DOCUMENT RESUME

ED 335 527 CE 058 762

TITLE	Creating a Learning Culture. Work and Literacy in the Nineties. Based on the Report, "Workforce Literacy: An Economic Challenge for Canada," by the Hudson Institute.
INSTITUTION	National Literacy Secretariat, Ottawa (Ontario).
REPORT NO	ISBN-0-662-18232-4
PUB DATE	90
NOTE	30p.
PUB TYPE	Reports - Research/Technical (143)
EDRS PRICE	MF01/PC02 Plus Postage.
DESCRIPTORS	Adult Education; *Adult Literacy; Computer Literacy; Economic Development; Foreign Countries; *Futures (of Society); *Human Capital; Illiteracy; Job Skills; Labor Force; *Labor Force Development; Labor Supply; *Lifelong Learning; Literacy Education; Productivity; *Technological Advancement
IDENTIFIERS	*Canada; Workplace Literacy

ABSTRACT

Technological change and other innovations affect the way Canadians work. These changes demand increasingly higher levels of literacy for today and for the future. Basic skills are not enough. A low level of schooling is associated with higher unemployment. People who invest in their own higher education are likely to reap the reward of higher income. Although school credentials are important, the most important skill for workers is "learning to learn." Companies must start to train, not merely buy, skilled labor. In the nineties, more service and manufacturing skills that require continuous training in new technologies mean that a good education will be the minimum requirement for new workers to get rewarding jobs. New technologies will be created over the next 10 years, and current technologies will be improved. Other trends are as follows: computer literacy will become a key part of workplace literacy; robots will be able to do more; communication technology will play a growing role in daily life; and advances in energy production could change the way people work. Industries are using technology and other innovations to compete for new markets worldwide. Countries with the best educated and best trained work forces will prosper in a world more reliant on brains than muscle. Canada's labor force will have a new look with more women and older workers. Employers will have to invest in workers, and Canadians must create a learning culture. (Author/YLB)

Multiculturalism and Citizenship Canada
Multiculturalisme et Citoyenneté Canada

CREATING A LEARNING CULTURE

WORK AND LITERACY IN THE NINETIES

BASED ON THE REPORT
WORKFORCE LITERACY:
AN ECONOMIC CHALLENGE FOR CANADA
BY THE HUDSON INSTITUTE

NATIONAL LITERACY SECRETARIAT

Minister of State
Multiculturalism
and Citizenship

CANADA

Ministre d'État
Multiculturalisme
et Citoyenneté

This report summarizes many of the findings of the Hudson Institute study, *Workforce Literacy: An Economic Challenge For Canada.* The Hudson study contributes to Canadians' understanding of how literacy helps determine our economic future. It points out that technological change and other innovations affect the way Canadians work. They demand increasingly higher levels of literacy for today and for the future.

Improving literacy skills and creating a learning culture are essential to our economic and social well-being. They can help us make more informed choices and participate actively as citizens in the life of our communities and our country.

Literacy is a challenge. It is also an opportunity in which we can all share.

Gerry Weiner

Ottawa, Canada K1A 0M5

Cat. No C53-3/2-1990E
ISBN 0-662-18232-4

Table of Contents

Introduction: The Literacy Challenge

Technology, like international competition and the emergence of an integrated world economy, is changing the way Canadians work. Computers are familiar pieces of equipment in offices and factories, and Canadians working on the shop floor and in the boardroom are having to learn new tasks. The new workplace skills require more education, more training, better communication, higher levels of literacy. Skilled minds are taking over from the skilled hands of yesteryear.

Canadians are not just hewers of wood and drawers of water any longer. With more international competition than ever before, our goods and services must be economical, innovative, and of high quality. Canada's traditional industries, such as logging, fishing, and mining, our manufacturing industries, including auto assembly, paper making, and smelting, and the new service industries, such as business consulting and international banking, are relying on new technologies to be competitive in the world marketplace. All kinds of jobs are becoming more complicated. Workers everywhere, and at all levels, are having to learn new skills.

Skilled workers and companies that use the new technologies will improve our productivity, and help Canada compete internationally. Canadians shouldn't compete with low-wage countries by paying Canadian workers less than they are worth. Instead, Canadian companies will have to make the most of the skills and abilities workers bring to their jobs through training and development. Companies will have to provide employees with training throughout their careers, so that workers and industries don't get lost in the technological shuffle.

Life-Long Learning

Canadian companies will become more competitive only if they are able to organize work so that workers' skills are used to advantage to develop new products and services. Well-educated and well-trained workers are necessary to make these changes and innovations. This competitive edge can bring higher profits and wages, more jobs, and a stronger economy. Canadian public policy must therefore support continuous learning. Workers too must be willing to make a commitment to life-long learning.

A life-long commitment to learning brings benefits outside work as well. Just as work is getting more complicated, so is our environment demanding that we all become better educated citizens and consumers. As consumers, we face a bewildering choice of products and services, and we need information to make informed decisions. As citizens, we assess policies and changes that can affect our lives profoundly. Education, and the higher level of literacy it can bring, helps us be active in our country's political life.

