Highway. Provision of interactive distance learning available online would help reduce regional barriers to training and education.*
42. *In partnership with the private sector and other levels of government, the federal government should leverage investment in the development of access and applications for IT in the classroom. Rather than displacing curriculum or professional expertise, the technology should be used to enhance the curriculum and allow educators to act as 'facilitators' rather than sources of knowledge.*
43. *Working with other levels of government, the federal government should develop initiatives and opportunities to increase the level of technical competence in the use of IT among the nations's educators. If IT is to be used as a foundational learning tool, it is critical that teachers are well versed in the use of such technology.*
44. *In partnership with provincial authorities the government should set as a priority the need to enhance opportunities for life-long learning and acquisition of basic knowledge skills, to provide the opportunity for upward mobility for those workers in the low-skill level of the labour force.*
45. *The government is urged to entrench in federal legislation the right of workers to a basic entitlement to unpaid leave for education and training in order to expand opportunities for learning.*



46. *The government should undertake foundational (i.e., basic) research in order to better determine how IT can contribute to the learning process at all levels of the public education system.*
47. *The government should implement a training levy as a means of increasing the amount of employer-based training by private sector firms. The levy should be fiscally neutral and would involve firms paying into a federal fund (e.g., a percentage of payroll). This revenue would be granted back to those employers who undertake to provide recognized training for employees.*

Work Organization and Industrial Relations

48. *The government should amend the Canada Labour Code and related legislation and regulations, to cover both full-time and contingent workers across all sectors, with standards that ensure benefits and protection exist for all workers, including part-time, dependent contractors, trainees, temporary and out-sourcing workers. This should include extension and enforcement of standards for those workers in decentralized, remote or home-based locations. The federal government should also encourage the provinces to adopt similar legislation.*
49. *The government should extend hours of work legislation under federal employment standards legislation to include salaried employees and contingent workers. The federal government should also encourage the provinces to adopt similar legislation.*
50. *The government should amend the Canada Labour Code and related legislation and regulations, to provide fair working standards and protection against abusive or discriminating practices for those employed in telework. Such protections should include:*
 - the requirement for employees with collective agreements and workers without collective agreements to sign a letter of understanding of the telework assignment with the conditions of assignment described therein; and,
 - the provision that telework not be used by employers to change jobs to part-time, sub-contract or self-employment status.

The federal government should also encourage the provinces to adopt similar legislation.

51. *The government must develop operational definitions of 'telework' and the 'workplace' with respect to inclusion under current employment standards legislation. The implications of the Information Highway and teleworkers must also be considered in the development of specific amendments to employment standards and related legislation.*
52. *In partnership with its provincial counterparts, the government should move to ensure that both federal and provincial employment legislation apply equally to*

teleworkers as they do to traditionally defined employees and current home-work definitions. Definitions in the legislation should be broadened to include clerical work, professional work, and forms of home-work not yet anticipated.

53. *The government, in partnership with its provincial counterparts, should ensure that federal and provincial legislation does not limit the protection granted to teleworkers due to a narrowly interpreted definition of the workplace.*
54. *The government should amend the Canada Labour Code, and related legislation and regulations, to include protections for workers against electronic surveillance, including:*
 - *the requirement for management to inform employees of all overt and covert surveillance activity or capability;*
 - *identification of the technologies used and purpose of the activities;*
 - *assurance that surveillance activities do not violate privacy rights; and,*
 - *a mechanism for recourse in the event of surveillance disputes.*

Amendments should also ensure that the use of IT in monitoring worker productivity levels is deemed reasonable and identifiable, and that its introduction is negotiated accordingly. The federal government should also encourage the provinces to adopt similar legislation.

55. *The government should provide for mandatory employer-sponsored training and skills upgrading for those workers affected whenever new technologies and processes cause a reorganization or re-definition of the workplace. The federal government should also encourage the provinces to adopt similar legislation.*
56. *The government, as the largest employer in Canada, should establish a leadership role by supporting innovative and alternative workplace practices to facilitate the reduction, reorganization and redistribution of work time. The federal government should examine policies that would support new arrangements in the public and private sectors with the potential for additional job creation.*
57. *The government should incorporate into employment standards legislation the provision that would allow employees to refuse overtime work after a legislated standard of 40 hours, as proposed in the Report of the Advisory Group on Working Time and the Distribution of Work. The federal government should also encourage the provinces to adopt similar legislation.*
58. *The government should incorporate into employment standards legislation the provisions, as proposed in the Report of the Advisory Group on Working Time and the Distribution of Work, that:*
 - *the maximum amount of overtime in excess of regular working hours for which compensation can be paid be set at 100 hours annually; and,*



- *that the hours of work coverage under employment standards legislation be broadened to include salaried employees and other full-time workers.*

The federal government should also encourage the provinces to adopt similar legislation.

59. *The government is urged to vigorously enforce employment standards, particularly for part-time workers and those contingent workers outside the normal workplace environment.* Special attention should be paid to non-standard workers to ensure they are adequately protected, have access to collective bargaining rights, and receive at least the legislated minimum hourly wage. The federal government should also encourage the provinces to adopt similar legislation.
60. *The government is urged to create a registry to cover employees who work at home.* Such a registry should include:
- an obligation from employers to provide information on hours of work and pay for their home-based employees; and,
 - a mechanism to enable employees to verify the accuracy of information.

The federal government should also encourage the provinces to adopt similar legislation.

61. *The government should encourage provincial governments to amend employment standards legislation to require employees to provide pro-rated benefits to regular, part-time employees.* The federal government should also encourage the provinces to adopt similar legislation.
62. *The government is urged to set a leadership role by adoption of the practice of phased-in retirement, where older employees are encouraged to work reduced regular hours as a transition to retirement.* Such an initiative would also require changes to pension plans and regulations to ensure that the process does not erode future pension benefits. The federal government should also encourage the provinces to adopt similar legislation.
63. *While outside of the federal mandate, the government should initiate discussions with its provincial counterparts concerning the inclusion and strengthening of technological change provisions in provincial statutes with respect to the introduction of information technology and the impact of Information Highway-related applications.* While four provinces, British Columbia, Manitoba, Saskatchewan, and New Brunswick currently have adopted such provisions, the remaining provinces have yet to do so.
64. *The government should provide a leadership role in establishing a national forum on the process and impact of technological change.* The purpose of the forum would be to provide a means for labour, industry and government to develop a partnership

framework for direct involvement in, and control over, the process of technological change, and to ensure that such change remains compatible with society.

