Trends in National Policies

for

Automatic Data Processing

CANADA

A report prepared for

Data for Development

by

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This report presents the views of the authors and does not necessarily reflect those of the Canada Department of Communications, nor those of any other Government Department or Agency.

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PART I: THE PRESENT SITUATION

1. The Growth of ADP in Canada

1.1 User costs

Quantitative measurements of ADP activities and of discernible trends are essential as a basis for the formulation of national policies related to the new "information society", and as a basis for assessing the effectiveness of past decisions and actions. However, the field is too new and developments too rapid for governments to have yet developed official statistical information on many of the necessary aspects.

In Canada, the first estimates of the broad range of ADP activities were provided in the report of the Canadian Computer/Communications Task Force, "Branching Out", published in 1972[1]*. At that time the principal source of information was the annual Computer Census[2] published by the Canadian Information Processing Society (CIPS), supplemented by surveys and interviews conducted by the Task Force. Subsequently, there has been a steady improvement in the availability of statistical information. Statistics Canada now publishes an annual report on the "Computer Service Industry"[3], which has improved steadily since the first issue (for 1972). Treasury Board initiated an annual "Review of EDP in the Government of Canada" in 1974[4]. R.W. Evans Associates publish useful statistical information in their "EDP In-depth Reports"[5], and trade journals, such as Canadian Datasystems, also provide useful information. The CIPS computer census continues on an annual basis and their Salary Survey[6] now provides useful information on employment.

* The figures in brackets refer to the list of references given at the end of this report.

These sources of information are incomplete and not always compatible, and there were growing pressures to update the estimates and projections of the Task Force, as it was clear that actual developments had departed in some respects from the forecast path. At the end of 1976 new estimates were released in a report prepared by the Computer/Communications Secretariat[7]. In that report a "model" was presented in which "users" were the key element, being serviced by three supply modules - the equipment suppliers", the "data transmission suppliers", and the "computing service suppliers". The interrelationships among these four elements were developed and estimates made of costs and revenues from published statistical data. The model required internal consistency in the assumptions made, and enforced a degree of discipline not required for independent estimates of individual elements in the model.

During the past year the work was extended to cover imports of services and a revised report was released in March 1978[8]. Users are still the key element in the model but a difference in user spending patterns associated with the use of imported computing services is recognized and computer service "imports" become a fourth "supplier" module (see Fig. 1).

Table 1 gives the estimates and projections of Canadian use of ADP goods and services for 1965, 1970, 1975, 1980 and 1985. Costs to Canadian users increased five-fold in the first five-year period and approximately doubled in each subsequent five-year period. The bulk of these costs are incurred by in-house producers of data services to acquire and maintain the staff, equipment, supplies, accommodation, data transmission and other components necessary to produce the required services. Estimates of this in-house share of services production indicate a steady decline, from 87% in 1965 to 81% in 1975, and 69% in 1985 (see Fig. 2).