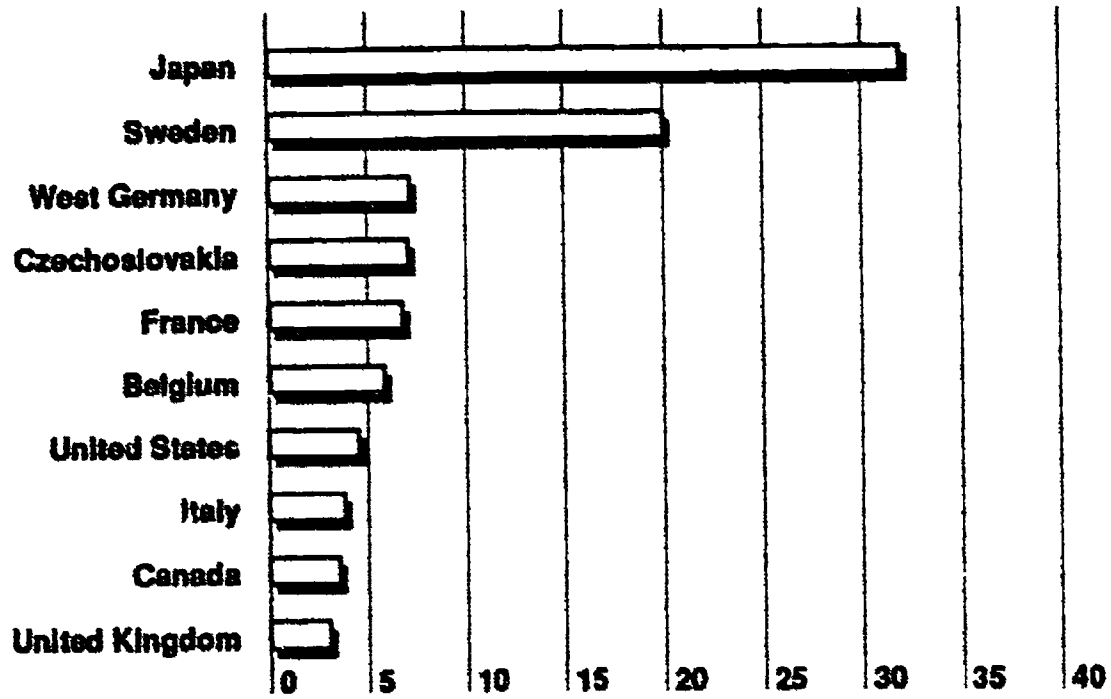
All Canadians face a literacy challenge. Canadians who can't read and write, and those whose skills are only basic, need to improve their abilities. Those who can read and write well might need to learn the new workplace skills involving computers and robots, problem solving, and team work. People who are highly educated need to make sure their skills don't get rusty. Technology, creativity and scientific research are changing our world every day. What we learned yesterday isn't enough. We have to keep learning just to keep up.

Work in the Nineties

Work is changing. As new products and services are created each year, many new jobs become available for workers with the necessary skills. The muscle and manpower that were needed for many jobs early in this century have been replaced by machines that can produce more than ever before, operated by workers with specialized skills.

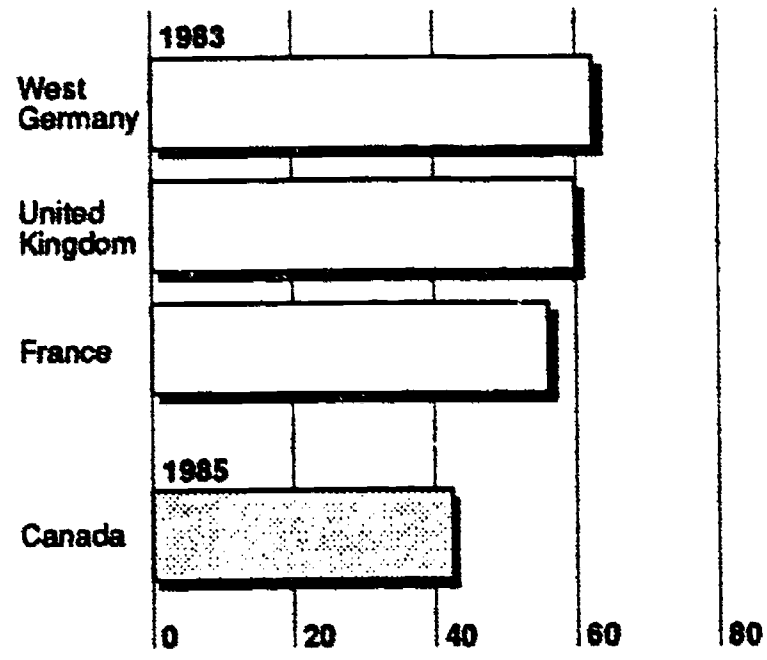
In the earlier decades of this century, many jobs didn't demand high levels of literacy. If a worker had a problem with written material, a supervisor could shift job responsibilities around so that someone else could handle the reading or writing tasks. Illiteracy wasn't as big a problem on the job as it is today. Many high tech workplaces of today require line workers who have good reading, math, and problem-solving abilities. And workplaces will become more complex. In the nineties, Canadian companies must invest in more advanced technologies to get the job done efficiently. Today, although robots and microelectronics are widely used in Canada, Charts 1 and 2 show that we still lag behind Japan, the United States, and a number of industrial countries.

CHART 1
NUMBER OF ROBOTS PER 10,000 PERSONS EMPLOYED IN MANUFACTURING



Source: Economic Council of Canada, *Making Technology Work*, Ottawa: Supply and Services Canada, 1987.

CHART 2
PERCENTAGE OF MANUFACTURING ESTABLISHMENTS USING MICROELECTRONICS



Source: Economic Council of Canada, *Making Technology Work*, Ottawa: Supply and Services Canada, 1987.

Sophisticated technology tends to link jobs that were once separate and distinct. Computers can warn of problems in one area of an assembly line so that workers further down the line can adjust their activities. Workers have to be aware of the impact of their work on others, use their analytical skills to solve problems, and their communication skills to explain the problem and solution to co-workers.