65. *The government should establish a National Workplace Institute.* The mandate of the Institute would be to:
- provide recommendations for legislative action designed to mitigate the adverse effects of technological change on the 62% of the workforce not covered by collective agreements, including the self-employed;
 - develop ways in which firms could integrate innovative work systems and human practices with new technologies and production methods; and,
 - develop initiatives for the promotion of innovative workplace practices.
66. *The government should construct a social policy framework that facilitates the transition of workers between companies and between the home, the workplace and the educational system.* Specific initiatives required are:
- the promotion of pension and benefits portability;
 - removal of barriers to non-standard employment practices, provided such practices are mutually beneficial to employer and worker;
 - elimination of provincial barriers to employment; and,
 - strengthening of the adjustment and transition mechanisms for workers.
67. *In order to reduce job displacement inherent in technological change and the pressures of globalization, the government should develop incentives to encourage firms to invest in timely and flexible human resource development programs, such as:*
- provision of flexible working hours;
 - provision of educational and training sabbaticals
 - maintenance of benefits in job sharing agreements; and,
 - maintenance of benefits for part-time and contingent workers.
68. *The government should work with its provincial counterparts to amend federal and provincial labour standards, and health and safety legislation to include regulation of the flexible work force.*
69. *The government should consider imposing penalties for firms which undertake a large-scale lay-off of workers without having demonstrated that all reasonable methods of mitigating job losses (e.g., work-sharing, shortened working hours, utilization of telework options, etc.) have been attempted.*

Bibliography

1. Access, Universal Service and Affordability and Awareness on the Emerging Information Infrastructure, Information Technology Association of Canada, March 1995.
2. "Advice to Governments; Fighting Unemployment: OECD Finds the Key in Improving Adaptability to Change," 1994.
3. "Advice to Governments; OECD Employment Outlook: Understanding the Process of Job Creation/Destruction," OECD Letter, 1994.
4. "AFL-CIO on Jobs Issue," Harry Kelber, LaborNet World Wide Web Site, 1994.
5. "Alone Together: Will Being Wired Set Us Free?," Andrew Kupfer, Fortune, March 20, 1995.
6. "Are Canadians Being Taken For a Ride?," Theresa Johnson and Susan Ford, Alliance, Spring 1995.
7. Association of University and College Employees, Local 2 (Petitioner), and Simon Fraser University (Respondent), and Industrial Relations Council of British Columbia (Respondent), Decision from British Columbia Court of Appeal, May 12, 1994.
8. "Be Prepared for the Ride of Your Life," Jocelyne Cote-O'Hara, Business Quarterly, Spring 1994.
9. "Bell Atlantic Joining a Cutting Trend," Kathryn Jones, The New York Times, August 16, 1994.
10. "Bell Atlantic to Slash 5,600 Jobs Over 3 Years," The Globe and Mail, August 16, 1994.
11. "Breaking the Chains of Command," James B. Treece, Business Week/The Information Revolution, 1994.
12. "Building the Data Highway," Andy Reinhardt, Byte, March 1994.
13. Bulletin of the European Union, European Commission, Supplement 2/94.
14. On Business and Work, J. Thurman et. al., International Labour Organization, 1993.
15. A Call For Action: Human Resource Challenges in the Canadian Consumer Electronic & Appliance Service Industry, Human Resources Development Canada, December 1993.



16. A Call For Action: Human Resource Challenges in the Canadian Consumer Electronic & Appliance Service Industry, (Executive Summary), Human Resources Development Canada, December 1993
17. "Can Structural Adjustment Overcome Unemployment?," Sunil Guha, World of Work, 1994.
18. "Canada's Economy May Be Better Than Statistics Indicate," Jay Bryan, The Gazette, March 29, 1994.
19. Canada's Information Highway: Building Canada's Information and Communications Infrastructure. Providing New Dimensions for Learning Creativity and Entrepreneurship. Progress Report of the Information Highway Advisory Council, Minister of Supply and Services Canada, 1994.
20. The Canadian Information Infrastructure: An Agenda for Action, Information Technology Association of Canada, June 1994.
21. Canadian IT Statistics Overview, Industry Canada/Communications Canada, 1993.
22. Canadian Labour's Response to Work Reorganization, Pradeep Kumar, Queens University, 1993.
23. The Canadian Workplace in Transition, Gordon Betcherman et. al., 1994.
24. "Canadians Fear Info Highway A Threat to Culture," Geoffrey Rowan, The Globe and Mail, April 20, 1995.
25. "CANARIE: Toward Canada's Information Highway," Andrew K. Bjerring, Business Quarterly, Spring 1994.
26. "The Case of the Omniscient Organization," Gary T. Marx, Harvard Business Review, March-April 1990.
27. "Chair's Conclusions," Results of the G7 Summit July 1994 and February 1995.
28. The Changing Face of Industrial Relations and Human Resource Management, Bryan Downie and Mary Lou Coates, Industrial Relations Centre, Queens University, 1993.
29. Changing Information Services: Strategies for Workers and Consumers, Communications Workers of America, May 1994.
30. "Changing Work Environment Creates Need For Workplace Literacy Programs," Corinna Frattini, Canadian HR Reporter, February 28, 1994.

