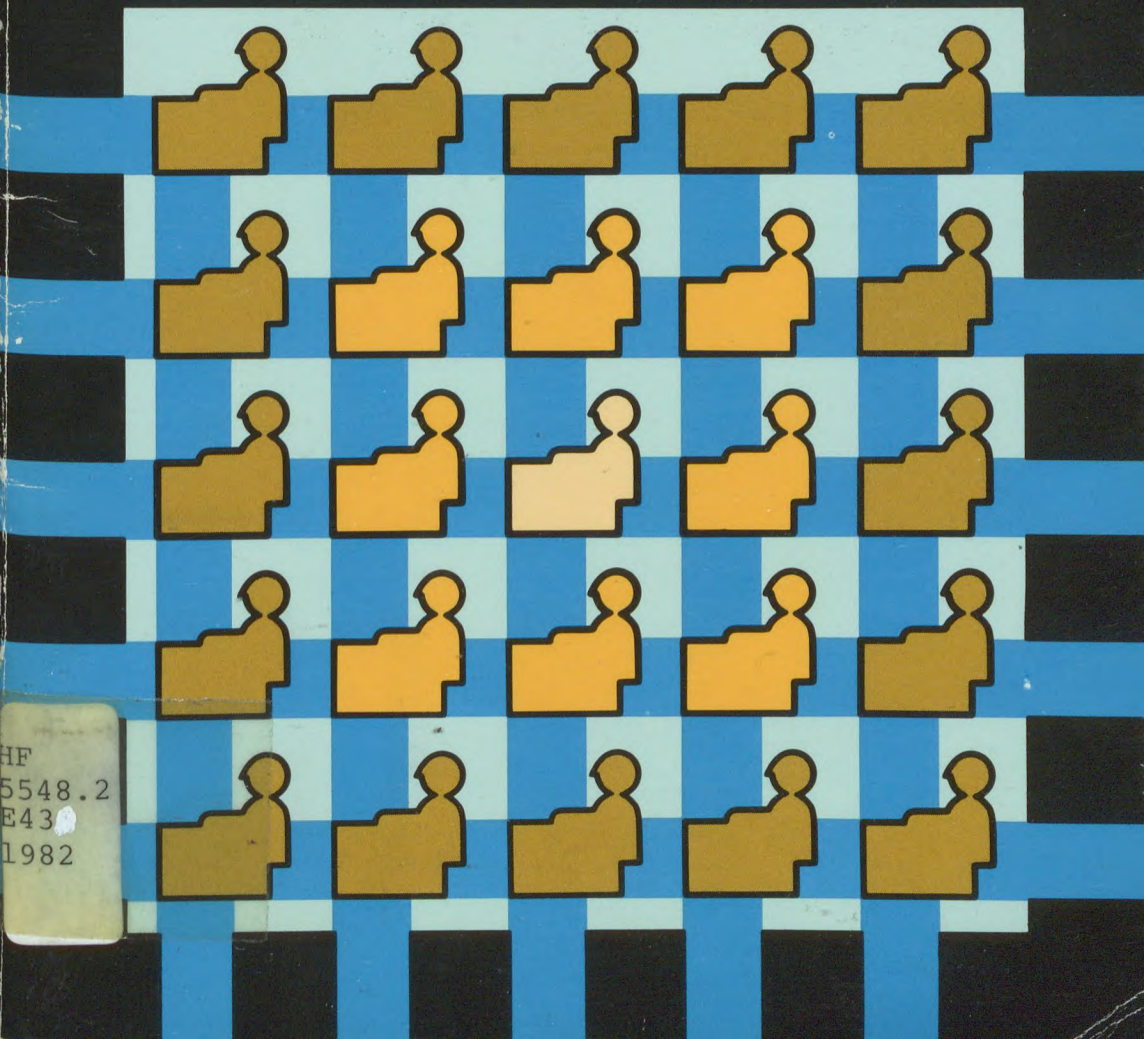
Government of Canada
Department of Communications

Gouvernement du Canada
Ministère des Communications

THE ELECTRONIC OFFICE IN CANADA



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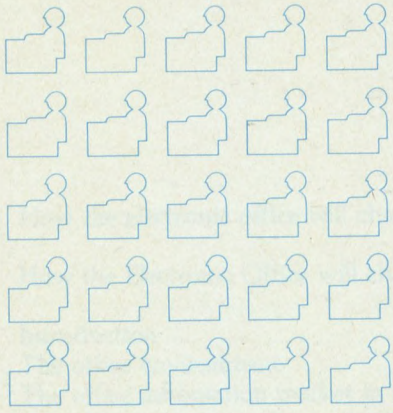

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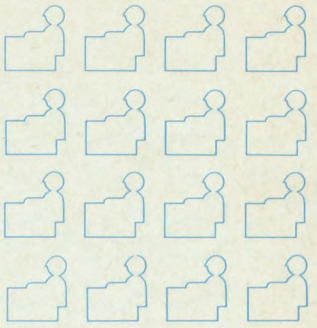
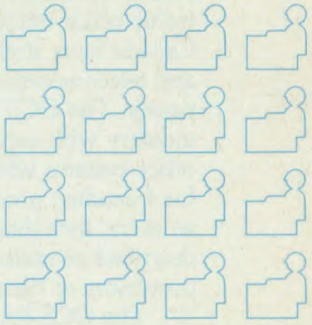


EXECUTIVE SUMMARY

The Office Communications Systems Program



The Office Communications Systems Program is a federal industrial initiative administered by the Department of Communications with support from the Industry, Trade and Commerce. It is designed to develop a Canadian industrial capability for research, development and manufacturing of integrated electronic office systems, and to develop services and marketing for these, domestically and internationally.

Phase I of this program began in November 1980 and was completed in early 1982. In Phase II, electronic office field trials will take place in federal departments. These field trials will be supplied by Canadian companies in or preparing to enter the integrated electronic office marketplace.

Phase II began on April 1,1982, and will conclude in 1985. It will be devoted primarily to the field trials and to research into leading-edge technologies. A particularly critical component of the field trials will be the behavioral and social research involved with implementing new information technologies. Productivity, employment, worker attitudes and technology will be studied.

About $12 million has been budgeted for the field trials, in which office workstations will be used by professional and executive employees as well as clerical staff. About 90 percent of this funding will be devoted to contracts with Canadian firms currently concentrated in central Canada. Funding is expected to diffuse to the regions as the industry matures during the 1980s. (Some Canadian companies, such as Systemhouse and AES Data, already have offices in all regions of Canada.)

The field trials could involve 5,000 or more workstations distributed across Canada as field trials are expected to meet operational requirements of the host site. They are designed to make Canadians aware of the potential of Canadian electronic office products, systems and services, especially for improving productivity.

The Office Communications System (OCS) Program was established because of an alarming fall in the productivity growth rate of Canadian labor, and because the trade deficit in this electronic office industry could reach $20 billion by 1990. We in Canada have strength and potential, especially in word processing and telecommunications equipment provided by Canadian companies. The OCS field trials are expected to provide Canadian industry with experience in developing and marketing electronic office systems while providing a market in the federal government for Canadian products and systems. By 1990, many white collar workers, including executives and professionals, will use what are described as multi-functional workstations, which are like word processors or data terminals with many capabilities.

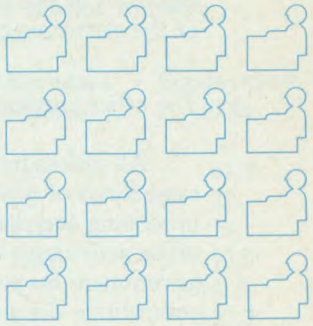
The OCS Program will help Canadian industry enter this market. As has been shown in many countries, considerable leverage can be exercised from government procurement, field trials, and research and development to the benefit of industry, workers and our standard of living.

Five major electronic office trials are planned. The first is led by the Office Communications Research Associates (OCRA), a consortium consisting of Nabu, Mitel, Gandalf, CNCP Telecommunications and three Ottawa cable companies. The second is led by Bell-Northern Research and supported by Bell Canada and Northern Telecom. The third is by Systemhouse which will use equipment supplied by AES, Canstar and other Canadian companies. A fourth is planned for the Department of Communications. The fifth, led by Officesmiths, an Ottawa-based company, will test electronic business-manual systems. Other Canadian companies such as Micom and Norpak may participate in the field trials.

Phase II will support several different systems and technologies. These activities complement other federal programs sponsored by the National Research Council and Industry, Trade and Commerce such as the Strategy for Technology Enhanced Productivity (STEP) and the Enterprise Development Program.

PART I

How the electronic office will change our future



Introduction

Canada, like other western countries, will experience more profound technological and economic change over the next decade than in the last 20 years because we are in the midst of what is often called an information revolution. The battleground for this revolution will be the office; the outcome may be a stimulus to productivity, renewed growth, employment and a higher standard of living. Some people, however, fear their jobs will be lost to machines.

Office automation is an inevitable development, one we Canadians could hardly arrest, even if we wanted to. Making the technology work for us will improve our productivity and business competitiveness in international markets, create employment and lower our balance-of-payments deficit. Rejecting it will make our industries uncompetitive in international markets and create unemployment and other economic dislocations. Canada, therefore, has little choice but to integrate the office automation industry into its overall priorities for economic development. This means developing a federal program to research and stimulate the domestic industry to enter the integrated electronic office market now, while there is still time.