"Enabling" Skills

All jobs are changing, often becoming more complicated. Workers who can't learn the new tasks or who can't handle the new computers or robots could be left behind. Unemployed workers need to develop "enabling" skills that will help them get the new jobs.

These skills include reading, writing, numeracy, listening, computer literacy, and the ability to process new information and solve problems. Table 1 lists the enabling skills that are used in a variety of jobs.

TABLE 1
ENABLING SKILLS USED IN SELECTED TYPES OF JOBS

Types of Jobs	Enabling Skills
Home health care, child care, elder and nursing care	Register patients, administer medicine, keep records, complete insurance forms, respond to enquiries.
Building construction and maintenance	Read blueprints and manuals, understand cost estimates, follow directions.
Office work	Understand payroll and insurance forms, memos, etc. Use computers, communicate orally.
Banking, real estate	Read instructions, handle forms, understand business math.
Retailing	Read and communicate directions, understand sales slips, invoices, etc.
Warehousing, truck driving, machine operation, inventory control	Read maps, follow directions, use forms. Read production schedules, use computer-controlled equipment.
Preparing and serving food	Read menus, make out bills, make change, follow recipes.
Hotel housekeeping and guest services	Understand requests, register guests, use computers.
Equipment repair and maintenance	Read maintenance manuals, fill out logs, answer complaints.

Source: Hudson Institute

Enabling skills are important for everyone. The average worker is likely to change jobs or careers eight times. With each change, a worker may need to update old skills or to learn new skills. Even workers who remain in one job are likely to need continuous training. Today, technological change makes workers' specialized knowledge and skills obsolete in roughly three to five years. Just a decade ago, skills stayed current for between seven and fourteen years.

Workers who lack a good educational background don't fare well with technological change. The Economic Council of Canada found that technology has a negative impact on workers with less than a grade nine education. Although workers with at least a grade nine education fare somewhat better, it is workers with some university education who benefit from technological change.

Table 2 points out that certain groups of workers are less likely to have completed secondary school. These young people who have left school, older workers, Native people, and people with disabilities are most vulnerable to technological change.

TABLE 2
PROPORTION OF SPECIAL GROUPS WITH LESS THAN A HIGH SCHOOL EDUCATION

Youth Age 15 to 19, not attending school full time	66.4 %
Older Persons Age 45 to 54 Age 55 to 64	 54.4 62.3
Native People	71.3
People with Disabilities * (84.6 % of people with disabilities have high school graduation or less, and 43.5 % completed less than grade 9.)	High*
Total Population, 15 years and older	47.6

Source: Economic Council of Canada, *Making Technology Work*, Ottawa: Supply and Services Canada, 1987.

Basic Skills aren't Enough

Employment and Immigration Canada estimates that two-thirds of the new jobs which will be created by the year 2000 will require more than twelve years of education. Nearly half of these new jobs will require more than seventeen years of education. Canadians will have to be more literate than ever before. Just being able to read and write won't be good enough for many of the new jobs.

A low level of schooling is associated with higher unemployment. From 1975 to 1988, while the national unemployment rate averaged under eight per cent, more than ten per cent of the people who had less than nine years of schooling were unemployed. This trend has worsened over the past decade, and is expected to be even more serious in the future.

People who are only able to do jobs that robots can do are in danger of being replaced. Repetitive, routine physical tasks are being done by machines that can do the work cheaply. Companies which replace people with machines must retrain those workers to do the new types of jobs arising out of the use of new technology. This includes not only high tech jobs but also jobs which require "cerebral skills" such as decision making and creativity. If instead, companies go out and hire new, well-trained, and well-educated workers for the high tech jobs, workers will become discouraged, and Canada will face even greater unemployment.

Reading and Writing

Literacy, the ability to process information, enables a person to work effectively. Functionally literate people are able to get along independently, doing the daily reading and writing tasks that are necessary in their community. Research has shown that many Canadians aren't able to read and write well enough to meet most of the everyday reading demands they encounter.

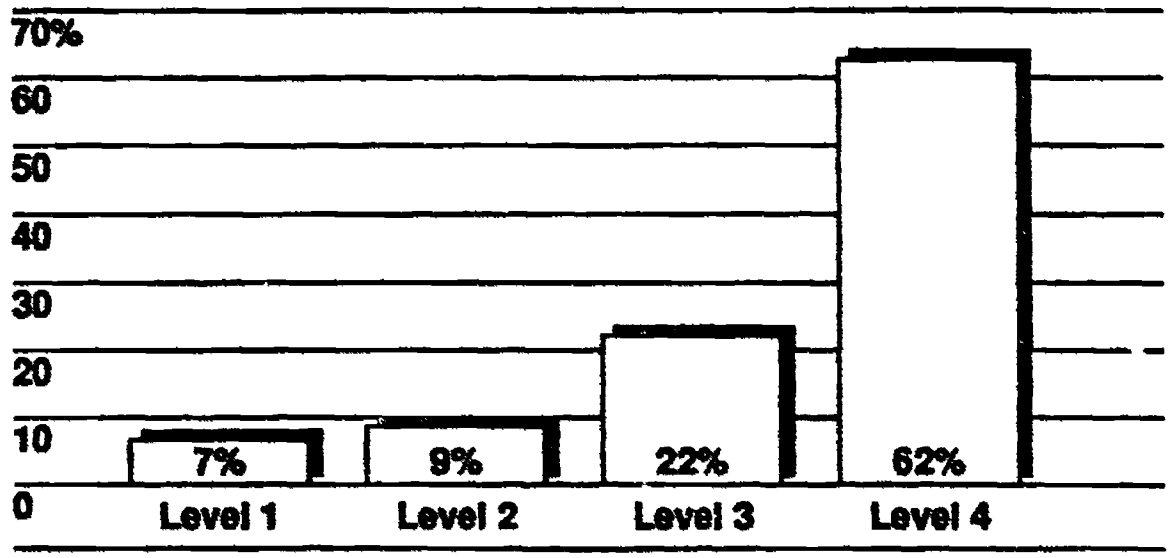
One in Three Canadians

In 1989, the National Literacy Secretariat had Statistics Canada test a sample of Canadians to find out what their literacy skills were, and how many had difficulty in day-to-day activities. Statistics Canada discovered that more than one out of three Canadians has some difficulty reading. These results are based on tests which asked Canadians to do everyday tasks such as finding the expiry date on a driver's licence, reading a chart

to find out whether an employee can receive a certain benefit, or reading a bus schedule.