31. "City Vs. Country: Tom Peters & George Gilder Debate the Impact of Technology on Location," Forbes ASAP, 1992.
32. "The Coming of Knowledge-Based Business," Stan Davis and Jim Botkin, Harvard Business Review, September-October 1994.
33. "The Commission Brings the EU Into Internet," Sources Say..., An Ecco News Service, February 24, 1995.
34. "Competitiveness: A Dangerous Obsession," Paul Krugman, Foreign Affairs, March/April 1994.
35. The Condition of Postmodernity, David Harvey, (no date).
36. "Considering Privacy in the Development of Multi-media Communications," Andrew Clement, Kluwer Academic Publishers, 1993.
37. "The Contingency Work Force," Jaclyn Fierman, Fortune, January 24, 1994.
38. Cooperative Support for Computer Work: A Social Perspective on the Empowering of End Users, Andrew Clement, Proceedings of the Conference on Computer-Supported Cooperative Work, October 1990.
39. "A Copy is A Copy: Copyright Issues and the Emerging Information Infrastructure," Information Technology Association of Canada, February 1995.
40. "Creating Viable and Productive Jobs," editorial, OECD Employment Outlook, June 23, 1994.
41. "Cyberspace and the American Dream: A Magna Carta for the Knowledge Age," Esther Dyson, George Gilder, George Keyworth, and Alvin Toffler, The Progress & Freedom Foundation, August 22, 1994.
42. "Deal Tightens Internet Security," Peter H. Lewis, The Ottawa Citizen, April 12, 1995.
43. Defending Values, Promoting Change, Social Justice in a Global Economy: An ILO Agenda, International Labour Office, 1994.
44. "Delivering the News," Andrew Prozes, Business Quarterly, Spring 1994.
45. "Designing Information Technology for People," William A. Etherington, Business Quarterly, Spring 1994.
46. "Desktop Computing: A New Arena for Worker Participation," Andrew Clement, Information Technology Assessment, Jacques Berleur & John Drumm, eds., 1991.



47. The Development of the Information Society: A UNICE View, Paper Submitted in the Context of the G7 Summit on the Information Society, February 1995.
48. Developments in Industrial Relations and Human Resource Practices in Canada: An Update from the 1980's, Noah Meltz and Anil Verma, Queens University, 1993.
49. "Digital Pioneers," Jonathan Berry and Kathy Rebello, Business Week, May 2, 1994.
50. "The Digital Juggernaut," Michael J. Mandel, Business Week, The Information Revolution, 1994.
51. Doing It Right with Computer Communication: A Case Study of the United Services Automobile Association, Vincent Mosco, Centre for Information Policy Research, Harvard University, December 1994.
52. "E Pluribus Unum," Mickey Williamson, Telecommunications, April 1, 1994.
53. Economic Benefits of the Administration's Legislative Proposals for Telecommunications, National Information Infrastructure Taskforce Internet Gopher Site, June 14, 1994.
54. "The Economic Crisis: A Crisis in the Theory of the State," Dian Cohen, CABA News, Winter 1995.
55. Economic Impacts of the Information Highway, Marc Lee & Mark Potter, Spectrum, Information Technology and Telecommunications Sector, Industry Canada, April 1995.
56. The Economic Potential of the Information Highway, Dale Orr and Ron Hirshhorn, Stentor Telecom Policy Inc., January 1995.
57. "Economic Renewal From the Grass Roots," David Walsh, The Toronto Star, May 10, 1994.
58. The Electronic Connection: An Essential Key to Canadian's Survival, Bernard Ostry, (no date).
59. The Electronic Cottage - Boon or Bust for Women? A Critique of the Futurist View of Home Work and an Exploration of Mothers' Experiences With It, Margaret A. Oldfield, Presented to the Seminar on Gender and Economic Restructuring, University of Waterloo, May 1991.
60. Electronic Enterprises: Looking to the Future, Office of Technology Assessment, 1994.

61. "Electronic Markets and Virtual Value Chains on the Information Superhighway," Robert Benjamin and Rolf Wigand, Sloan Management Review, Winter 1995.
62. "Electronic Shopping and the Death of Retail," Aneurin Bosley, The Internet Business Journal, Volume Two, Numbers Four & Five.
63. Electronic Workplace Surveillance: Sweatshops and Fishbowls, Andrew Clement, presentation to the Canadian Association for Information Science Annual Conference, 1990.
64. The Emergence of Global Multi-Media Conglomerates, Greg MacDonald, International Labour Office, 1990.
65. "The Employment Effects of New Technology and Organizational Change: An Empirical Study," Mike Campbell, New Technology, Work and Employment, 1993.
66. Employment Outlook, OECD, July 1994.
67. Employment, Unemployment, Hirings and Layoffs During the 1981-82 and 1990-92 Recessions (Draft), P. Kuhn, G. Lemaitre, G. Picot, Business and Labour Market Analysis Group, Statistics Canada, March 1993.
68. "The End of the Job," Fortune, September 19, 1994.
69. The End of Work, Jeremy Rifkin, G. P. Putnam, 1995.
70. "Enterprise Size, Information Technology and the Service Sector - The Employment Implications," Peter Nisbet, New Technology Work and Employment, Spring 1992.
71. Europe and the Global Information Society: Recommendations to the European Council, (The Bangemann Report), The European Commission, 1994.
72. "Europe, Snail of the Information Age," The Globe and Mail, August 15, 1994.
73. "Europe's Many Data Highways," Bernd Steinbrink, Byte, March 1994.
74. Europe's way to the Information Society: An Action Plan, European Commission, 1994.
75. The European Information Society, The European Commission, September 24, 1994.
76. European Information Technology Observatory 94, European Information Technology Observatory and European Interest Grouping, 1994.
77. Excerpts from "A Conference on Homeworking: From the Double Day to the Endless Day," Regis College, November 13-15, 1992.