Canada's major trading partners have recognized the potential of the electronic office and they have devised national programs to promote new technologies, new industrial growth, competitiveness and productivity. Their economic performance in almost every case has been superior to Canada's.

In addition to the traditional information industries such as telecommunications, new hybrid industries are emerging. They are based on informatics, the science of information processing; telematics, the merging of computers and telecommunications; and bureaucratics, the science of office technology.

The emergence of the electronic office will have a significant impact at both the organization and individual level. The program described in this paper will address not only the industrial aspects of the electronic office but the human and social ones as well.

The office environment

All offices have a great deal in common. They are used for the same kinds of activities — those related to the collection, storage, processing and distribution of information. The management of office activities is becoming increasingly important to business and government for several reasons. The first relates to the increasingly competitive domestic and international market environment, which in turn will determine whether we have a growing labor force of employed or unemployed persons. The second reason relates to the effectiveness of the public sector in general. In view of the limited share of national expenditures that can be supported by the private sector, the public sector must make more effective use of its existing resources as the demand for better service to the public increases.

About 50 to 55 per cent of Canada's labor force is employed in offices. Furthermore, in the near future, this percentage is expected to increase relative to employment in industry, agriculture and services. Capital investment per office worker, however, is low and office productivity is declining. These trends exact an economic price in terms of efficiency, growth and the ability of Canadian industry to compete in increasingly competitive international markets.

The dramatic advances being made in semiconductors, telecommunications, software applications and artificial intelligence will accelerate the transition from the paper-based office to an electronic one.

The office automation market in Canada

In the office of the future, information workers will routinely use workstations rather than telephones. Multifunctional workstations will integrate voice, data, text, message, graphics and video technologies. Forecasts by IBM and others indicate that by 1990 up to 50 per cent of all professional workers will have these workstations and by the year 2000, 90 per cent of all white collar workers and many homes will have them. Paul Strassman of Xerox Corp. has forecast that by as early as 1985, all employees of large information-intensive companies in the United States will be equipped with workstations. These developments will have a major impact on the economy and on work as we know it now.

Office automation is the leading edge of three distinct but converging industries: telecommunications, data processing and office equipment. The office automation market is huge. Industry statistics for Canada in 1980 are as follows:

Industry	1980 Revenues ($ billions)	Employment (000)
Business telecommunications	3.6	61.8
Communications equipment	2.7	25.
Computer and office equipment	2.03	5.
Computer services	1.06	15.5
Computer software	N/A	N/A
Total	9.4	107.3

Office automation is the most dynamic and rapidly growing segment of the information industry. Products and systems in the office automation marketplace include:

Word processing equipment
Copiers and printers
Electronic typewriters
Electronic PBXs
Electronic telephones
Professional workstations
Computerized business systems
Electronic filing systems
Store-and-forward equipment and services
Local access networks
Public message services
Graphics systems

The skills required to implement an integrated office automation system are diverse and complex. Not only are skills in project management, systems analysis and telecommunications planning required, but also skills and knowledge relating to human factors, work analysis and measurement, organizational analysis and social psychology. Few organizations have these skills at present. Many organizations will, nevertheless, attempt to mount an ambitious office automation project in the next two or three years. Consequently, there will be an insatiable demand for consulting services and few consulting companies have either the skills or experience to meet this demand.

In the last few years, we have witnessed, the appearance of new industry. Some refer to the people in this industry as systems integrators; they bring together various systems, including telecommunications and office equipment, to form an integrated electronic office customized to meet the particular needs of the user organization.

The telecommunications industry is experiencing significant changes from increased competition as well as a growing demand for new services. On the supply side, new electronic switching and transmission systems are expected to propel innovations in new services as real costs continue to decline. New satellite technology, fibre optics, cellular communications and semiconductors will continue to broaden the range of telecommunications services and drive down costs sharply as energy and travel costs escalate.

Information retrieval and processing services have been under development for some time with the growth of the computer service industry and the more recent emergence of the data bank industry. Both industries will undergo further changes as new technologies are introduced and some consolidation, integration and further specialization takes place. Videotex, for example, is only one of the new technologies that may change this industry.

Canada offers a considerable market for office automation systems. It is estimated that by 1990, the Canadian market for integrated office automation systems (including electronic voice and data switching equipment; multifunctional workstations; word, data, voice and graphics-processing equipment; communications and copier equipment) will reach between $15 and $20 billion. The international market will be 20 to 25 times this size. If we assume $150,000 equals one worker, this could mean 100,000 Canadian jobs supplying the domestic market alone. If Canadian industry captured 40 per cent of the domestic market and 5 per cent of the international market, this would represent revenue of $21 billion and 140,000 jobs. Capturing 50 per cent of the market would mean revenues of $10.5 billion for Canadian industry and 70,000 jobs in 1990, together with a significantly lower trade deficit growth rate. Most of the jobs created would be new and would be in the systems and software applications segment of the industry. In the office, there would be greater demand for higher skilled semi-professional and non-professional employees.

Evans Research Corporation, which specializes in market research on the Canadian computer industry, recently published a report in which it predicted:

- The hardware sector will maintain a 26 per cent annual growth rate to 1987 and will reach more than $11 billion in revenues.
- The software sector will grow at an annual rate of 32 per cent to $1.7 billion in revenues in 1987.
- Word processing is expected to reach a 53 per cent annual growth rate in 1987.
- The personal computer market, which grew 100 per cent in Canada in 1981, should achieve average annual growth of 77 per cent to 1987.

The Evans Research report concludes that the industry has not yet entered the mature stage of the growth cycle. Considerable growth potential remains and most of this will be in smaller systems. By 1987, for example, close to a third of the shipments of computers to domestic industry will be in the under $10,000 purchase price category. Today, that proportion is less than one-tenth.

Canadian industry performance

The office automation market spans many diverse technological and product areas from telecommunications and computers to word processing, semiconductors and applications software. The industry's structure is complex and one of the most highly dynamic and rapidly growing industries in the economy. It is concentrated domestically and internationally in the hands of a few multinationals such as IBM, Xerox, Wang and Digital Equipment. Barriers to entry are very high and include high research and development costs, difficult access to large international markets, product differentiation, economies of scale and vertical integration. Canadian industry is at a serious disadvantage in all these respects and its performance reflects these serious weaknesses. The trade deficit in electronics reached close to $3 billion in 1981.

The trade statistics for the Canadian office equipment industry show that the industry has performed poorly. In 1980, the domestic market totalled $2.03 billion growing 39 per cent in 1979-80 alone. In contrast, imports grew 43 per cent and constituted 96 per cent of the domestic market. The trade deficit grew 69 per cent in that year. Should these trends continue, this trade deficit will reach $5 billion in 1985 and $12 to $15 billion in 1990. This deficit would be a severe blow to Canada's employment picture and the strength of the Canadian dollar.

There is, however, some hope. The emerging integrated electronic office market requires strength in at least four distinct but converging technologies: telecommunications, word processing, software applications and data processing. Canadian companies such as Northern Telecom, Mitel and Gandalf have been successful in developing and penetrating international markets. AES Data and Micom have captured about 15 per cent of the North American market for word processors. Systemhouse is a successful world-scale software applications and systems company. Nabu, a newly formed, Ottawa-based company, has moved rapidly in microcomputer-based office systems in Canada. Our country also enjoys a strong presence in telecommunications semiconductor production. Canadian companies are currently strengthening their position in data processing and integrated systems.

The Canadian information technology sector is dominated by large foreign-owned multinational companies. This domination will probably continue but, as the Evans Research Corporation recently pointed out, many of those multinational corporations are not the good corporate citizens in Canada that they are in the United States. The study concluded that if the 13 multinationals under study invested in research and development and in plant and manufacturing in Canada to the same degree that they did at home, 21,000 more jobs would be created here.

Canadian industry has considerable potential, however, further government support in research and development assistance, procurement policy and other means is necessary to ensure that this potential is realized.

Domestic and international trade policy

Current international trends and pressures favor more open markets, the reduction and elimination of non-tariff trade barriers, deregulation and more liberal policies for the ownership and attachment of terminal equipment to the public telecommunications networks. These trends will open the domestic market even more to international competition and will favor large multinational companies. The GATT negotiations will probably eventually rule out the use of procurement policy as a legitimate instrument for stimulating economic development although many nations will undoubtedly find a way to circumvent the rules. The United States has embarked on a program of reciprocity in dealing with its trading partners. If other nations are to have access to the large U.S. market, these nations will have to open their own markets. Canada will be affected by this trend, especially in telecommunications.

The price we pay for the benefits of international trade is high. The more international trade that takes place, the greater the importance of specialization and productivity plays in determining competitiveness and job creation. International trade imposes a discipline on each economy, forcing specialization and higher productivity. Otherwise, unemployment and a falling standard of living result. Canada's position in this respect is precarious. The governments of Canada's major trading partners; most notably France, Japan and the United States; have recognized the strategic importance of information technologies to economic development. These nations have developed highly complex and sustained policies and programs to protect, support and stimulate the telecommunications, data processing, office systems, software and semiconductor industries. West Germany, Sweden and Great Britain have mounted similar programs. Typical support programs

cost in excess of $300 million over several years and include non-tariff trade barriers, procurement policy, joint ventures with foreign-owned multinationals, incentive schemes and chosen instruments.