According to Statistics Canada, seven per cent of Canadians have so much difficulty with printed materials that they might say they cannot read. Another nine per cent can find a word they know in a simple text, but might have difficulty with many common reading materials. Still another 22 per cent can handle a variety of reading materials, but only if they are simple and clearly laid out, and if nothing too complicated has to be done with the information. This group of people tends to avoid situations requiring reading.

CHART 3
LITERACY SKILLS IN CANADA, 1989
READING SKILLS



Source: Secretary of State of Canada, based on data from Statistics Canada.

All told, 38 per cent of the people Statistics Canada surveyed had some difficulty with basic reading material, the kinds of letters, forms and messages we all come across in everyday life. Many of them would never be considered "illiterate"— they can read basic things — but their skills aren't good enough for much of the work of the nineties.

This is bad news for people who are planning training programs for the changing workplace. The words and ideas that are likely to be found in training manuals and instruction books would probably be far too difficult for many Canadians to tackle.

Even some of the 62 per cent of people whom Statistics Canada found were able to handle most everyday reading tasks might not be able to understand training manuals. Some might find the technical information too complicated. Others might not want to learn a whole new vocabulary to deal with computers, for example, or a different way of doing their jobs.

When faced with a new subject, people must learn new terms and build their skills slowly. The time it takes to learn something new is a process of becoming functionally literate in a subject. The process is made more difficult when one's level of literacy isn't high enough to deal with routine reading. The demands of technology can seem intimidating to workers at all levels, especially when they are not comfortable reading new or complicated material.

The results of Statistics Canada's research echoed the findings of the Southam Literacy Survey, which was published in 1987. The Southam survey found that 4.5 million Canadians were basically illiterate or only marginally literate. These two studies are important measures of Canadians' literacy skills. Because they actually asked people to answer questions based on everyday reading materials, the results are considered very reliable. They are a better measure of people's ability than, say, considering anyone who hasn't completed "X" years of school to be illiterate.

Before these surveys were done, years of schooling was used as an approximate measure of the number of Canadians who might have difficulty reading, writing and working with numbers. A grade eight education was considered the cut-off point for functional literacy. Such an arbitrary assessment, however, distorts the picture in several ways.

Some older Canadians did not have the opportunity to finish school. Nonetheless, many seniors without a grade eight education have continued learning throughout their working lives. This self-directed learning is every bit as valuable as a school education. To label someone illiterate because of a lost opportunity is not only unfair, it is often wrong.

On the other hand, some Canadians may have achieved a fairly high level of education without having developed high literacy skills. Statistics Canada found people who, even with a university education, weren't able to handle all the basic reading tasks in the test. That doesn't mean that education isn't valuable, but it points out that education by itself doesn't necessarily mean that a person can handle all everyday literacy tasks.

Investing in Education

Even if education on its own isn't a foolproof indicator of whether a person might be functionally literate or a productive worker, it is a good investment for individuals and for society as a whole. People who "invest" in their own higher education are likely to reap the reward of a higher income.

A study of 1981 census data in Ontario, for example, showed that men who had dropped out of high school were earning an average of $10,538. High school graduates, meanwhile, were earning an average of $11,181. The difference in income was even higher for older men. In the 35 to 39 age group, high school dropouts earned an average of $19,116, while graduates earned $21,714. University graduates in the 35 to 39 age group earned an average of $30,193.

A similar picture evolved for women in Ontario in 1981, but the numbers are all lower, reflecting the continuing lower earnings of women in the work force: Of 20- to 24-year-olds, women who had dropped out of high school earned an average of $6,521, while high school graduates earned $7,755. In the 35 to 39 age group, women who hadn't completed high school earned $8,347 and graduates earned $10,038. Women university graduates earned $16,936.

Education is a good investment for society too. High schools, universities, vocational schools, and community colleges can give future workers skills that can serve them well as they learn on-the-job throughout their careers. Critical judgment, creativity, clarity, independence, responsibility, and knowledge are the centre of a "liberal arts" education. These skills may be more desirable than ever, but it may also be time for them to be taught outside academic institutions in a context of continuous learning.

Workers use enabling skills to get the job done. In service jobs they process information on invoices and business forms, and on computer screens, blueprints, patients' charts, and street maps. They must understand customers' needs or complaints, analyze situations, propose new services or products, and feed information back into the system. Working in teams, they must listen and interact with their colleagues.

Yesterday's Education may not be Good Enough

While school credentials are important, they are less important to a worker's productivity than the ability to process information at the workplace. It isn't necessarily what you've learned that's important, it's how you can apply what you learn. As technology changes the way we work, yesterday's education may not be good enough. Canadians have to be willing and able to keep on learning. With the fast pace of change in society and technology, skills, even specialized skills, become obsolete every few years. So, for most occupations, the most important skill for workers is "learning to learn."