78. "Executives Jam E-Mail Signals," The Globe and Mail, June 23, 1994.
79. Fact Sheets on the Information Society, European Information Society Project Office (ISPO) World Wide Web Site, 1995.
80. "Factors Determining the Successful Implementation of New Information Technology in a Professional Union," Norman Solomon and Andrew Templer, Relations Industrielles, (1992).
81. "Faster, Smaller, Cheaper," Peter Coy, Business Week/The Information Revolution, 1994.
82. Findings of a Survey of Industrial Attitudes Concerning the Education, the Role, and Equity Participation of Technicians and Technologists, Employment and Immigration Canada, March 1992.
83. Focus on Facts, International Labour Organization, 1994.
84. "From Capitalism to Knowledge Society," Peter Drucker, Post-Capitalist Society, 1994.
85. "From Higher Education to Employment," Eric Esnault, The OECD Observer, June/July 1992.
86. Fundamental Policies for the Creation of an Advanced Information-Intensive Society, Committee for the Promotion of Advanced Information and Communications Infrastructure, Office of the Prime Minister of Japan, February 21, 1995
87. "The Future of Information Technology," Vary T. Coates, The Annals of the American Academy, July, 1992.
88. "Future of Telecommunications Glimpsed in Roll Out of Orlando Network Trial," The Cable-Telco Report, December 19, 1994.
89. "The Future Workplace," Harry Kelber, LaborNet World Wide Web Site, 1994.
90. "G7 Countries To Go On-Line," News Release, Treasury Board of Canada, April 5, 1995.
91. "The Geography of an Emerging America," Kenneth Labich, Fortune, June 27, 1994.
92. "Given the Choice," George Fierheller, Business Quarterly, Spring 1994.
93. "Global - Or Just Globaloney?," Alan Farnham, Fortune, June 27, 1994.

94. Globalization, Technology and Competition: The Fusion of Computers and Telecommunications in the 1990's, Stephen P. Bradley, Jerry A. Hausman, and Richard L. Nolan, eds., the President and Fellows of Harvard College, 1993.
95. "Government Learns Humility," Rob Norton, Fortune, June 27, 1994.
96. "The Great Equalizer," Ira Sager, Business Week/The Information Revolution, 1994.
97. "Group Versus Group: How Alliance Networks Compete, Benjamin Gomes-Casseres, Harvard Business Review, July-August 1994.
98. High and Persistent Unemployment: Assessment of the Problem and Its Causes, Jorgen Elmeskov, Organization for Economic Co-operation and Development, 1993.
99. "The High-Tech Gravy Train," Gary Chapman, The New York Times, May 31, 1994.
100. "Highway Safety: The Key is Encryption," Paulina Borsook, Byte, March 1994.
101. "Hitching a Ride: Labor and the Perils of the Information Highway," Jeff Keefe, Dollars and Sense, July/August 1994.
102. "Home Based Employment - A Consideration for Public Personnel Management," Wendell H. Joice, Public Personnel Management, Spring 1991.
103. Homeworking in the EC, Report of the Ad Hoc Working Group, Commission of the European Communities - Employment, Industrial Relations and Social Affairs, 1993.
104. "How Can Unions Work Smarter?," Jane Slaughter and Mike Parker, LaborNet World Wide Web Site, 1995.
105. "How To Get To Work in 60 Seconds or Less," Tracey leBlanc, PC Novice, September 1994.
106. Human, Organizational, and Social Dimensions of Information Systems Development, D. Avison, J.E. Kendall, and J.I. DeGross, eds., North-Holland, 1993.
107. "Human Resource Implications of Information Technology in State Government," Sharon S. Dawes, Public Personnel Management, Spring 1994.
108. Human Resources in the Canadian Broadcasting Industry, Executive Summary, prepared by Peat Marwick Stevenson & Kellogg for The Canadian Broadcasting Industry Human Resources Steering Committee, Employment and Immigration Canada, November 1992.



109. "Hyping The Highway," Heather Menzies, Canadian Forum, June 1994.
110. "Imagine the Possibilities," Kenneth Copeland, Business Quarterly, Spring 1994.
111. The Impact of Information Technology on Knowledge Workers: Deskillling or Intellectual Specialization, J. Sulek, A. Marucheck, 1994.
112. The Impact of Technological Change on Human Resources in Health Care, Employment and Immigration Canada, 1990.
113. Industrial Relations Outlook, Ruth Wright, The Conference Board of Canada, January 1995.
114. "Industry Focus," The Cable-Telco Report, April 7, 1995.
115. Information and Communication in Economics, Robert E. Babe, ed., Kluwer Academic Publishers, 1994.
116. The Information Highway: Avenues for Expanding Canada's Economy, Employment, and Productivity in the New World Marketplace. A Report on Strategic Positioning of the Content Industries for Network Delivery, Burke Campbell, May 1994.
117. The Information Highway: A Road Map to Canadian Success, Canadian Business Telecommunications Alliance, May 1994.
118. The Information Highway: Canada's Road to Economic and Social Renewal," Stentor Telecom Policy Inc., October 1993.
119. The Information Society: Europe's Way to the Information Society - An Action Plan," The European Council, 1994.
120. "Information Specialists Will Flourish in the Age of the Net," Dr. Marvin Cetron and Owen Davies, SpecialList, June 1994.
121. "The Information Superhighway: Paving Over the Public," Z Magazine, March 1994.
122. The Information Superhighway (Draft Discussion Paper), Telecommunications Workers Union, June 1994.
123. Information System, Work and Organization Design, Peter Van Den Besselaar, Andrew Clement, Pertti Jarvinen, eds., Proceedings of the IFIP Working Conference on Information System Work and Organization Design July 1989.

124. Information Technology and the Corporation of the 1990's: Research Studies, Thomas J. Allen and Michael S. Scott Morton, eds., Oxford University Press, 1994.
125. Information Technology and Employment, Christopher Freeman and Luc Soete, December 1993.
126. "Information Technology, Organizational Restructuring and the Future of Middle Management," Sue Dopson and Rosemary Stewart, New Technology, Work and Employment, 1993.
127. Information Technology in the Service Society, National Research Council, 1994.
128. The Informational City, Manuel Castells, (no date).
129. An International Review of Labour Adjustment Policies and Practices, Norm Leckie, Queens University, November 5, 1993.
130. "Internet Advertising Review," Michael Strangelove, The Internet Business Journal, Volume Two, Numbers Four & Five.
131. "The Internet as Catalyst for a Paradigm Shift," Michael Strangelove, The Internet Business Journal, Volume Two, Numbers Four & Five.
132. "The Internet: How It Will Change the Way You Do Business," John W. Verity, Business Week, November 14, 1995.
133. Introduction to the Information Society the European Way, European Commision's Information Society Project Office (ISPO), (no date).
134. "The Iron Fist and the Velvet Glove: Totalitarian Potentials Within Democratic Structures," Gary T. Marx, The Social Fabric: Dimensions and Issues, James E. Short Jr., ed., Sage Publications, 1986.
135. "The Issue in French Election is Jobs," Peter Cook, The Globe and Mail, April 24, 1995.
136. "IT and New Forms of Organisation for Knowledge Workers: Opportunity and Implementation.," Colin Coulson-Thomas, Employee Relations, 1991.
137. Job Security Agreement Negotiated Between the Government of British Columbia and Health Care Unions, CUPE Research Department, April 1993.
138. "A Job as Worker Property," Harry Kelber, LaborNet World Wide Web Site, 1995.