National strategies

Information technology is as important to some countries as energy. In some cases, it is more important. It will form one of the most strategic industries of the 1980s and 1990s because it will influence in a major way the international military, economic and political balance of power. No advanced country can afford to ignore this technology. The problem is that it takes decades and several billions of dollars to develop the economic strength to compete.

The United States has traditionally been and is still the recognized leader in the information technology sector. This supremacy has been developed by the most dynamic private sector in the world aided by the procurement policies in, especially, the defence and aerospace industries.

Although Japan has captured some segments of the semiconductor market, the United States economy has the strength to maintain its leadership through the 1980s. There is, however, a growing concern in the United States about its economic prospects. Economists in government and industry are calling for an industrial strategy to provide the programs needed to make the transition ahead smoother. The *Harvard Business Review* now frequently carries articles on this subject. A recent article summarized the plight of the United States:

> Without a coherent strategy for regaining industrial competitiveness, the government is susceptible to political manipulation and inevitably reduced to throwing money and tax breaks indiscriminately in the direction of business. Our trading partners, meanwhile, are becoming more proficient in designing and administering programs to help their industries adapt to market changes. The very directness of their approach is more rational and more efficient than that of the United States. Perhaps more important, their explicitness has enabled them to foster a consensus among labor, finance and industry about the overall direction of economic growth and the nature of the sacrifices such growth entails.

The past year has seen a distinct change in the industrial policy strategy of the United States, undoubtedly in recognition of the serious weaknesses of American industry. One major change resulted from the Department of Justice's dropping its anti-trust

cases against AT&T and IBM. More recently, 16 U.S. companies, led by Control Data, have proposed setting up a special organization, tentatively called Microelectronics and Computer Technology Enterprises (MTCE), to co-ordinate American research and development efforts to better compete with the Japanese and get back much of the leadership lost to Japan in recent years. Anti-trust authorities appear prepared to accept this development for the time being, at least.

Japan has made a national commitment to dominate the world information industry much as it did with television and is doing with automobiles. Since the 1972 Masuda report to the President, the Japanese government has developed the most ambitious, consistent and sustained strategy of any nation to dominate this industry and it is beginning to pay off. Joint industry and government committees have been set up to develop key objectives and programs. They have identified the computer, telecommunications, software and semiconductor industries as targets for developmental assistance during the 1980s. One of the most recent endeavors, the VLSI(Very Large Scale Integration) program, has attempted to develop a new generation of semiconductor devices to take the lead away from the United States.

The Japanese government has several other ambitious programs underway designed, to provide their domestic companies with the skills, experience and technology to dominate the world market. One is a new generation of computers based on advanced artificial intelligence. Another program is in fibre optics and yet another is in optical (rather than electronic) information processing. The Japanese know the pay-off may be a decade away. It is difficult to be objective in assessing the Japanese informatics industry because of institutional factors. Many of their institutions such as the bank system, trading houses, industry cartels and industry-government committees have installed very effective non-tariff trade barriers. Because the Japanese market system works so differently, it is difficult to make a legitimate case for unfair protectionism although the barriers to trade are increasingly recognized for what they are.

West Germany, France, Great Britain and Sweden have programs to develop domestic strength in information and communications technologies. Many of these programs — especially in the computer mainframe industry — have been failures in terms of creating profitable ventures. The current strategies appear to be tailored to technology transfer especially from American multinationals and more recently from Japan in semiconductor technology.

The French government provides its semiconductor industry with $140 million in subsidies each year; Great Britain provides $110 million and West Germany, $150 million. Each has developed

programs in software and semiconductor applications and has raised the level of awareness of their industries and public to the issues and the need for support.

For example, former French President Giscard d'Estaing commissioned a national study. Completed in 1977, the report entitled "La Société Informatisé," but often referred to as the Nora Minc Report after its authors, identified the information industry as strategic to France's future and called for a national plan to develop its domestic industries.

Commitments of $5 to $10 billion have been made to overhaul the national telephone system and to develop the domestic semiconductor industry, the software and office equipment industries. France has achieved substantial success in this endeavor.

Great Britain has had an intermittently ambitious information technology program for a decade. The Thatcher government, after hesitation and investigation, has decided it cannot afford not to have an ambitious program in place. To this end, a ministry of information technology has been set up to co-ordinate all economic development activity related to information technology. The government designated 1982 as information technology year in the United Kingdom. Throughout the year, major government and industrial initiatives will be launched in telecommunications, telematics and informatics.

The diffusion process

Although the importance of these new technologies cannot be overestimated, neither can their diffusion throughout the society. The factors involved in the diffusion of new technology include:

- Market forces: These forces include intense international competition; high research, development and distribution costs; increasingly short cycles for product lives; falling product prices; rapidly growing performance/price ratios and strategic timing.
- Economics of production: The industry requires excellence in management and technological skills, high motivation and flexibility. Economies of scale characterize hardware and communications but software appears to be labor intensive without economies of scale except in distribution. Software and systems applications represent the leading edge of the industry.
- Human factors: The human dimension in information technology determines to a considerable degree how the technology is used and how quickly it is adopted. It takes considerable time to develop the skills to use the technology effectively. Attitudes toward innovation and new technology play an important role. Tradition and culture also play important roles in the diffusion of technological innovation.

— Institutional factors: Perhaps one of the most important factors influencing the diffusion of information technology is the structure of the market. The industries comprising the information sector appear to be highly concentrated, undoubtedly reflecting considerable economies of scale or high entry costs. Regulation has played an important role especially in telecommunications but governments are increasingly relaxing regulatory initiatives in favor of free market forces. This is increasing the pace of competition and diffusion in the telecommunications and equipment supply industries.

The information technology has a long history, beginning with the development of the computer and followed by the successive introduction of the general purpose computer, the minicomputer and the microcomputer. The first computers were large, bulky, expensive and primarily designed to perform numerical calculations. Scientists and engineers managed their operation because they were so complicated. Only organizations with large workloads of calculations, large budgets and highly skilled scientists and engineers in government, industry, universities and the military could operate and use them. Gradually, input techniques improved, better memory developed and software vastly improved.

With increasing sophistication in hardware and software, lower cost and higher performance, the general purpose computer emerged to meet the needs of both business and scientific users. Growth in use by business, government and universities was rapid. Timesharing and computer services developed so that an expensive but highly productive information processing tool could be shared, thus reducing costs, by a number of different users. Major users were banks and other financial institutions, utilities, insurance companies, airlines and government. Costs continued to drop, performance increased and advances were made in software, storage and operating systems. The industry outperformed every other industry in the economy.

The development of the minicomputer was another significant step in the diffusion of information technology. The minicomputer brought inexpensive high-performance computer power to another level of users. Now several smaller units within a large organization could justify acquisition of a computer. Minicomputers could be dedicated to specific tasks and applications in manufacturing, resource and service industries. Applications in the office environment were still in structured information activities such as personnel records, budgeting, inventory control, corporate planning and modelling.

The merging of computers with communications took a major step with the development of computer-communications networks

for resource sharing and distributed data processing. Public packet-switching networks were developed or under development by the large telecommunications organizations in most western countries. Computer-controlled switching and voice-data integration in switching and transmission systems in terrestrial and satellite systems were developed and marketed.

During this period, a significant change took place in the composition of the information processing industry. Software and computer applications became the driving forces in the industry; software costs rose as a proportion of total systems costs. Hardware costs dropped. The industry was becoming more labor intensive.

During this period, regulatory authorities in Canada and the United States released much of their hold over the telecommunications industry and more competition was introduced. In the United States, for example, the Carterfone Decision, the Open Skies Decision, the Computer Inquiry and many others changed the structure of this segment of the U.S. economy, opening up the terminal attachment, satellite and long-distance telecommunications markets to competition. This was designed to allow business and users generally to benefit from the information revolution. Events in Canada are following the same course.

The development of the microcomputer in the early 1970s is proving to be one of the most significant and influential events in recent history. It is opening up a vast mass market for information technology in the office and home. It will influence production processes (robotics), the media, service industries (including communications and finance) as well as the balance of military, industrial and economic power. The result will be a new society with a different economy and a different culture.

Microcomputers are beginning to challenge minicomputers for computing power. A home computer is almost as accessible as a color television set. As many as 20 to 25 per cent of Canadian homes are expected to have a home computer by the end of this decade. Video games are the driving force in the home now and the bridgehead they have established will be widened to include transaction services such as those for banking, reservations and retail purchases; message, voice and graphics services; store-and-forward communications; information and entertainment on demand for television and radio broadcasting; security and alarm services and heat control systems. This list goes on.

As has been observed frequently, the pace of technological change is becoming faster all the time and these changes will have a dramatic impact on the office.

The emerging electronic office

The integrated electronic office may not be much more than a concept now, but over the next decade or so, our knowledge about it will be strengthened by experience. What will the electronic office offer the white collar worker?