Skilled Workers must be Trained, not "Bought"

A study by the Economic Council of Canada showed that firms in Canada carry out very little formal and continuous training. As a result, we lag behind most of our industrial partners and competitors in this area. In the past, companies have chosen to hire workers who were graduates of high schools and other public educational institutions. The literacy and other skills these graduates brought to their jobs were paid for by all Canadians through their support for the educational system. With technology and competition reducing the opportunities for workers with a more limited educational background, it is time for employers to take on the responsibility for training all employees. For Canada's work force to be able to give its best, companies must start to train, not only buy, skilled labour.

The Economic Council also found that our government programs put more emphasis on supporting people who have lost their source of income, than on training people so they can avoid being without a job. As the Council says, while unemployment insurance is clearly important, Canada needs more "employment insurance" as well. Our spending on training programs does not measure up to other countries'.

Targeted Training

New initiatives need to be targeted to the special needs of certain groups of workers. Not everyone who is unable to read and write well will have trouble finding or keeping a job, and workers with very high-level skills might find themselves unemployed and unable to find new jobs. Training must meet workers' special needs, and must reach the workers who need it.

Older workers may need assistance with job mobility. Younger workers might have trouble making the transition from school to work. People with disabilities have special needs, and the particular concerns of Native people need to be addressed.

From Skilled Hands to Skilled Minds

Agriculture was once Canada's main industry and source of wealth. Like other industrial nations, as Canada's economy developed, it shifted first to manufacturing, and then to services.

With technological change and efficiency gains in manufacturing, fewer new jobs are being created in Canada's factories, smelters and assembly plants. The jobs of the nineties are in service industries, in research, retailing, business services, engineering, education, government, food services, and other industries which require a high level of literacy and communication skills.

For new workers in the nineties and beyond, there will be fewer "mill" jobs that provide good pay to workers who don't have at least a high school education. More service jobs and manufacturing jobs that require continuous training in new technologies mean that a good education will be a minimum requirement for new workers to get rewarding jobs.

High Skills, High Pay

While some service jobs offer low pay, and require only basic skills, there is also a large number of service jobs in very highly skilled, high tech industries, such as health care, finance and transportation. Service jobs can be interesting and can offer very high salaries, but only to workers who can meet the literacy demands of these jobs. The Economic Council of Canada called these demands "post-industrial skills," which range from interpersonal abilities to the ability to handle unpredictable events.

The higher skills demanded by the service sector are important for two reasons. Service industries have not become as productive as manufacturing industries. Highly skilled workers and sophisticated management, using technology effectively, can raise the service sector's productivity. Good literacy skills will also be an important asset to workers in the less stable environment of some service sector jobs.

Low Skills, Low Pay

Many new service jobs are to be found in firms and worksites that are smaller than those of traditional manufacturing jobs. These firms are more vulnerable to shifts in the economy, and are more able to respond quickly to opportunities for new markets. Their flexibility and vulnerability mean that these firms can create or lose more jobs each year. With good training, workers can protect their incomes in the uncertain environment of some service jobs. If necessary, they can adapt more easily to jobs in other industries.

Many service jobs are part-time or short-term, available only through temporary help agencies, or created by workers themselves, who become self-employed. Such jobs accounted for nearly half of all the new jobs in Canada between 1981 and 1986. They now represent about 30 per cent of all jobs, including 21 per cent of workers in goods-producing industries.

Three out of Four Jobs

The Economic Council found that service jobs accounted for more than 70 per cent of total employment in Canada in 1988, compared to less than 60 per cent in 1967. By 1993, they are expected to account for 73 per cent of all jobs in Canada. Table 3 shows how, from 1967 to 1988, employment shifted from the goods sector to the service sector.

TABLE 3
EMPLOYMENT SHARES AND EMPLOYMENT GROWTH BY INDUSTRY
1967-1988

	Industry Employment		
	As a share of total employment		Annual growth rate
	1967	1988	1967-88
Service sector	**59.4**	**70.9**	**3.4**
Dynamic services	10.7	23.0	3.2
Transportation, communications, and utilities	9.0	7.4	1.5
Wholesale trade	4.5	4.6	2.7
Finance, insurance, and real estate	4.3	5.9	4.1
Business services	1.9	5.1	7.3
Traditional services	21.7	25.7	3.3
Retail trade	12.1	13.1	2.8
Personal services	9.6	12.6	3.8
Non-market services	18.0	22.2	3.5
Health and social services	6.2	8.9	4.3
Education	5.8	6.6	3.2
Public administration	6.0	6.7	3.0
Goods sector	**40.6**	**29.1**	**0.9**
Primary industries	10.3	6.0	-0.1
Manufacturing	23.9	17.2	0.9
Construction	6.5	5.9	2.1
Both sectors	**100.0**	**100.0**	**2.5**

Source: Economic Council of Canada, *Good Jobs, Bad Jobs*, Ottawa: Supply and Services Canada, 1990

The Hudson Institute used data from Informetrica and Employment and Immigration Canada's (EIC) computer model to forecast the number and types of new jobs that will be created between 1989 and the year 2000. They identified what will be the fastest and slowest growing occupations in the nineties. The types of fast-growing jobs listed in Table 4 will demand math skills, verbal and communications skills, and management ability. Blue-collar jobs, assembly work, fabricating, and jobs in primary industries except mining will be in decline.