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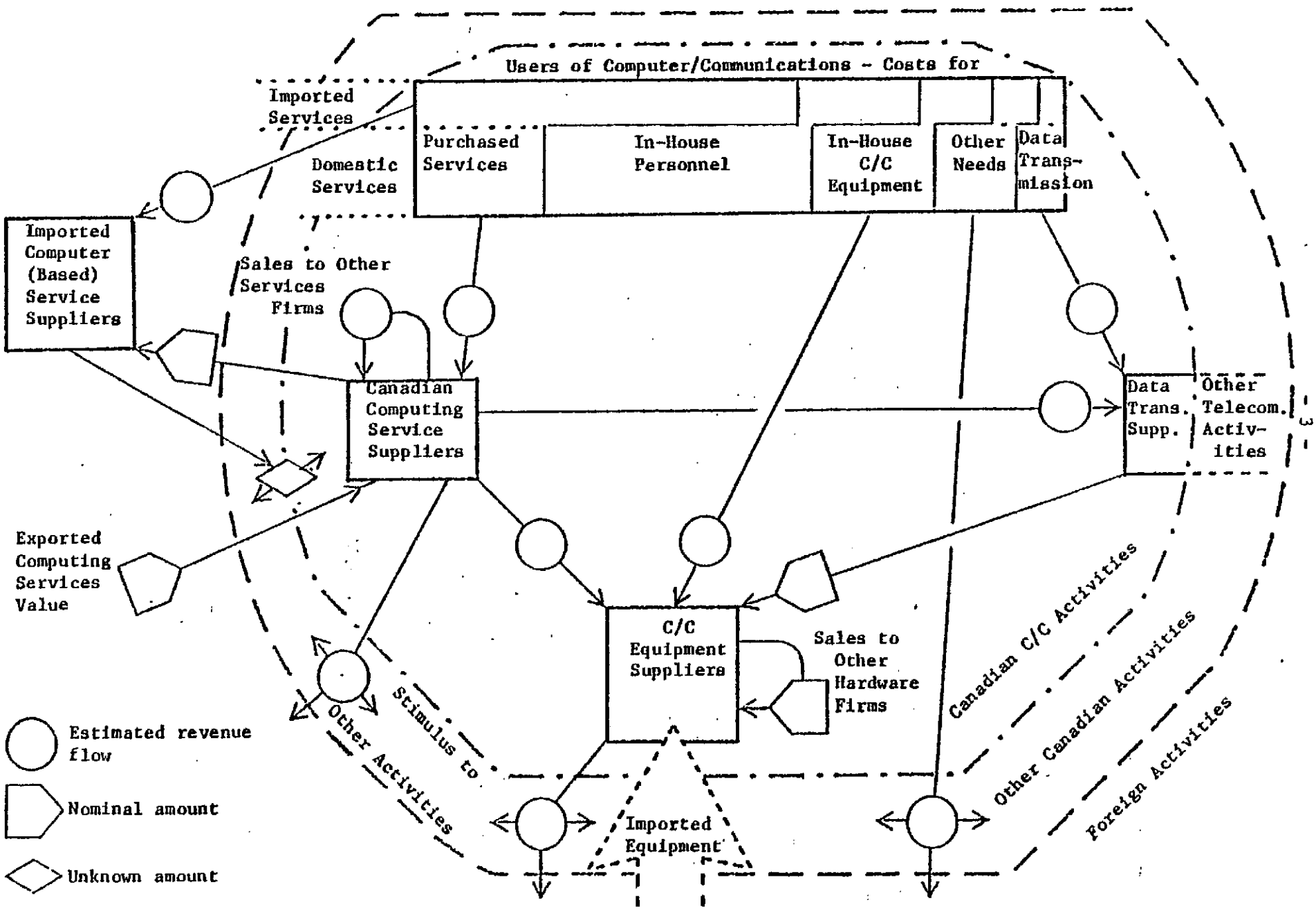
FIG. 1

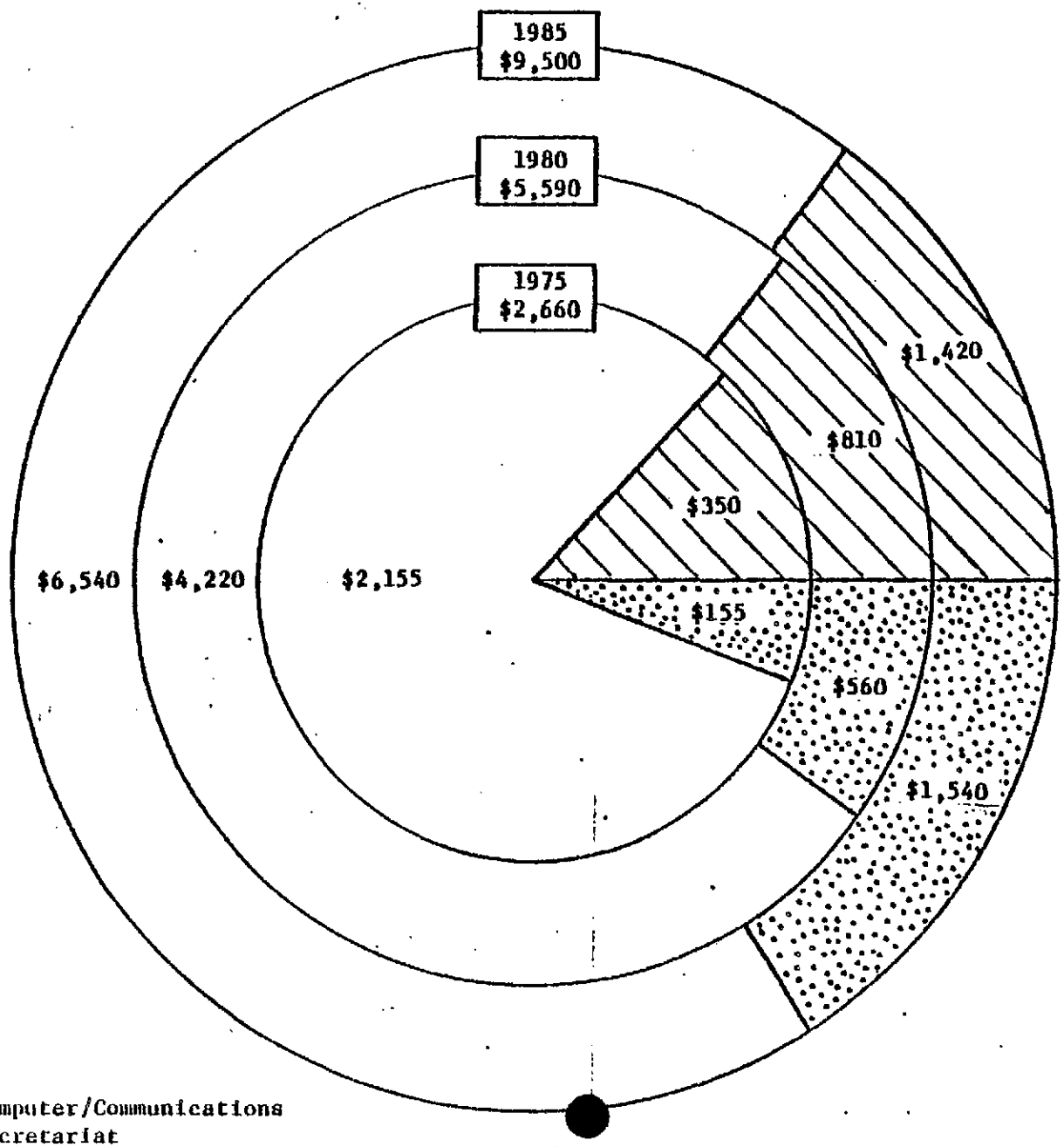
AN EXTENDED MODEL OF ADP ACTIVITIES IN CANADA