— Multifunctional workstations: In the same way that the telephone has become a universal and relatively inexpensive communications device, the multifunctional workstation will provide a set of software and hardware applications needed to prepare voice, graphics and textual documents for communications.
— Professional or executive workstations: Specialized workstations for executive, professional and managerial use will provide additional planning aids, control procedures, calculations, scheduling and budgeting aids, storage and retrieval of files with a communications capability.
— Electronic filing systems: Although most memoranda, business manuals, directives, notices and directories are now paper-based, electronic filing systems will store this information in voice, graphic and textual forms accessible electronically by employees.
— Local access networks: The medium of information processing and communications will be the local network. Although the telephone network is the most obvious medium for such networks, coaxial cable, fibre optics and radio technologies will find applications, especially when broadband is required for high speed transmission or video distribution.
— Compound documents: Although voice and text represent separate media for information and communications now, the document of the future will be electronic and combine both.
— Teleconferencing or electronic boardrooms: New display technologies and new integrated telecommunication services at the local and long distance levels are already providing cost-effective means for conferencing as an alternative to travel.
— Public information data bases: Users can access a growing range of data bases, which provide economic, scientific, engineering, legal, medical and stock market information. Newspapers, newsletters and other publications are also going electronic.

Office automation: revolution or evolution?

Office automation will probably continue to evolve in a way determined by whether we understand ourselves, our work and the technology sufficiently well to shape it to meet our demands.

Indeed, the obstacles to the emergence of the electronic office are no longer technological; they are determined by human, organizational and marketing factors.

James Nolan, a systems researcher, has developed a hypothesis which greatly assists in understanding, planning and managing office automation. The hypothesis suggests that automation will evolve and mature from task mechanization to process automation. It suggests benefits to automation but observes that it will take time and will depend upon our ability to incorporate the notion of process into our planning. It suggests too that organizations move through (at least) four stages: initiation, expansion, formalization and maturity.

Initiation: Organizations will perceive opportunities to reduce cost or increase productivity through the use of mechanized office equipment. Stand-alone word processing and shared logic systems, for example, are introduced and managed by administrators; data processing managers are not interested in it. Most organizations are currently in this stage.

Expansion: Rapid expansion in the use of office equipment follows but there is still mechanization, the objective being to either replace paper flows with electronic flows or speed up information distribution. Data processing managers recognize office automation as a major applications area, for electronic filing, report preparation and text handling. Prospective users are interested in the many applications and low marginal cost of usage.

Formalization: Users, comfortable with the tools, will want to automate processes rather than devices. Process refers to unstructured office procedures not amenable to conventional data processing; the emphasis here is on the manager rather than the secretary.

Maturity: This stage refers to a stable state where the costs and problems of automation have been ironed out.

Each of these stages moves to a higher level of complexity and decision-making and from structured to unstructured activities where artificial intelligence will increasingly be applied. The stages also exhibit a process of greater humanization of technology, taking into account the needs of office workers. Eventually alienation is banished from the office. Over the next two decades, we will probably enter the third stage, while maturity may not be reached until the next century.

The employment debate

The impact of automation on employment has prompted an unresolved debate and has been the subject of many studies in Canada and abroad. Concern about the impact of technology on unemployment goes back at least as far as the industrial revolution. Public debate reached a peak in the countries of the Organization for Economic Co-operation and Development (OECD) in the 1970s.

Although some labor dislocations have occurred, the overall effect of the introduction of information technology appears to be one of reducing the rate of growth in the creation of certain jobs rather than of increasing unemployment. Economic studies have failed to find a causal relationship between unemployment and technology. On the contrary, increasing evidence shows that information technology has created jobs. The problem, therefore, is labor adjustment resulting from some displacement and excess demand for skilled labor.

Canada has the lowest rate of productivity growth of any of the eight largest members of the OECD. This can be partly attributed to Canada's low performance in dealing with technological change. This low performance itself has reduced Canada's ability to compete in international markets and has resulted in a loss of employment and a lower standard of living. Recognizing that increased productivity is necessary to improve our competitive position and create jobs, and that shortages of skilled labor will severely constrain our growth prospects for the 1980s, it is critical that we enhance the technology that leads to increased productivity. Simultaneously, we must initiate public programs to mitigate labor shortages and any job dislocations that may result.

Although information technology has already penetrated much of the clerical level of organizations, some displacement may yet occur. This must be anticipated and retraining programs must be developed.

Shortly after the turn of the 19th century, textile workers in Nottingham, England, attacked and destroyed plants where new machinery had just been installed. The workers revolted because they claimed that the machinery would take away their jobs, depriving them of income and food. The issue is still as hotly debated as ever.

Don Michael, in *Cybernation: The Silent Conquest* (1962), said that 1.5 million people had been displaced in manufacturing between 1956 and 1962. He asserted that this represented permanent unemployment and pointed out that both blue and white collar workers would be seriously affected by permanent unemployment in the future.

A landmark study was published in 1966 by the U.S. National Commission on Technology, Automation and Economic Progress, entitled *The Outlook for Technological Change and Unemployment.* This ambitious study was intended to resolve the issue once and for all. The report concluded that automation was like any other of the many technological changes experienced over the centuries and that demand would play a critical role, expanding sufficiently rapidly to absorb any employment dislocation. Proper management of fiscal and monetary policy would stimulate economic growth and employment. Automation was, however, the locomotive to a higher standard of living.

During the 1970s, the unemployment debate reached another peak, as a result of concern and alarm raised by the advances in microelectronics. An overview of this debate was completed by the Institute for Research on Public Policy under contract from the Department of Communications in 1980. This study presented the pros and cons of the debate and surveyed more than 200 studies from all over the world. It concluded that, while the debate was heated, no economic or statistical evidence supported the proponents of the unemployment side. Other studies presented the following opinions:

— Arthur D. Little, a U.S. consulting firm, concluded that microelectronics would result in a net gain of one million jobs in Europe by 1987 and create $30 to $35 billion in additional wealth.
— The Bureau of Labor Statistics in the United States concluded that between 1960 and 1978, employment of clerical workers increased 73 per cent as a result of computers and forecast this rate to continue through 1985.
— The Science Policy Research Unit in the United Kingdom predicted an 18 per cent job loss over the next 15 years, including a 27 per cent decline in information handlers, 22 per cent in intellectual workers and so on. Other pessimistic researchers forecast similar impacts.

Where will the jobs come from in the 1980s? In an attempt to answer this question, economists at the Massachusets Institute of Technology recently looked back at the 1970s and asked the same question. Their discovery may have some significance to Canada in the decade ahead. They found:

— About 70 per cent of the new jobs created during the 1970s were created in newly developing industries particularly in high technology.
— The birth and death rates of companies within developing industries were very high, with a half-life of three years.
— Manufacturing contributed to 4 per cent of the new jobs.

If we can apply these findings to this country, Canada, too, must look to newly developing, highly skilled industries to provide the jobs, growth and the productivity needed for the 1980s.

The Bureau of Labor Statistics in the United States has issued the most interesting and professional analysis of how employment is affected by information technology. In a recent article, economists reported the following:

- Employment in computer-related occupations reached 765,000 in the United States and grew 50 per cent to 1,158,000 in 1978. The projected employment for 1990 is 2,140,000, a rise of 85 per cent.
- During the 1970s employment in computer-related occupations grew 2.5 times faster than total employment in the economy. This employment growth is stable because it cuts across all industries although it is concentrated in the service, manufacturing, wholesale and retail trade, and finance, insurance and real estate sectors of the economy.
- In manufacturing, for example, although employment grew 5 per cent during the 1970s, computer-related employment grew at a 34 per cent rate. In wholesale and retail trade, computer-related employment grew more than twice as fast as total employment in this industry. In government, such employment grew at a 200 per cent rate. In finance, insurance, real estate, transportation, communications and utilities, growth was somewhat slower because those industries adopted computer technology during the 1960s. The supply of new, small, inexpensive but powerful computers stimulated employment in agriculture, forestry, fisheries, mining and construction.

The growth of employment during the period 1970-1978 and the forecast for the period 1978-1990 are as follows:

	Growth Rate		Relative Distribution		
Employment Growth	*1970-78*	*1978-1990*	*1970*	*1978*	*1990*
	(%)			*(%)*	
Computer operators	177	116	19	34	40
Programmers	40	102	23	21	23
Systems analysts	77	120	14	16	19
Keypunch operators	−9	−15.8	40	24	11
Technicians	70	154	5	5	7
Total	53	85			
U.S. labor force	18	(20-25 est.)			

The economists drew these conclusions:

- The educational system will need to develop more programs to meet the rising demand.
- Shortages of computer workers are expected to become increasingly acute in the years ahead.
- The shortages will result in a continued escalation in wages of computer workers.
- Schools, colleges and universities will find it increasingly difficult to compete and will lose staff.
- Upward mobility into the executive level of management will increase.

In general, therefore, the report says: "The shortage of computer personnel is expected to continue, resulting in higher wages, more job mobility, increased job security and greater opportunities for those workers."

Examination of the composition of white collar occupation categories for the United States reveals some very interesting facts.

White collar workers (professional, technical, managerial and clerical employees) rose from 25 per cent of the labor force in 1920 to 49 per cent in 1980 and are expected to constitute 56 per cent in 1990. The composition of the white collar work force also changed, with professional and technical occupations making the largest gains from 27 per cent of white collar workers in 1960 to 31 per cent in 1980. This is expected to increase to 32 per cent by 1990. Since 1960, clerical labor declined from 27 per cent to 25 per cent of the labor force but clerical employment grew from 7.3 million in 1960 to 12.8 million in 1980, representing a net growth in total clerical jobs of 75 per cent. This was when heavy investment was made in computers and when concern was expressed about the threat to clerical workers of unemployment resulting from computerization. During this period, a shift in clerical jobs did take place, however, from predominantly routine production jobs to non-routine support jobs. Over the next decade, clerical employment is expected to increase 20 per cent in proportion to the increase in managers and professionals.