TABLE 4:
THE CHANGING OCCUPATIONAL STRUCTURE, 1989-2000

	1989	2000	% Growth
Computer, Math, and Natural Scientists	168,043	254,661	51.5
Technicians	315,662	542,041	40.0
Sales and Marketing	972,016	1,273,524	30.9
Managerial, Management-related	921,315	1,155,439	25.3
Librarians	26,400	33,087	25.3
Writers, Artists, Entertainers, Athletes	195,487	249,395	25.0
Lawyers, Judges, Notaries	49,962	62,340	24.6
Health Diagnosing and Treating Occupations	538,136	661,473	22.9
Mechanics, Installers, Repairers	425,489	515,379	22.0
Helpers, Labourers	413,714	500,214	20.9
Other Professionals and Paraprofessionals	222,930	269,639	20.7
Service Occupations	3,121,910	3,688,844	18.1
Engineers, Architects, Surveyors	169,664	190,021	17.8
Teachers, Counsellors	526,288	610,998	16.1
Heavy Equipment Operators	396,040	455,132	15.0
Miners	51,546	57,699	12.0
Clerical	708 060	752,750	6.3
Blue Collar, Supervisors	122,750	122,512	0.0
Religion	35,473	32,920	-7.5
Handworkers, Assemblers, Fabricators	216,040	198,758	-8.0
Agriculture, Forestry, Fisheries	517,825	420,279	-18.8
Total	**12,475,712**	**14,154,996**	**13.5**

Source: Hudson Institute, based on data from Informetrica, and using the Employment and Immigration Canada COPS model.

Old Jobs

The number of jobs being created in Canada's traditional industries, such as mining, forestry, and fishing, is dwindling. The needs of a large number of older workers and workers with a narrow range of skills, who have long worked in these industries, will require special attention. Training programs may have to help these workers improve rusty reading and writing skills before dealing with new job skills.

Because these traditional industries have been located in remote areas, where there are few opportunities for training, new and expanded adult education programs will be needed for these workers. Native people, who may have relied on hunting, fishing, trapping, and forestry as part of their traditional way of life, will require more attention as programs are developed.

New Jobs

Even jobs in manufacturing are becoming more and more like service jobs. Workers need greater technical skills to supervise, maintain and reprogram computer-assisted equipment and robots. They must deal with new materials on the job, and oversee quality control for the goods they produce. More workers are spending time on design work, marketing, distribution, maintenance, and finance. These jobs require good communication skills and problem-solving abilities.

Technology is having an important impact on jobs in every kind of industry. Tables 5 and 6, taken from a recent study on the employment effects of technological change, list the kinds of jobs technology is changing, and the new occupations that technology is creating.

TABLE 5
SELECTED OCCUPATIONS POTENTIALLY AFFECTED BY COMPUTER-BASED TECHNOLOGIES

Technology	Occupations affected
Robotics	Welders Painters, except construction Assemblers - autos Assemblers - electrical equipment Hoisting equipment operators Longshore workers and freight handlers Material-handling equipment operators Packagers Material handlers, labourers, etc.
Automatic teller machine, debit cards, teleshopping	Tellers and cashiers Sales workers
Computer-assisted design/ manufacturing machines	Draughting occupations Tool and die makers Machinists Machine tool operators Metalworking machine operators
Computer diagnostic equipment	Mechanics - motor vehicles Repairers - electronic equipment
Statistical inventory, storage and process control systems	Production clerks Shipping/Receiving clerks Stock clerks
Automated office equipment	Typists Bookkeepers File clerks Mail clerks Telephone operators

Source: Newton, Keith, and Norm Leckie. 1987. *Employment Effects of Technological Change*, New Technology, Work and Employment, Vol. 2, No. 2 (Autumn, 1987): 112-135.

TABLE 6
SELECTED OCCUPATIONS THAT HAVE EMERGED FROM NEW TECHNOLOGIES, CANADA 1980-1985

Type Of Technology	New Occupational Title	First Appeared In
Computer	Computer specialist: graphics	'82
	Computer specialist: micro/mini computers	'82
	Systems software programmer	'82
	Computer consultant, market support	'85
	Computerized-information processor	'85
	Training specialist, computers	'82
Computer-aided design (CAD)	CAD draughtsperson	'85
Microelectronics	Auto radio/accessories installer	'85
	Avionics assembler	'85
	Electronic games repairer	'85
	Precision metal fabricator	'85
	Cashier, electronic cash register	'80
Office automation	Word processor operator	'82
Laser	Laser-beam welder	'85
Satellite	Satellite antenna installer	'85
Fibre-optic	Fibre-optic cable splicer	'85
Solar	Solar heating equipment installer	'85
Aquaculture	Technician: aquaculture	'85
Nuclear	Control technician: heavy water/nuclear plant	'80
	Nuclear technologist	'80
	Nuclear-operations engineer	'80

Source: Newton, Keith, and Norm Leckie. 1987. *Employment Effects of Technological Change*, New Technology, Work and Employment, Vol. 2, No. 2 (Autumn, 1987): 112-135.

High Tech, New Tech

New technologies will be created over the next ten years, and current technologies will be improved. These changes will have a profound impact on the way we live and work. It isn't easy to predict which developments will have the greatest impact, but future trends may follow our past experiences.

The personal computer, so central to many of our jobs, found a national market even though its manufacturers thought there would be little demand for it. Computers are becoming more powerful, able to do more complicated tasks. Early in the next century, microcomputers small enough to fit into a briefcase will be more powerful than today's mainframes. Sophisticated tasks, such as diagnosing illness and writing computer programs, will be automated to a considerable degree. Computer literacy will become a key part of workplace literacy.

Robots will be able to do more in the next decade. They may be able to take dictation and edit letters, take reservations in any language, load trucks, or pick strawberries.

While communication technology will improve and play a growing role in our daily lives, in the past new inventions have sometimes taken time to catch on. Television became universal in a single decade, but telephones required half a century to come into widespread use. By the next century, most homes could have, in addition to a telephone, a home terminal which will carry voice, text, video, and other data.