SOURCE: Computer/Communications Secretariat

FIG. 2

PROJECTED SUPPLIERS OF CANADA'S COMPUTING NEEDS
(Values in C $'000,000)



SOURCE: Computer/Communications Secretariat

A higher rate of increase is suggested for computer service revenues in the fifteen-year period 1970-1985, with more than a ten-fold increase from $150 million in 1970 to $1.6 billion in 1985. However, the main reason for the projected decline in the in-house share of services production is the rapid increase now foreseen in imports of services. Estimates show a very gradual increase in imports up to about 1973, probably because of the limited capability and high cost of data communications. By 1973 these constraints were less severe and a more rapid increase appears to have set in. For the fifteen-year period trends indicate a more than twenty-fold increase from $70 million in 1970 to $1.5 billion in 1985. Expressed as a percentage of the services obtained by users from other than in-house facilities, these imports are estimated as 33%, 35%, 30%, 41% and 52% for the five years recorded in Table 1. It must be emphasized that these estimates are based on limited data and that improved information is necessary.

Most of these imports of services into Canada are by Canadian subsidiaries from headquarters of multinational corporations.

It does not appear likely that Canada will be able to offset the increase in imports by greater export of services from Canada: what little evidence is available suggests that even by 1985 annual exports will be no greater than $60 million.

1.2 Computers installed in Canada

The first computer was installed in Canada in 1950. In 1965 the CIPS computer census identified only 710 computers. Since that time there has been a rapid increase in the number of computers installed. This is reflected in Table 2 which shows a breakdown of the total number into four size categories based on monthly rental value. The table also shows the estimated value of installed computers in each of these categories.

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It will be noted that in 1970 the medium size category accounted for well over half of the total value of computers installed. Now it accounts for well under one-half and is still declining. The rapid increase in the number of small computers, and even more rapid increase in the number of very small computers, is shown in the table. This latter increase is such that by 1985 the total value of very small computers will be about equal to that of the medium computers.

1.3 Employment in ADP

In its work last year, the Computer/Communications Secretariat extended its attention to employment in ADP[8]. Two methods of estimation were used: one based on the personnel costs derived from the Secretariat's model; and the other based on the number of employees reported to the CIPS Salary Survey. The estimates were in close agreement and the average of the two approaches is given here. Account was taken only of those directly involved in the production and sale of computing services - in user organizations and in the computer services industry. Those employed in the supply of hardware and in the provision of data transmission services were not included.

Total ADP employment in Canada, as defined here, has not grown as rapidly as total costs to users because of the use of less manpower-intensive computing techniques and the increase in use of utility programs and purchased software and services. Employment was estimated to be about 25,000 in 1965, 68,000 in 1970 and 96,000 in 1975, growing to about 134,000 by 1980 and 169,000 by 1985. These figures represent an increase of just over 2½ times in the first five-year period compared with a five-fold increase in total user costs, and increases of about 41%, 40% and 26% respectively in the last three five-year periods, compared with the approximate 100% increase in total costs in each of these three periods (cf. Tables 1 and 3).