The federal government has recently completed a task force on Canada's labor prospects for the 1980s. The report, "Labor Market Development in the 1980s," identified four main goals of labor market policies: a high and rising level of employment, a reasonable degree of wage and price stability, a high rate of growth of output and productivity, and a fair and equitable distribution of economic opportunity and income. All of these goals and issues are relevant to the subject of office automation.

The Task Force emphasized the seriousness of the adjustment problem while recognizing the following:

— The need to retrain aging workers;
— The strong demand for workers in some industries, especially in high technology;
— The declining demand for unskilled workers in industries where there is little technological innovation as a result of international competition;
— The static demand for clerical and office workers in health, education and public administration.

The task force recognized that, should these trends persist, aggregate employment, output and productivity growth would be reduced and inflationary pressures increased. A critical component of the federal labor strategy is to develop and tailor training programs to meet these demands, improve adjustment to innovation and the quality of relevant information available, and ensure that the disadvantaged have better access to new opportunities.

The productivity dilemma

Productivity is a measure of how much a worker produces during each unit of time employed, that is, output per hour, day, week or year. It is also a measure of the length of time a person needs to work to produce enough income to afford a certain standard of living. The higher the level of productivity, the more a worker can produce in a given time (thus, the higher the standard of living achieved or the shorter the time worked to make a particular standard of living). Once productivity growth drops below a certain level, unemployment will result. The higher the level of growth of the labor force, the higher the growth of productivity must be to raise per capita income and the standard of living.

Productivity and its rate of growth is therefore directly related to economic prosperity, the level of per capita income and the standard of economic well-being. It is also related to our ability to compete in international markets. High and rapidly growing productivity is therefore an extremely important economic policy goal. Canada's performance in recent years with regard to productivity growth has been very poor and ranks below those of our major trading partners in the OECD.

Don Daly, an economics professor at York University, is a recognized expert in the field of productivity, in particular as far as macro-economic analysis is concerned. Dr. Daly recently examined the following figures compiled by the U.S. Department of Labor:

	United States	Canada	Japan	European Economic Community (Big Four*)
Growth in real gross domestic product per employed person				
1950-74	1.93	2.46	7.53	4.29
1974-80	.86	.09	4.04	2.49
Growth in output per hour in manufacturing				
1950-74	2.56	4.15	9.63	4.91
1974-80	1.84	1.66	7.21	3.51

* (The U.K., France, West Germany, Italy)

Dr. Daly observed that, for every country, there was a decline in growth over the two periods for both gross domestic product (GDP) and output in manufacturing. Canada had the biggest decline in growth for both performance measures and now has the lowest growth rate of any of the seven countries in both categories.

No single factor can explain these trends. Some researchers attribute them to weak demand, but inflation may be the price paid if stimulatory monetary and fiscal policies are used to correct it. Others feel that low business investment and savings are at fault, but they fail to note that Canada has the largest capital investment per worker in the world. Inflation, high energy prices and a decline in research and development spending have also been cited as causes of these alarming performance trends in Canada and abroad.

A great deal is known about productivity in the goods-producing industries, such as agriculture, resources and manufacturing. Productivity is high and has been rising for decades. Capital investment plays a particularly important role in stimulating productivity growth in these sectors. In the information industries and in offices, productivity is not well understood and there is no agreement on measurement techniques or factors influencing it. With such a concentration of information workers in the economy, the serious decline in the rate of productivity growth experienced by most western countries has been attributed to the unproductive office worker. More research is required to understand the nature and measurement of the office worker's productivity. Understanding the factors that contribute to improved office worker productivity and devising programs to correct the problem are critical to our economic well-being.

Information has very peculiar economic and other properties, making it completely different from normal goods and services in the economy. These properties must be understood in order to understand productivity.

For example, information and communications are inextricably linked together. Information depreciates rapidly, so timing is important to the valuation of information. Valuation also depends on who has access to the information, how much other information he or she has access to and the ability to process and use it opportunely. Information is often expensive to produce but inexpensive to distribute. Copyright laws are required to police property rights to information and obtain the benefits of ownership. In short, information, knowledge and communications are often synonomous with economic, political and social power.

Information and communications activities are often treated as an overhead expense, in part because they are not understood, but particularly because output or profit is the primary measurement of success. Information and communications are indispensable to producing an economic good but the cost and effort involved cannot easily be measured, nor can their contribution to output (or profit and productivity) easily be determined. Ultimately, information and communications activities rest with every employee of an organization and are inherent in the overall management structure, even though an increasing segment is being taken over by electronic machines.

An economic organization operating in a market system collects information about its external environment and its internal operation, assesses and processes this information, establishes plans and goals, and controls procedures to ensure these goals are achieved. Although the critical decisions are made at the top of the organizational hierachy, some decision-making power is delegated and distributed throughout the organization. All decisions cannot be taken by a single decision unit because of its capacity and access to information, so it is decentralized.

Decentralization works best when the information, action plans and decisions are required locally rather than centrally and the organizational performance is increased as a result of decentralization.

Information technology will have an impact on organizational efficiency in numerous ways. It will change the carrying capacity of information channels and alter and influence its distribution channels, power structures, access to information and timeliness of information. It will alter the value of information to the organization.

Control over information is exercised by people involved in the distribution channels, those who screen incoming information and distribute it to the appropriate people who process it or make

decisions based on it. These activities, which historically have been the responsibility of employees, are being mediated by information and communications machines and channels. Considerable power can be exercised by those who control these machines, access the information in them or control the flow of information.

Ultimately, information and communications activities come at a cost that must be assessed according to their contribution to output, however defined. Too much information or the wrong kind of information can be costly and can quickly degrade the performance of an organization. The danger to organizations today, and to those who work in them, lies in who exercises control over information, rejects non-relevant information and evaluates good information. It is essential to ensure a balance between adequate valuable information relative to the processing, communications and decision-making capacities of the organization, its costs and its contribution to output, profit and the well-being of its workers.

Many writers on office automation cite statistics published by the Stanford Research Institute in 1976: Office costs constitute 40 to 50 per cent of a company's total expenses; of these, labor costs are the largest. Furthermore, these costs are rising at a rate of about 8 per cent annually, while salaries are rising about 10 to 12 per cent. These costs must be brought under control. The solution, so the argument goes, is to raise investment in information technology to cope with the workload and raise labor productivity. Office worker productivity rose only 4 per cent between 1967 and 1977, compared to that of factory workers which rose 83 per cent. Capital investment per office worker was estimated at $2,300; for industrial workers, it was $31,000.

James Bair, a researcher at BNR in Palo Alto, has calculated that the payoff to office automation must come from raising productivity of managerial and professional employees where 66 per cent of the labor costs are concentrated. Clerical staff already have a substantial capital investment in such facilities as word processing and their productivity is improving. Bair calculates that savings of up to 25 per cent of non-clerical labor costs can be eliminated through office automation. The savings would take the form of reduced media transformations and shadow functions, lower labor costs and improved timeliness and control.

Booz, Allen & Hamilton, Inc., a management consulting company in the United States, has also carried out related economic studies. It calculated that U.S. businesses spent $800 billion in 1979 to support white collar workers, $600 billion of which was on managerial and professional workers. Only $21 billion was spent on equipment to support managerial and professional workers, while over $50 billion was spent on equipment to support clerical workers. Furthermore, managers and professionals spent as much as

25 per cent of their time on clerical and support work. Without integrated office technology, white collar costs would rise to $1.5 trillion in 1990. If the technology is successfully exploited, savings of $300 billion annually could be achieved by the end of the decade.

Paul Strassman, an economist at Xerox Corporation, uses a value-added approach to the analysis of productivity at the company level. "Value-added" is defined here to mean profit plus direct cost plus "organizing information costs", that is, marketing plus overhead. The productivity index of the organizing sector is then defined as the ratio between value-added and information costs. Based on a study of 2,000 organizations, the U.S. Strategic Planning Institute has found a strong correlation between return on investment and value-added per employee, so value-added is a strategic factor in determining return on invested capital.

Charles Jonscher of Harvard University analyzed 33 industries in the United States using the same methodology. He found that contrary to the popular belief that organizers were an unnecessary burden on the production system, the value-added-per-unit-of-direct-labor-cost of information workers increases relative to production workers. Information-intensive enterprises are therefore likely to show greater return on capital than labor-intensive industrial ones. In fact, if we take the highest and lowest ranking U.S. companies, ranked by the cost of goods sold as a percentage of revenues, we find that those companies with a value-added measure greater than 50 per cent have a return twice that of those firms having a measure of less than 10 per cent. These findings should affect corporate strategy and a nation's economic development policy.

Technological change, in general, and automation in particular raise the productivity of labor. This results in a higher standard of living, lower prices, and so on. Technological change is fundamental to economic growth.

As it imports about 30 per cent of all goods and services, Canada must meet fierce competition from other nations. The key determinants of competition are price, industry concentration and productivity. Our low productivity performance has cost us many jobs. Productivity is related to the changing work ethic, international specialization, economies of scale, government intervention in the economy, regulation, unionization and industry concentration. Technology and automation represent perhaps the greatest hope for increasing our competitiveness in international markets and stimulating economic growth and employment.