Advances in energy production could change the way we work. When electric motors and generators were improved and made available to industry late in the last century, few manufacturing plants made good use of them. It was only after World War One that manufacturers reorganized their production to take advantage of machines which had their own motors. In 1986, scientists discovered superconductive materials which could make electric motors more efficient and smaller. Electric cars and magnetic trains are among the new inventions this technology could make possible.

New products and processes will change the kinds of goods we produce, and will have an impact on jobs. In manufacturing, diamond coatings, ceramics, and reinforced plastics will increase the toughness, resilience and durability of many products. In coming decades, goods will be produced more efficiently, and with less material. As a result, there will be fewer people needed to produce raw materials, and jobs producing durable goods will be in decline.

New technologies in agriculture will be used throughout the world. As farming becomes more productive, fewer farm workers will be needed. In the developing world, these workers will look for jobs in manufacturing and service industries, which will then compete with the industrialized countries. Our highly skilled work force can and must produce more sophisticated products and services than those which will be made in the newly developing countries.

High Tech Training

Technology could help train our work force. Multi-media learning environments using books, computers, television, and video packages, for example, can tailor education and training to learners' individual needs. The learner will be able to work with a system that can retrieve vast amounts of information from video data banks. In this way, customized learning can also be accessible to people far removed from urban centres and educational institutions.

A Changing World of Work

In the 1980's, governments around the world reduced the number of regulations that had limited industries' actions. Industries responded by using technology and other innovations to compete for new markets around the world.

Trading Partners

International trade has been increasing. Europe's Economic Community and North America's free trade agreement are examples of reduced barriers to goods and services being produced in one country and sold in others. This international competition means that goods are sold at the price established by whatever country can produce them most competitively and reliably.

Trade is growing faster than countries' economies. In industrial countries, economic growth averaged 2.4 per cent each year from 1973 to 1984. Merchandise trade grew 4.2 per cent over that same period. It represented 12 per cent of these countries' Gross Domestic Product in 1965 but, by 1983, it accounted for 18 per cent.

Technology has improved transportation and communications, and contributed to increasing world trade. Logs cut in British Columbia forests travel to Japan to become lumber, and then return across the Pacific to become houses in Southern California. World markets establish the prices of energy, agricultural products, and manufactured goods such as clothing, automobiles and semiconductors.

The competitive pressures unleashed by reduced regulation and increasing trade make companies look for ways to improve their products, their productivity and their quality. They rely on their workers for the ability, creativity, cooperation, quality control, and flexibility that companies need in order to compete.

Brain Power Versus Muscle Power

Countries with the best educated and best trained work forces will prosper in a world that is more reliant on brains than muscle. Japanese companies such as Honda, for example, have used technology, team work and worker involvement in suggesting innovative processes and quality control, to improve their cars' styling, performance and price. Honda's success in the international marketplace isn't due to low wages — cheap Japanese labour no longer exists. Workers' diagnostic and problem-solving abilities are the assets which have helped them compete. And literacy is the key to these skills. Japan estimates that less than one-half of one per cent of its people are illiterate.

People Skills Mean Growth

All countries feel the impact of international pressures on their economies, and Canada is no exception. Our prosperity depends on our ability to improve our productivity, especially in relation to the United States. If we cannot compete, our standard of living may fall, and our economy may stagnate.

A study of the American economy between 1929 and 1982 found that labour contributed 47 per cent of the country's growth during that period. There were more workers than ever before and their work hours, educational backgrounds and personal attributes contributed significantly to economic progress. Advances in knowledge also added to the country's economic growth, contributing another 26 per cent. All told, people skills accounted for 73 per cent of America's growth over more than fifty years. In the future, growth will continue to depend on workers' talents.

Our Changing Labour Force

Canada's labour force will have a new look in the nineties. Women will continue to enter the work force in great numbers, the working age population will grow more slowly, and workers, on average, will be older.

Work outside the home has become an important part of many women's lives. Most families now depend on two incomes, and the national economy has adapted to and benefitted from women's contribution.

Most Women Work

Two decades ago, a minority of women worked outside the home. By 1986, almost 57 per cent of Canadian women were gainfully employed. The Hudson Institute projects that, by 1995, more than 71 per cent of women will be in the labour force.

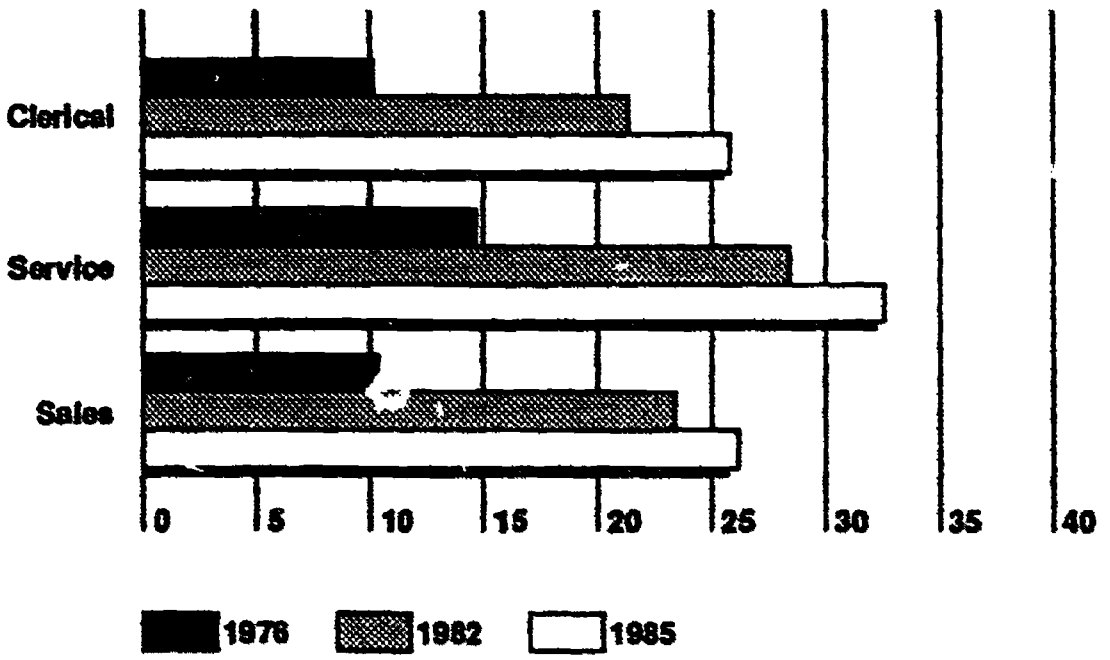
Unfortunately, for a variety of reasons, many women find themselves in unstable and low-paying clerical jobs. With fewer manufacturing jobs being created, these women may remain in this pink collar ghetto, and have only limited opportunities for advancement.