139. "Job Insecurity: It's Here To Stay," April Lindgren, The Ottawa Citizen, April 23, 1995.
140. "A Jobless Economy?" Arthur Kroeger, Canadian Business Economics, Winter 1994.
141. "The Jobless Horizon: Unsettling Prospects," World of Work, 1994.
142. Jobs in the Knowledge-Based Economy: Information Technology and the Impact on Employment, The Conference Board of Canada, November 1994.
143. Jobs in the Knowledge-Based Economy: Information Technology and the Impact on Employment, The Conference Board of Canada, February 1995.
144. Jobs in the Knowledge-Based Economy: Information Technology and the Impact on Employment, Speech to the Information Technology Association of Canada Annual Conference By, James R. Nininger, March 1, 1995.
145. Jobs Study, OECD, 1994.
146. "Jobs With A Future: An Engineer's Guide to the New Economy," Engineering Dimensions, January/February 1995.
147. "Jointness at GM: Company Unionism for the 21st Century," Elly Leary and Marybeth Menaker, LaborNet, World Wide Web Site, (no date).
148. "Knowledge: Its Economics and Its Productivity (Chapter 10)," Peter Drucker, Post-Capitalist Society, 1993.
149. A Knowledge-Based Canada: The New National Dream, Information Technology Association of Canada, January 1993.
150. Labour Arbitration - 1989 (Chapter 8, Regulation of Home Work), Leo B. McGrady and John J. Steeves, McGrady & Company, June 1989.
151. Labour Market Adjustments to Structural Change and Technological Progress, Eileen Appelbaum and Ronald Schettkat, eds., Praeger, 1990
152. "The Labour Market: Year-End Review," E.B. Akyeampong, Canadian Economic Observer, March 1995.
153. Labour Standards and Structural Adjustment, Roger Plant, International Labour Office, 1994.
154. "LaborTech Report," Marda Graybeal and Madelyn Elder, LaborNet World Wide Web Site, 1994.

155. Lean and Mean: The Changing Landscape of Corporate Power In The Age of Flexibility, Bennett Harrison, BasicBooks, 1994.
156. "Let the Digital Age Bloom," The Economist, February 25, 1995.
157. Major Canadian Telecommunications Carriers: Overview Economic & Financial Analysis, Financial & Regulatory Policy Telecommunications Policy Branch Communications Canada, 1991.
158. "Making Information Superhighways Work," George Harvey, Business Quarterly, Spring 1994.
159. "Making Labour Markets Work," Abrar Hasan, The OECD Observer, December 1991/January 1992.
160. Making a Match: Questions and Answers About the Job Matching Process, Healthcare Labour Adjustment Agency, December 8, 1993.
161. "Making the Virtual Office A Reality," Samuel Greengard, Personnel Journal, September 1994.
162. "The Manager and the Information Worker of the 1990's," Larry D. Runge, Information Strategy: The Executive's Journal, Summer 1994.
163. "Managing in an Information Highway Age," Janice Moyer and George Fierheller, Business Quarterly, Spring 1994.
164. The Micro-Economic Agenda: Growth With Jobs, Industry and Science Canada, September 28, 1993.
165. "Misplaced Panics," The Economist, February 11, 1995.
166. Multinationals and Employment, Paul Bailey, Aurelio Parisotto and Geoffrey Renshaw, eds., International Labour Office, 1993.
167. National Information Infrastructure: Progress Report September 1993-1994, Information Infrastructure Task Force, Secretary of Commerce, Washington, D.C., 1994.
168. "Navigating the Information Highway," Peter V. Jones, Business Quarterly, Spring 1994.
169. "Negotiating Flexibility to Save Jobs," Michel Fromont, World of Work, Number 5, 1993.
170. "A Neo-conservative Grows Up, Wakes Up; It Was All a Big Lie," David Ewart, The Globe and Mail, April 28, 1995.



171. "The New Economy?," Andrew Reddick, December 15, 1993.
172. "New Evidence Suggests Women Suffer Most in the New Economy," The Ottawa Citizen, July 23, 1994.
173. "The New High-Tech Training," Wendy Marx, Management Review, February 1995.
174. New Information Technologies In The Education Systems of EC Member States: Synthesis Report, W.J. Pelgrum, European Commission, October 1993.
175. "The New International Division of Labour" Francis Stewart, World of Work, Number 8, 1994.
176. New Participants Named to Working Groups of Information Highway Advisory Council, News Release, Information Highway Advisory Council, July 25, 1994.
177. The New Tools: Implications for the Future of Work, Thomas Ran Ide and Arthur J. Cordell, A Paper Presented at an International Fundacion Sistema, at Seville Spain, September 1992.
178. The New Wealth of Nations: Distributing Prosperity, Arthur J. Cordell and Thomas Ran Ide, A Paper Prepared for the Annual Meeting of the Club of Rome, 1994.
179. "The New Work Force Builds Itself," Louis S. Richman, Fortune, June 27, 1994.
180. "The New Worker Elite," Louis S. Richman, Fortune, August 22, 1994.
181. "News and Views," Science and Technology Policy, October 1994.
182. "Not Always a Smooth Road," Geoffrey Wheelwright, Financial Times (UK), April 5, 1995.
183. Not Working: State, Unemployment and Neo-Conservatism in Canada, Stephen Kenneth McBride, University of Toronto Press, 1992.
184. "Occupational Employment: Wide Variations in Growth," George T. Silvestri, Monthly Labour Review, November 1993.
185. "Office Automation's New Threat to Health and Productivity: A New Management Concern," Omar E.M. Khalil and Jessie E. Melcher, SAM Advanced Management Journal, Summer 1994.
186. On Business and Work, J. Thurman et. al., International Labour Office, 1993.