Toward a policy framework

Sozaburo Okamatsu, Director of the Electronics Policy Division in the Japanese Ministry of Industry summarized the approach of the Japanese government at a recent conference on micro-electronics and employment in Ottawa: "We are of the belief that the influence of micro-electronics on the economy is a very positive development and while eliminating negative factors as much as possible, we hope to contribute to the formation of an information-oriented society."

Western countries are aware of the need for a policy framework to stimulate economic growth to achieve the benefits of productivity increases and employment growth and to channel investment and other resources in a timely manner to achieve this growth and mitigate any adverse effects and employment dislocation that may result.

Such a framework should recognize the following elements:

- Technology plays a critical role in raising productivity, economic growth, employment and our standard of living.
- Technology and the speed with which it is introduced can create employment dislocations if policies and programs are not developed in anticipation of the technology's introduction.
- Technology and its effects cannot be regulated effectively in the economies characteristic of most western democracies.
- Many dying industries can be revived by infusing them with new information technology.
- The micro-electronics, information and communications industries are high growth industries and should be regarded as targets of stimulative fiscal, monetary and other economic policies.
- There is an urgent need for awareness programs aimed at all segments of society. These will enable us to understand and cope with the new technology.
- The social and economic policies appropriate to an information and communications-oriented society will be very different compared with those in an industrial society. New policy instruments and programs must be devised relating information and communications activities to the economic and social development process.

Many people have expressed a legitimate concern about the human and behavioral impacts of office automation. Office workers and unions are concerned about the effects of new electronic office systems on individuals and on their privacy, security, health, safety and status in the organization. Another serious cause of concern: most workers will want equal access to the new

technology, the training programs and the jobs that grow with them.

The office is, above all else, a human environment and will always be that way. Although there will be a need to measure effectiveness and performance in the office in an economic or financial sense, the human side is the major factor that can make or break the performance record of any organization.

An organization can achieve superior performance if every worker knows the objectives of the organization, how well it is performing, what he can do to improve its performance and if he has the information and motivation to do what he can to improve performance. Without this prescription, performance will be inferior. Performance, has a motivational element, an informational element and a decision-making element. The new electronic office environments must therefore be designed with these in mind. They must be designed for humans, to serve humans.

Understanding the human and organizational aspects of office work, although they are extremely complex, is essential to designing and implementing an office automation strategy. The success of such a strategy will, to a large extent, reflect whether these aspects have been suitably addressed. There are several issues which should be considered important to an effective plan for office automation.

The threat of job displacement is perhaps the most sensitive issue. Some displacement will undoubtedly occur, not only among clerical staff, but also among managers and professionals. Any major dislocation, however, would be contrary to trends in the past two decades during which the major introduction of computerization took place. There is a legitimate fear, however, that new skills will eventually be required by every worker and this fear must be overcome in conjunction with the job security issue.

Every office worker may require retraining in the next few years, so even the fear of being retrained must be overcome. Managers will have to be sensitive to these fears and try to overcome them. The first stage of such retraining, that is, in word processing, appears to be well in hand, and most word processing operators seem to enjoy their work. They appear also to be strategically placed and trained for key positions in the integrated electronic office.

Women are particularly concerned about office automation since they represent 60 to 80 per cent of the clerical and secretarial workforce. Although a great deal of automation has taken place, further training of clerical and secretarial staff will be required. For women, the shortage of skilled personnel, now and over the next decade, in the low and middle levels of the organization, represents an important opportunity for advancement for those who have the skills and motivation.

Workers will also be affected by the reorganization of work. Some will like this; others will not. If work is redesigned to create narrow and low-skilled jobs, workers will be concerned even if they have a job. Although massive under utilization of skills is unlikely, the redesign of jobs will have to take into consideration the human concerns of the workers directly affected.

If jobs are repetitive, boring and monotonous, isolation and alienation will result. Although this is a possibility, it seems unlikely because the new systems will have a substantial communications component and require more social interaction, decision-making and a better understanding of the organization. Variety, mobility and better performance will result.

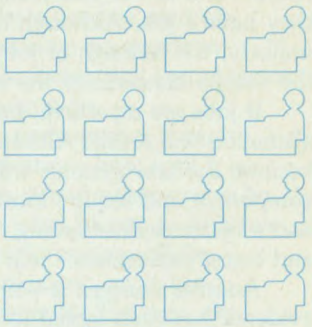
Another concern is with health and safety. Although no evidence has been tabled to date to show that exposure to word processing equipment or other types of terminals is injurious to health, further research into this issue must take place so that it can be suitably addressed. Other issues such as fatigue, stress and heart attacks resulting from work with or exposure to intelligent machines must be researched. Much of this is not new, of course, because computer personnel have been exposed to computer terminals for at least a decade.

Other concerns of office workers will also arise. When workers interact with machines, their performance can be more readily monitored. Decisions can be scrutinized by managers and their performance evaluated. Workers may react against this intrusion.

The overall work environment, therefore, will continue to be a very human one. Greater emphasis will be placed on job security, retraining, quality-of-work life and quality of decision-making, and ensuring that these contribute as much as possible to performance.

PART II

A program for the electronic office



PHASE I
Activities and Achievements

Background

On November 3,1980, the Cabinet Committee on Economic Development of the federal government approved a a budget of $2.5 million for the first phase establishment of the Office Communications Systems Program. This federal industrial initiative in the emerging market for integrated electronic office systems was jointly sponsored by the Department of Communications and Industry, Trade and Commerce.

The program's main objective is to develop Canada's industrial capability for supplying integrated electronic office systems for domestic and international markets. To meet this goal, the program will:

- Support field trials of Canadian produced integrated office communications systems in federal departments;
- Perform research addressing the human, social and employment questions resulting from the introduction of new office systems and ensure that these systems contribute as much as possible to higher productivity and a better quality-of-work life;
- Carry out research on leading-edge technologies and support standards activities;
- Carry out a public information program to promote Canadian systems and to improve productivity.

There are two phases in the program. Phase I started in November 1980 and finished in 1982. It was designed to:

- Establish and maintain a program office in the Department of Communications (DOC);
- Provide assistance to departmental field trial activities;
- Carry out behavioral, economic and systems research;

— Pursue research to develop a methodology for performing feasibility, implementation and assessment studies of office automation systems;
— Provide support for interim industry field trials;
— Develop a program of activities for Phase II;
— Set up industrial and federal advisory committees; and
— Foster information and awareness programs and standards activities.

Phase II began on April 1,1982, and will finish in 1985. Its purpose is to conduct and support a finite number of field trials for integrated electronic office systems under development by Canadian industry. These field trials will take place in selected federal departments which are prepared to embrace office automation as a strategic management commitment over the next several years. On April 22,1982, Cabinet approved $10 million, for the support of Phase II activities.

In co-operation with Industry, Trade and Commerce, Phase I has achieved substantial success in carrying out the following activities:

— Research to better understand the social and behavioral impacts of office automation was begun. Eight studies are in preparation and will be used to guide the implementation of the field trials.
— Studies were conducted of forecasts published on international trade trends, Canadian industry performance, productivity, employment and other economic effects.
— Industry and federal department committees were established to advise DOC and to prepare reports on productivity, human factors, standards and technology assessment.
— A field trial methodology and plan were developed and distributed to all federal departments as a guide to field trial planning and to advise them on how to participate in the OCS Program.
— Field trial proposals from Canadian industry were solicited and assessed. Several proposals were retained for extensive consultations with prospective host departments.
— A limited public information program was initiated.
— Limited field trials were conducted to test several Canadian systems, including a Canadian-built optical character reader to automatically read printed documents.
— Assistance and advice were provided to other departments planning to implement integrated electronic office systems.
— A project of university research in office communications was funded at the University of Waterloo.

— Companies such as AES Data and Mitel were assisted under the Enterprise Development Program of Industry, Trade & Commerce.

These activities have confirmed the feasibility and desirability of proceeding to the next phase of the OCS Program. Accordingly, a strategy and plan of activities have been developed for Phase II which the Ministers have accepted.

Before describing these plans and activities, we will report on what was learned during Phase I.

Studies and Research

To gain more knowledge about the nature and impact of the emerging electronic office, the OCS Program has initiated about 20 studies covering behavioral, economic, marketing, feasibility and field trial feasibility activities at a cost of more than $400,000. Reports on the majority of these studies are expected to be released in the early summer 1982.

The OCS committee system

The OCS Program office has initiated the formation of several committees to organize the industry and user groups in Canada and to co-ordinate activities, share information and provide advice on matters pertinent to the OCS Program. An OCS Users Group and an Industry Consultative Committee have been formed with various associated subcommittees. In addition, a software committee will represent the interests of the Canadian software industry. A brief description of each committee and its objectives, membership and activities is provided here.

The OCS *Industry Consultative Committee* was formed to provide private sector advice to the Department of Communications and Industry, Trade and Commerce on issues related to industrial development of the office automation sector. Its principal function is to recommend to the federal government actions that will encourage the use of electronic office technology and stimulate the development of a competitive Canadian office automation industry.

The committee chairman is Carl Beigie, Professor of Canadian-American relations at the University of Toronto and President of the C.D. Howe Institute in Montreal. Members of the committee are drawn from the private sector and represent the Canadian Advanced Technology Association (CATA), the Electronic and Electrical Manufacturers' Association (EEMAC), the Canadian Business Equipment Manufacturers' Association (CBEMA), the

Canadian Association of Data Processing Service Organizations (CADAPSO), and Canadian carriers such as the Cable Telecommunications Research Institute (CTRI), the TransCanada Telephone Systems (TCTS) and Canadian National-Canadian Pacific Telecommunications (CNCP).