Women are most vulnerable to changes in office technology. While men tend to be concentrated in information occupations where technology assists in analysis and decision making, women dominate the less skilled office occupations. As technology changes their jobs, women will need more training to obtain promotions or to change careers.

Women who have interrupted their careers for family responsibilities find it difficult to re-enter the labour market as hiring standards increase, and as the gap between skilled and unskilled jobs widens. If they end up in lower skilled jobs, they may be displaced by technology.

Women are also facing the problem of having to accept part-time work instead of full-time employment. Although some women prefer part-time work, a growing number of women are "involuntary" part-time workers. Chart 4 shows the Economic Council's estimate that between one-quarter and one-third of women in part-time clerical, service, and sales jobs would prefer full-time employment.

CHART 4
THE PERCENTAGE OF WOMEN IN PART-TIME JOBS WHO WOULD PREFER FULL-TIME WORK



Source: Economic Council of Canada, *Making Technology Work*, Ottawa: Supply and Services Canada, 1987.

Women's Double Workload

Policies are needed to support the growing number of women in the work force. While public policy may not be able to alleviate the double burden many women face of working full time, and taking on most of the family and home responsibilities, supportive policies can help. Training programs could be offered to people returning to the work force after having taken time to care for their families. Expanded day care and parental leave policies could help women with younger children remain in the work force and keep their skills current.

In the nineties, the challenge for governments and industry will be to improve training and reintegration opportunities for women. With a more slowly growing labour force, women's contribution will be more important than ever before.

The "Boom" is Over

The baby boom is over. In the sixties, Canada's birth rate started to drop, so there are now fewer young adults to join the work force. With fewer younger workers, unemployment pressures may ease in future years, but there may also be labour shortages in some occupations.

In the past, immigration has been used to meet labour requirements when there were shortages. Canada benefitted from skilled tradespeople and other immigrant workers who entered manufacturing industries. However, if immigrant workers are unable to communicate well in English or French, there may be problems integrating them into service jobs requiring good communication skills. Specific training and literacy programs will be needed to allow even highly skilled immigrant workers to obtain many service sector jobs.

We are Getting Older

Special training policies and programs may also be needed for older workers in the nineties. As fewer young people are available to enter the labour force, the median age of workers will climb from 36 to 39 over the next twelve years. With one-half of the work force older than 39, many industries may have to reassess their assumption that there isn't a significant benefit in training older workers. Public policy may have to address the problems of older workers in declining industries by providing extensive education and training to assist them in finding new jobs.

Middle-aged workers can bring experience and stability to their jobs, but they also tend to be less dynamic and more inflexible than younger workers. They are less likely than younger workers to change locations or occupations, for example, or to opt for training or education.

It is important for Canada to retrain older workers so that we can compete with developing nations. These countries' birth rates and labour force growth rates tend to be much higher than ours, so their work forces are therefore younger on average. Recent history has shown that young workers have more up-to-date knowledge, are more flexible, and, because

they have less seniority, accept lower salaries. In rapidly changing industries, younger competitors have generally outperformed older ones.

Although it may take time to retrain workers who have been out of school for many years, and who have worked in the same trade or profession all their lives, people can learn at any age. With continuous learning, Canada can have an older work force with young skills.

Conclusion: Creating a Learning Culture

In Canada today, employers provide most of their training to employees who are already highly educated. Public training funds aid the most disadvantaged. The mass of workers in the middle has little support for training to improve their job skills.

Invest in Workers

All workers need continuing opportunities to improve their contribution to the workplace, and their understanding of our economy and society. We need to develop a continuous learning culture to complement formal education.

Canadians will have to make some choices in planning for change and increasing trade. Some of the rapidly growing occupations that require worker training will not involve large numbers of jobs. Nonetheless, they will be critical to our competitiveness and to our ability to develop and maintain a technological edge. If we choose not to invest in training in such fields because of the small numbers of people involved, we may lose out in international trade and competitiveness. An investment in our workers is an investment in our collective prosperity.

Creating a Learning Culture

In Canada's fast-moving, technological society, literacy demands are changing, and training and education are becoming more critical than ever before. Canadians must embrace a vision of a continuous learning culture, where basic, higher and professional education, and vocational training, are all part of a broad process of continuous learning.

As the labour force changes, Canadians need to meet its new needs. Increased immigration, changes affecting women and Native people, and the need to integrate people with disabilities require innovative policy making. Our economic future, and our record as an open society, depend on it.