187. On Ramp: Your Guide To The Information Highway, Don Tapscott, The Globe and Mail, 1994.
188. The Overworked American, Juliet B. Schor, BasicBooks, 1991.
189. People With Disabilities and NII: Breaking Down Barriers, Building Choice, Government Accounting Office, September 7, 1994.
190. Perspectives on the Telecommunications Sector in Europe, Report for the EMB Conference on the Telecommunications Sector, Research Institute for International Industrial Relations, January 1995.
191. "Policy Issues in the Public Access To Data Communications," Andrew Reddick, 1992.
192. "Post-Capitalist Society," P. Drucker, Harper Collins, 1993.
193. "Preparing the Team For the Brave New World of Work," Sid Shniad, Telecommunications Workers Union, November 1992.
194. Preserving High-Wage Employment in Telecommunications, Communications Workers of America, May 1994.
195. Priority Placement Program, Healthcare Labour Adjustment Agency, August 19, 1993.
196. "Privacy for Consumers and Workers Act," Prepared Statement of Gary T. Marx, Professor of Sociology M.I.T., Presented Before the Subcommittee on Employment and Productivity, Senate Labor and Human Resources Committee, United States Congress, September 24, 1991.
197. "Privacy Issues and Emerging Information Infrastructure," Information Technology Association of Canada, November 1994.
198. "Productivity and Information Technology: Emerging Issues and Considerations," Arie Halachmi, Public Productivity & Management Review, Summer 1991.
199. "The Productivity Payoff Arrives," Myron Magnet, Fortune, June 27, 1994.
200. Program for Advanced Information Infrastructure, Japanese Ministry of International Trade and Industry, May 1994.
201. "Promoting Telecommuting: An Application of the National Information Infrastructure," Government Accounting Office, September 7, 1994.
202. "Public Servants Search For 'Guts' To Go It Alone," Randy Boswell, The Ottawa Citizen, April 1995.



203. The Race to the Intelligent State: Towards the Global Information Economy of 2005, Michael Connors, Blackwell Publishers, 1993.
204. Racing Towards Millennium, RTM Conference, May 1994.
205. "Ready, Set - Go On-Line," Edward C. Baig, Business Week, The Information Revolution, 1994.
206. "Reengineering, Outsourcing and All That," J. Gordon Garrett, Business Quarterly, Spring 1994.
207. Report of the Advisory Group on Working Time and the Distribution of Work, Human Resources Development Canada, December 1994.
208. Restructuring in Public Telecommunications Operator Employment, Organization for Economic Co-operation and Development, November 1994.
209. "Retail on the Internet," The Internet Business Journal, Volume Two, Numbers Four & Five.
210. Science and Technology Review, Report of the Job Creation and Skills Working Group to the Sustainable Wealth and Job Creation Task Group, October 1994.
211. "Sending Them Home to Work: Telecommuting," Jocelyne Cote-O'Hara, Business Quarterly, Spring 1993.
212. "Seven Thinkers in Search of an Information Highway," Herb Brody, Technology Review, August/September 1994.
213. "Service is Everybody's Business," Ronald Henkoff, Fortune, June 27, 1994.
214. "Sharing Work Via Computers," Marcel Carrier, Business Quarterly, Spring 1994.
215. Shifting Time: Social Policy and the Future of Work, Armine Yalnizyan, T. Ran Ide and Arthur J. Cordell, 1994.
216. Shifting to The New Economy: Call Centres and Beyond, Paul Delottinville, Copp Clark Longman, 1994.
217. "The Skills Squeeze," Report on Business Magazine, December 1993.
218. Social and Economic Impacts of The Information Highway, Human Resources Development Canada, December 1994.
219. Social Europe: The Labour Market For Information Technology Professionals in Europe, Commission of the European Communities, Supplement 1/90

220. La Societe d'Information en Europe, Actualite des Services Publics en Europe, August 4, 1994.
221. Software and National Competitiveness, Employment and Immigration Canada, March 1992.
222. "Software Industry Recruiters Stuck With Nerdy Image," The Globe and Mail, August 30, 1994.
223. "Staking a Claim in Cyberspace," Mark Surman, This Magazine, June 1994.
224. Statistical Summary, Canadian Economic Observer, March 1995.
225. Summary of Job Security Agreement Negotiated Between the Government of British Columbia and Health Care Unions (Briefing Notes), CUPE Research Department, May 5, 1993.
226. Summary Report of the National Summit on Information Policy, 1992, The Canadian Library Association, 1993.
227. Tech Change: A Handbook for Union Negotiators, Canadian Labour Congress, (no date)
228. Technological Change & Labour Relations, Muneto Ozaki et. al., International Labour Office, 1992.
229. "Technological Change and Revolution," OECD Jobs Study, 1994.
230. Technology Adjustment Research Programme (TARP), Ontario Federation of Labour, November 1993.
231. Technology-Enabled Learning and Training: Defining User Needs (Discussion Paper), A Report for the Working Group on Learning and Training, Advisory Council for the Canadian Information Highway, January 14, 1995.
232. Technology-Enabled Learning and Training Needs: Findings, Telecon Consultants, March 29, 1995.
233. Technology Forecast: Communications and Information Technologies, Final Report, Communications Canada, February 1, 1993.
234. "Technology & Unemployment" The Economist, February 1995.
235. Telecommunications Services: Negotiating Structural and Technological Change, Brian Bolton et. al., International Labour Office, 1993.