Meetings of the Industry Consultative Committee are held approximately every six weeks and advice provided to DOC on OCS matters.

The Industry Consultative Committee has formed three subcommittees to represent interest groups. These subcommittees report regularly to the main committee. The Standards Subcommittee investigates and recommends standards for Canadian OCS suppliers. A Federal-Provincial Subcommittee will shortly visit Provincial Governments with a view to exploring prospects for co-operative initiatives to foster the development of an indigenous OCS industry in Canada. A third subcommittee will examine field trial evaluations. The subcommittees' findings are communicated to the Industry Consultative Committee and to the OCS Program office.

Canadian software suppliers have also formed a special interest group, the Software Strategies Committee, under chairman Glen McInnis, President of Officesmiths Limited. This committee investigates areas of co-operation among its members and exchanges information on software issues, standards and other areas relevant to office automation.

An *OCS Users Group* was formed to represent the interests of federal departments and agencies. The task of this organization is to ensure that OCS program activities and projects meet the needs of public sector offices to the greatest degree possible. This committee also ensures that the technical, economic and behavioral needs and requirements of office automation systems are satisfied and communicates these needs to the OCS Program office and to the Deputy Ministers of Communications and Industry, Trade and Commerce. In addition, the users group serves as an information exchange for all member departments.

The chairman of the OCS Users Group is Peter Meyboom, Deputy Secretary with the Treasury Board. Membership in the Users Group is open to any federal department or agency with an interest in office automation. The following departments and agencies are members:

Agriculture
Communications
Employment and Immigration
Energy, Mines and Resources
Environment
External Affairs

Health and Welfare
Industry, Trade and Commerce
National Defence
National Revenue
Public Works
Supply and Services
National Parole Board
Royal Canadian Mounted Police
Treasury Board
Statistics Canada
Status of Women

The OCS Users Group has three subcommittees to represent the special interests of its members and to investigate critical issues facing user departments. The first, called the Office Productivity Subcommittee, investigates all issues pertaining to office productivity including its meaning, measurement, evaluation and methods for increasing office productivity. Its findings are communicated to the OCS Program office and to members of the Users Group. A Human and Social Impact Subcommittee has also been formed to investigate social and behavorial problems related to the introduction of office automation. It is looking at issues such as worker resistance to automation, employment effects such as job displacement and retraining, man-machine interfaces, privacy and organizational design. A third subcommittee has been formed called the Communications and Technology Subcommittee. It identifies and evaluates major developments in telecommunications and office automation. It relates these developments to users' needs in the office. Other issues to be investigated are security of office automation systems and the development of functional specifications and standardization criteria for office automation products and services. The results of these investigations are reported to the users group and the OCS Program office.

Field trial guidelines and initiatives

During Phase I, the OCS Program office developed guidelines for supporting office automation field trials in industry and in federal departments. The guidelines proposed a four-stage field trial plan:

Phase I: Field trial planning, including feasibility, needs, systems analysis and site preparation.

Phase II: Field trial implementation and operation, including installation of new office equipment and systems, and training of staff.

Phase III: Field trial evaluation, including an assessment of productivity increases, quality of work improvements, behavioral factors and specifications to the system suppliers for system enhancements.
Phase IV: A full-scale implementation of the automated office system in the host department if Phase III results in a significant payoff to the department's operations and mandate.

The OCS Program office has proposed to negotiate its share of the cost of the field trial with the host department on the principle that much of the one-time start-up cost incurred by the field trial contractor would be borne primarily by the OCS Program, with remaining and operational cost (Phase IV) being borne by the host department.

The OCS Program office established certain criteria relative to the assessment of field trial proposals submitted by Canadian firms. These are:

- Systems being proposed for field trials should be suitable for managerial, clerical and professional use and perform interpersonal, informational, computational and decisional functions.
- The field trial proposal meets a distinct need of the host department and offers significant benefits to it in terms of productivity and quality of work.
- The field trial proposal is sufficiently advanced technically and commercially and represents the state-of-the-art in integrated office systems.
- The field trial proposal offers significant benefits to Canadian industry and enables it to compete domestically and internationally.

Although discussions have been held with foreign-owned multinational companies concerning their market plans, no proposals have been received from them. Economic studies, however, suggest that many foreign-owned multinationals are poor performers relative to domestic companies with respect to investments in local research and development and with respect to endorsing the concept of world product mandates.

A major aim of the OCS Program is to foster an awareness of the benefits of office automation in federal departments and to assist these departments with planning and implementation of advanced office automation systems, in particular with the analysis of needs. During Phase I, about $300,000 was spent on departmental field trial feasibility studies, as briefly described below:

During one preliminary field trial at the Department of Supply and Services, a behavioral study of the effects of implementing a store-and-forward message communications system was carried out.

Industry, Trade and Commerce started a project for the Tourism branch to assist commerce officers in tracking program activities and providing schedules, milestones and budget information. Substantial savings in operational costs and salaries are expected from the project.

Other activities commenced in the departments of Environment and Communications as well as Treasury Board and the Ministry of State for Economic Development. These are very much of a pre-field trial nature and have the objective of familiarizing departmental staff with office automation. Once the initial field trial preparation is completed, a decision can be made to proceed to the implementation and assessment stages.

PHASE II
Strategy and Program

Strategy

A two-pronged strategy has been devised for developing an integrated electronic office industry in Canada. The first focuses on a series of major field trials in federal departments. The second is support for special applications and systems research. The federal government approved $12 million for the program to continue to the field trial stage while approval for the leading edge research will be sought in late 1982.

Each field trial is based on a different technology and on systems supplied by a different industry group. In addition, a DOC field trial is planned and some modest assistance will be provided to four or five departments to enable them to introduce Canadian office systems into their operations.

The funding allocated for the field trials is not sufficient to support all federal activity in office automation. The OCS Program funds, however, will support more advanced integrated systems with emphasis on multi-functionality.

Support by the OCS Program for a variety of field trials is desirable for several reasons. The office automation market is and will be large and diverse. There will be a demand for many general purpose and customized systems. All of the proposed systems can enjoy success in the marketplace. No one company, not even one of the large multinationals, is likely to dominate this marketplace in the way that IBM has traditionally done in mainframe computers. In the electronic office marketplace, there will be many possible solutions, each of which addresses a variety of office functions and is integrated in such a way as to maximize the productivity of a

particular organization. Each of the trials proposed for Phase II is based on the competence and skills of a different group of Canadian companies.

Canadian industry will be the major recipient of benefits resulting from the implementation of Phase II. It is intended that new integrated office systems developed and tested in federal departments will lead to proven products for sale domestically and internationally. These will lead to the creation of employment opportunities in Canada and will reduce Canada's rapidly rising trade deficit.

Federal departments involved in the proposed field trials should benefit substantially through productivity improvements in their operations.

Government procurement will provide leverage for developing an industrial capability in Canada since this procurement typically represents as much as 25 to 30 per cent of the domestic market for information systems and equipment. Federal departments and Canadian industry are expected to make investments during Phase II at least equal to those of the OCS Program if the trials prove successful and a large scale operational phase is implemented.

The major benefit of the OCS Program is to provide Canadian industry and federal departments with the necessary experience in designing, planning, operating and assessing completely integrated electronic office systems.

Electronic office field trials

Four proposals for electronic office field trials have been received and given preliminary approval by DOC. The first three are for completely integrated systems; the fourth focuses on a specific function but can be expanded and developed into a larger integrated system.

The first field trial proposal was submitted by Bell-Northern Research and involves Bell Canada and Northern Telecom. It has three phases. Phase I lasting 12 months, is aimed at defining functional requirements for office automation systems for managerial, professional and clerical worker. During the second phase, the company would provide automated office support for between 50 and 100 users in two or three geographically separate sites. It would test office automation systems functions such as text messaging, file management, text and image processing, teleconferencing and access to public data bases. It proposes to use the Datapac packet-switching service, the iNET intelligent gateway, the Vista videotex system, the Envoy 100 public message service and the Displayphone (an executive workstation), all of which were developed and marketed by the Bell system.

In the third phase, the field trial would involve several hundred workstations in about 10 sites and a set of more advanced functions, such as decisional support, would be implemented.

The second field trial proposal was put forward by Office Communications Research Associates (OCRA), a consortium of Canadian companies offering a complementary package of office automation products, systems and services. The consortium includes Mitel, Nabu Manufacturing, Gandalf Data, CNCP Telecommunications, three cable companies, (Skyline Cablevision, Ottawa Cablevision and Télécâble Laurentian) and the Cable Telecommunications Research Institute. Membership is open to other Canadian companies.

The OCRA proposal details an office automation field trial consisting of four phases lasting three years. The proposal would use coaxial cable as the local broadband access network transmission system and the CNCP microwave network (and Telesat satellite facilities where necessary) for inter-city transmissions.

Phase I objectives are to select a field trial site, analyze user requirements and design the field trial system. The Phase II objective is to develop a field trial which would involve training, implementation of a limited system with off-the-shelf equipment and selection of measuring techniques.

Phase III would last 12 months and involve 100 to 200 workstations in sites distributed across Canada and involve further planning, training and development of hardware and software for office equipment and systems. Finally, Phase IV would be devoted to the full-scale field trial of up to 2,000 workstations for 18 months. It would involve the purchase and installation of advanced systems and services, operation of the office automation systems, performance evaluation, systems modification and assessment. A decision will then be made to proceed to a fully operational system.

A third proposal for support of a field trial has been submitted by Systemhouse Limited, a Canadian software and systems company. Systemhouse proposes development of an office automation system drawing on the company's strengths in software and systems and those of other leading suppliers of complementary systems and equipment such as AES Data; Mitel; Canstar, a division of Canada Wire and Cable; and Officesmiths.

The field trial focuses on office clerical, managerial and professional functions, activities and personnel. It plans to integrate special software applications in workstations with local access networks, data processing, and private and public communications.

Several other smaller industrial proposals are being considered. One of these is from Officesmiths Limited, an Ottawa-based software company, which proposes to develop "electronic filing

cabinet" and an automated business manuals management system.

The Officesmiths proposal addresses the office activities dealing with the design, production and distribution of policy and procedural documentation common to every organization. The proposal would provide a set of consulting services, procedural tools and software to make this information readily available throughout the organization. A considerable economic benefit may be achieved with this approach since office manuals are so ubiquitous and activities associated with them are so labor-intensive.

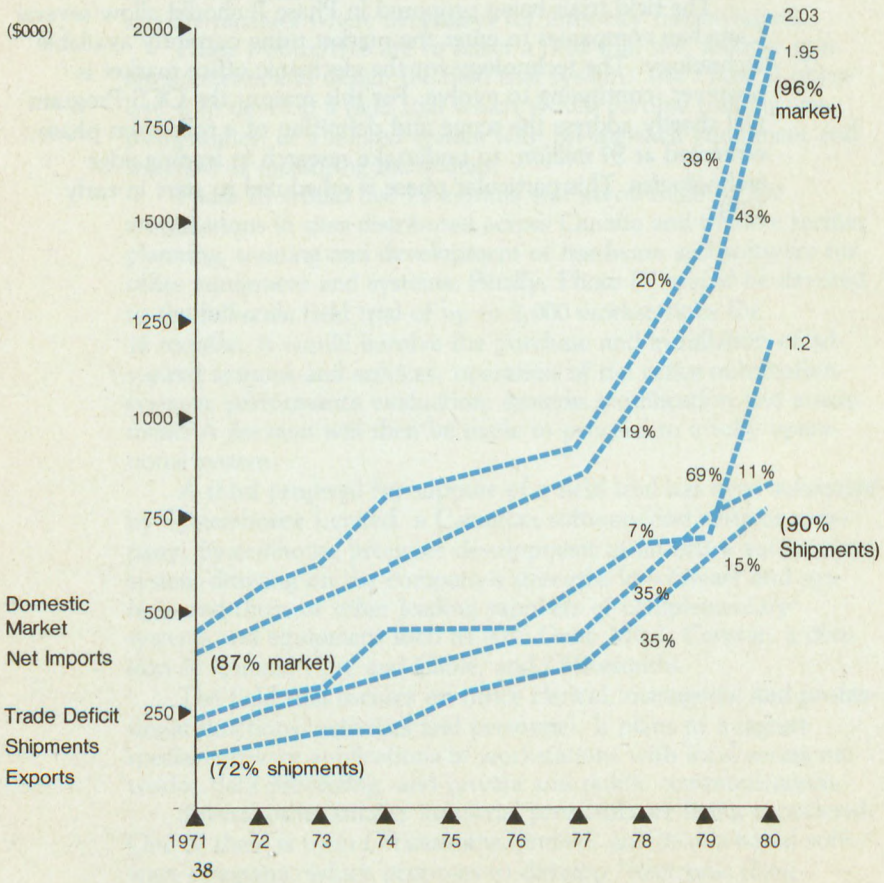
A field trial of advanced electronic office systems to meet the office automation requirements of senior managers has been proposed for the Department of Communications. The field trial will involve development of office automation tools for professional and executive personnel. It will address budgeting, management of correspondence, messaging and communications activities in the department and its regional offices.

The field trials being proposed in Phase II should allow several Canadian companies to enter the market using currently available technology. The technology for the electronic office market is, however, continuing to evolve. For this reason, the OCS Program will shortly address the scope and definition of a follow-on phase, estimated at $9 million, to undertake research in leading edge technologies. This particular phase is scheduled to start in early 1983.

Appendix A

The Computer and Office Equipment Industry in Canada (1971-1981)

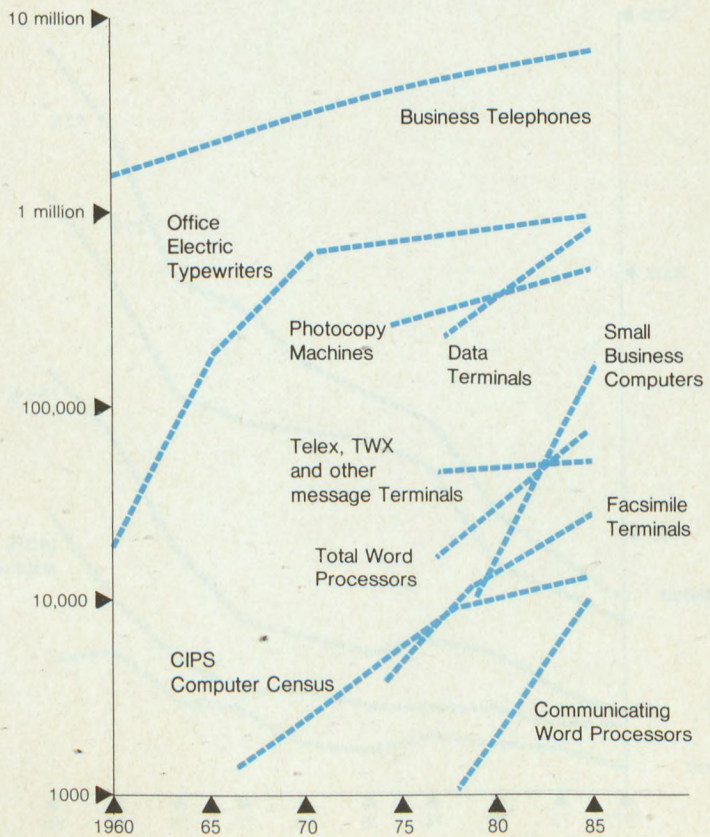
Source: Statistics Canada and Industry Trade and Commerce



Appendix B

The Office Automation Market in Canada
Installed base and forecast to 1985

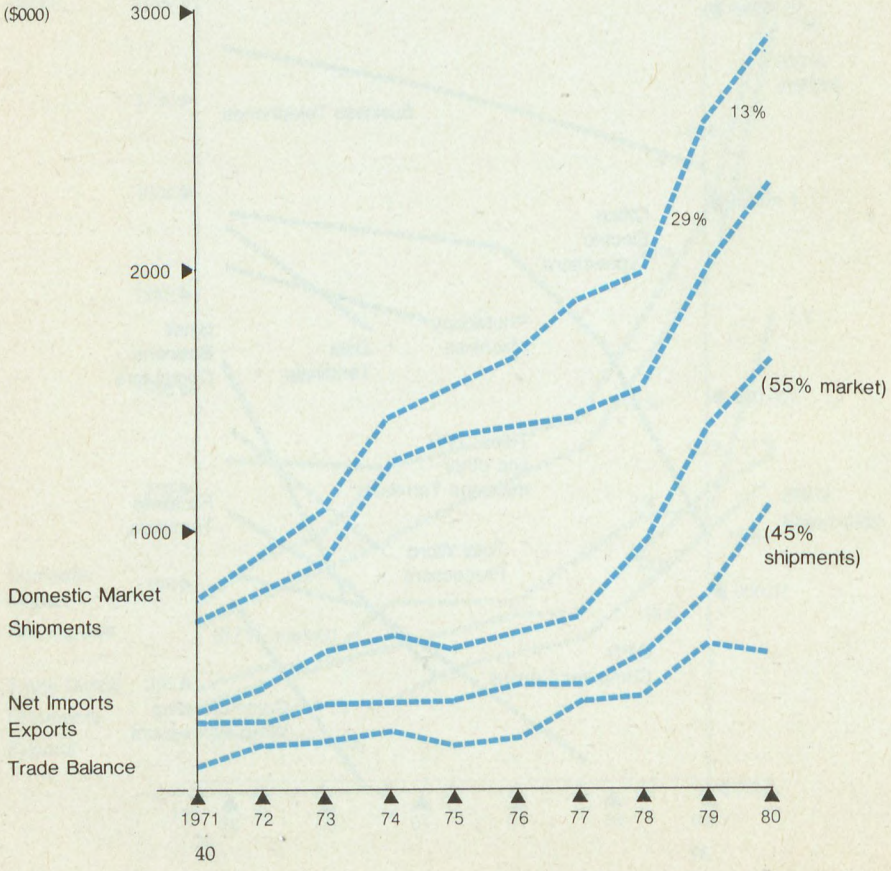
Source: Department of Communications Study



Appendix C

The Communications Equipment and Components Industry in Canada 1971-1980

Source: Statistics Canada and Industry Trade and Commerce



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