236. Some Telecommuters Hit Potholes When Driving Information Highway: Neagrarian Revolution, B, Young, 1994.
237. "Telecoms: Restructuring and the Workforce," John Doohan, World of Work, Number 6, 1993.
238. "Telelearning: The Multimedia Revolution in Education," William E. Halal and Jay Liebowitz, The Futurist, November-December 1994.
239. Telework at Home: Evaluation of a Pilot Project at Employment and Immigration Canada, Anne-Marie Tessier and Francois Lapointe, Industry Canada Centre for
240. Information Technology Innovation/Technological Innovation and New Forms of Work Organization, March 1994.
241. "Ten Pointers for Home Office Workers," The Financial Times, April 5, 1995.
242. "Third World Leapfrog," Pete Engardio, Business Week/The Information Revolution, 1994.
243. "Tomorrow's Jobs," Occupational Outlook Handbook, U.S. Department of Labor, Bureau of Labor Statistics, 1994-95.
244. Towards an Information Society, Minister of Supply and Services, Communications Canada, 1992.
245. "The Tools for New TV," Tom R. Halfhill, Byte, March 1994.
246. "Trade Unions and Tripartism: In Search of New Strengths," World of Work, Number 8, 1994.
247. "Training Is Not Enough," Commentary by Sid Shniad, Research Director Telecommunications Workers Union, February 10, 1994.
248. A Transformation of Learning: Use of the NII for Education and Lifelong Learning, Government Accounting Office, May 1994.
249. "Unemployment and Labour Market Flexibility" Loretto de Luca and Michele Bruni, ILO and World Employment Program, 1993.
250. "The Unemployment Crisis: Diagnosis and Remedies," World of Work, 1994.
251. Unionization, Collective Bargaining and Legal Institutions in the United States and Canada, Richard N. Block, Queen's University, 1993.
252. Unions, Competitiveness and Productivity: Towards a Labour Perspective, Andrew Jackson, Queens University, 1993.

253. "Unions Want Worker Protection Built Into World Trade Deals," Will Hutton, Monitor, April 1995.
254. "The Ups and Downs of Teleworking," The Financial Times, April 5, 1995.
255. The User Penetration of Communications and Information Technologies Products and Services in Canada, In Comparison to Other Nations (Internal Working Document), Department of Communications Development and Planning Branch, March 1993.
256. "Variety is the Spice of Teamwork," Don Tapscott, The Globe and Mail, June 29, 1994.
257. "The Virtual Corporation," John A. Byrne, Business Week, February 8, 1993.
258. "The Virtual Corporation," Don Tapscott, The Financial Post Magazine, September 1994.
259. "Virtual Corporation," M. Malone and W. Davidow, Forbes ASAP, 1992.
260. "Virtual Organization: A Vision of Management in the Information Age, Abbe Mowshowitz, The Information Society, 1994.
261. "Waking Up To The New Economy," John Huey, Fortune, June 27, 1994.
262. "We're living in the Information Century," Dr. Marvin Cetron and Owen Davies, SpecialList, April 1994.
263. "What Role for Universities in School Computing," Pierre Duguet, The OECD Observer, December 1991/January 1992.
264. "When Information Technology Alters the Workplace," Business Week/Information Revolution 1994.
265. "When Worlds Collide," Dan Branda, Business Quarterly, Spring 1994.
266. "Where are the Jobs? A Million People Need to Know," James G. Frank, The Conference Board of Canada, February 1995.
267. "White-collar Jobs Go Global," Sarah Veal, World of Work, Number 10, 1994.
268. White Paper on Growth, Competitiveness and Employment - The Challenges and Ways Forward Into the 21st Century, Commission of the European Communities, December 5, 1993.
269. "Why Are We So Afraid of Growth?," Christopher Farrell and Michael Mandel, Business Week, May 16, 1994.



270. "With Satellites, Boyle Keeps Trucking All Night Long," Alan Radding, Infoworld, October 17, 1994.
271. Work and Community Along the Information Highway: Realities and Possibilities, B. Wellman, B. Buxton, 1994.
272. "Work At Home: Data From the CPS," William G. Deming, Monthly Labor Review, February 1994.
273. The Work of Nations: Preparing Ourselves for 21st Century Capitalism, Robert B. Reich, Alfred A. Knopf, 1991.
274. "Workers on the Net, Unite! Labor Goes Online to Organize, Communicate, and Strike, Monteith M. Illingworth, InformationWeek, August 22, 1994.
275. "A World Without Jobs?," The Economist, February 11, 1995.
276. "Your Digital Future," Evan I. Schwartz, Business Week, September 7, 1992.
277. 1993 Canadian Master Labour Guide, 8th edition, CCH Canadian Limited, 1993.
278. "500,000 Fall Into Poverty," Mark Kennedy, The Ottawa Citizen, April 6, 1995.

Appendix A:
The Project Advisory Team

The Project Advisory Team

Mr. Vince Chapin

Vince Chapin graduated from the University of Toronto in Political Economy and worked for many years in economic analysis and policy development for the federal Departments of Finance and Labour and for two Secretaries to the Cabinet, before becoming a consultant in 1983. In that capacity he has provided research services and advice to government ministries and trade unions, including the United Steelworkers of America and the United Food and Commercial Workers Union. He is currently completing an enquiry into the implications of the Computer Numerical Control technology for the future of machining work for the International Association of Machinists and Aerospace Workers in the context of the Technology Adjustment Research Program (TARP) of the Government of Ontario and the Ontario Federation of Labour (OFL). He has had work published by the Royal Commission on the Economic Union and Development Prospects of Canada and the Women's Bureau of Labour Canada, and an article on the role of the workers' knowledge and experience in computer-intense work environments and limits of artificial intelligence is to be published by the OFL in a forthcoming anthology on the TARP research effort.

Mr. Andrew Clement

Andrew Clement is an Associate Professor in the Faculty of Information Studies at the University of Toronto. Prior to this current position, he taught at York and Simon Fraser Universities. Dr. Clement, a specialist in surveillance and monitoring issues, has co-edited three books, published nine articles, and refereed sixteen articles and conference papers. Two especially relevant articles are: "Electronic Workplace Surveillance: Sweatshops and Fishbowls", and "Considering Privacy in the Development of Multi-media Communications". He currently has two articles ready for publication: "Coping with Desktop Computing with Informal Group Collaboration" (with D. Parsons); and "Ethics and Systems Design: The Politics of Social Responsibility" (with I. Wagner). Dr. Clement also provided his expertise as an external assessor of the Technology Adjustment Research Program (TARP) for Technology Ontario, Ministry of Industry Trade and Development; prepared a report for UNISON in pay-equity tribunals for the Trade Union Research Unit, Ruskin College, Oxford, UK; and was an invited advisor to the Quality of Life sub-committee for the Ontario Telecommunications Strategy Task Force.

Mr. Arthur Cordell

Arthur Cordell is a Special Advisor to the federal government on the Information Highway. He was formerly with the Science Council of Canada where he was responsible for a study on the impact of computerization on work and workers. A prominent thinker on the social implications of information technology, Dr. Cordell has produced some of this country's most innovative policy ideas on the consumer society and the role of technology in our collective future. Dr. Cordell was a contributor to *Shifting Time*, and co-authored *The New Wealth of Nations*, a paper presented at the annual meeting of the Club of Rome in 1994.

Ms. Carole Farber

Dr. Carole Farber, Dean of the Faculty of Part-Time and Continuing education at the University of Western Ontario, has had nearly 30 years of informational/technological expertise. Beginning from early computer programming in the 60's as an undergraduate, she has continued a creatively tense relationship with technology ever since. She joined the Faculty of Part-Time and Continuing Education at UWO in 1982 as the Director of Part-Time Studies. During that time (1982-86) she enabled the move to interactive audiographic teleconferencing, increased the range of offerings in print-based correspondence and encouraged the mixed media supplementation of correspondence courses. After a 3 year term as Director of the Centre for Women's Studies and Feminist Research (1989-1992), she returned to the Faculty in 1993 as Dean. Dr. Farber has developed the correspondence course on Feminist Perspectives in Anthropology after teaching it through audiographic teleconference, and has taught Introductory Women's Studies through computer conferencing. She holds a Ph.D. from the University of British Columbia in Anthropology and is known for her research on popular culture in Canada and India, and for her commitment to South Asian (and its diaspora) research and communication. Having been awarded a UWO Excellence in Teaching medal in the first year of its awarding, Dr. Farber is known for her dedication to a pedagogy for empowerment and change. At present she also serves as an educational advisor in the Multimedia Task Force of LARG*net (the London Area Regional Global Network, an ATM network developed to link UWO, its teaching Hospitals, Fanshaw College and 3 corporate partners), and is establishing a Centre for Research in Technologically-Mediated Teaching and Learning.

Ms. Theresa Johnson

Theresa Johnson has been active in the union movement since 1978, specifically in the federal sector with the Public Service Alliance of Canada. Ms. Johnson has worked as staff representative with unions doing organizing work, providing representation to union members and delivering education courses. She has written a number of articles in union publications on a variety of topics and has a particular interest in women's issues pertaining to technology and work reorganization. Since 1991, Ms. Johnson has worked as a consultant doing telework research for the PSAC. This research is one of 12 labour-driven research projects funded by the Ontario government and administered by the Ontario Federation of Labour under the auspices of the Technology Adjustment Research Program, or TARP. The TARP project has produced leading-edge research on the many issues raised by the movement of work into the home.

In 1991, Ms. Johnson travelled to Sweden on an OFL-sponsored study tour to examine the Swedish approach to issues of technology and the organization of work. As a result of the study tour and the telework research she has conducted, Ms. Johnson has made numerous telework presentations to academic and union conferences and meetings. Most recently, in March 1995, Ms. Johnson made a presentation to an OFL-sponsored conference on Labour and the Information Highway. Ms. Johnson is part of the Canadian Labour Congress delegation to an ILO conference in Geneva this June (1995). That Conference will attempt to draft an international convention on the issue of work in the home.

Mr. Grant Kippen

Grant Kippen is a consultant with Western Economic Diversification of Human Resources Development Canada. As an advisor to the Minister on information technology issues, Mr. Kippen has been actively involved in a number of projects related to information technology applications and opportunities within the federal government. Examples of his involvement include: participation on an internal HRDC taskforce which reviewed the network and informatics capabilities of the Gemini Group; a member of the project team which sought a solution to the "air wars" conflict between Canadian Airlines and Air Canada over the Gemini computer reservation system; and the development of a business plan for the establishment of an "Office of Learning Technologies" within HRDC to promote the awareness, adoption and diffusion of learning technologies, as efficient and effective learning and training tools within public and private sector organizations. Mr. Kippen is also involved in developing and facilitating pilot projects in the area of technology based learning and training.

Mr. Sid Shniad

Sid Shniad has been the Director of Research for the Telecommunications Workers Union in British Columbia for fifteen years. In the past, Mr. Shniad has conducted union education courses for TWU members, however, more recently he has focused more on economic research and analysis for the union, particularly in issues relating to telecommunications. He has been involved in nearly every major campaign relating to telecommunications that the union has been involved in over the past decade. Mr. Shniad was involved in the successful fight against deregulation of the industry in 1985, when CNCP's bid to compete was turned down by the CRTC. He also played a major role in the union's campaign against deregulation prior to the CRTC decision in 1992 to allow Unitel to compete. Mr. Shniad was the union's liaison person with Goss Gilroy in their 1994 Science Council study on the Information Highway in B.C. He has also played an instrumental role in developing the union's response and opposition to the Free Trade Agreement and the North American Free Trade Agreement. He has participated in numerous conferences on the Information Highway, telecommunications developments, free trade and he has also authored the following articles: "Training is Not Enough", and "Preparing the Team for the Brave New World of Work".

Ms. Armine Yalnizyan

Armine Yalnizyan is program Director at the Social Planning Council of Metropolitan Toronto where she conducts research on labour market trends and policy changes affecting Metro residents. She is the author of several publications for the Council on the restructuring job market, labour adjustment and training programs, and the transformation of social security. Ms. Yalnizyan works with community-based groups to further public education in economic literacy and civic rights. She is past chair of the Employment and Economy Committee of the National Action Committee on the Status of Women, and has served on the federal advisory group on issues of working time and the distribution of work. A frequent media commentator, Ms. Yalnizyan works part-time, and raises three young children.



115049

QUEEN HC 120 .I55 I45 1995
Canada. Information Highway
Impacts of the information h