In looking at the effects of increasing imports of computing services on ADP employment, estimates indicate that the number of jobs created abroad (rather than in Canada) to meet Canadian requirements

amounted to about 4,400 by 1975 - about 4½% of the ADP jobs in Canada at that time. The increase expected is to some 11,000 by 1980 (about 8% of the Canadian jobs) and to about 23,000 by 1985 (about 14%).

1.4 Summary Comparisons

The above sections have given quantitative information on the dynamic nature of trends and developments in Canadian use of ADP. To permit comparisons with developments in other countries, it may be useful to relate these figures to some of the more traditional measures, such as population and Gross National Product (GNP). The information used for these comparisons is given in Table 4; the comparisons appear in Table 5.

The first two lines of Table 5 relate number of computers to population, first in terms of total number of computers per million Canadians and second, in terms of those computers renting for more than $1,000 per month. A more meaningful relationship is the value of installed computers per capita, which shows that annual increases from 1975 to 1976 and from 1976 to 1977 almost equal the total per capita investment in computers in 1965. This does not reflect inflation: the dollar bought about ten times more computing power in 1975 than in 1965.

User costs for ADP requirements reached almost 1.8% of GNP in 1977. This was about the same proportion accounted for by the total revenue of the telecommunications carriers two years earlier (in 1975). It seems likely that the more rapid growth in ADP costs will make them equal to carrier revenues by 1980.

As pointed out above, ADP employment is not increasing as rapidly as total ADP costs. It is therefore not surprising that the ratio of ADP employment to total employment has not increased as rapidly as the ratio of user costs to GNP (line 4 of the table).

The next two lines of the table compare growth of Federal Government use of ADP with growth of national use, in terms of costs and employment. It is clear from the figures that in 1965 the Federal Government was relatively more involved in computing (in terms of costs and employment) than it now is in comparison with the private sector. The lower figures in 1970 are indicative of a spurt of "catching-up" by the private sector in the sixties. They mask, however, a rapid growth period for the Federal Government from the late sixties to 1973, when federal ADP cost to total user cost reached 10.3% and federal ADP employment to total ADP employment reached 9.0%. The ratios have declined since that time.

Federal ADP costs equalled about 1% of all goods and services purchased by the Federal Government in 1965 and have now climbed to almost 3%. Federal ADP employment has increased from 1.8% of total federal employment in 1970 to about 2½% today.

2. Components of Total Use of ADP in Canada

2.1 Penetration of ADP in different sectors of the economy

Information on the penetration of ADP in the Federal Government is given by the annual "Review of EDP in the Government of Canada"(4). From the late sixties until 1973 total ADP costs in the Federal Government appear to have increased more rapidly than user costs in general. Since that time, the rate of increase has been slightly below the national average. Total ADP costs to the Federal Government are given in Table 4 (line 6) for fiscal years (April-March) 1965-66, 1970-71, 1975-76, and the two succeeding years. ADP costs in the current fiscal year (1978-79) are projected to be $348 million. Table 5 (line 5) gives the ratio of these costs to total user costs in Canada.

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There are no comparable figures for other sectors of the economy. During 1977 the Informatics Institute of Canada, in conjunction with the Computer/Communications Secretariat, undertook a survey of the Canadian information processing community, which has produced some estimates of ADP costs in different sectors of the economy. The survey was designed to examine future demands up to 1985 and the potential barriers that must be overcome to meet those demands. Some 111 organizations responded to the lengthy and complex questionnaire.

The data collected were summarized and tabulated in a release early this year[9]. That report provided no analysis or interpretation of the data. A subsequent report[10] (dated 28 April 1978) analyzed data in six of the tables and a summary of those results is presented here. Projections to 1985 were not given. The growth rates derived in the analysis were linked to data in the Secretariat model, the Treasury Board EDP reports and the CIPS census, which also provides a table of the number of computers in different industry segments. Some caution should be exercised in accepting the results of the analysis without further corroborative evidence, particularly at the sector level, as the number of respondents in some sector categories is low.

Table 6 shows estimates of annual costs of equipment by industry category for the years 1970, 1975 and 1980, together with estimates of the average annual compound growth rate for the two five-year periods. The 1970 and 1975 total costs were taken from the Secretariat's model. Because the sample analysis yielded a similar growth rate to that derived from the model, the 1980 totals are in close correspondence.

In the period 1970-75, equipment expenditures of the federal and provincial governments showed the highest annual growth rates, averaging about 24%. Much lower growth rates are expected in the current five-year period to 1980. Two-thirds of the respondents

from the Federal Government predicted that increases in equipment costs will be kept below 10%; a similar proportion of respondents from provincial/municipal governments predicted growth of less than 15%.

One of the more interesting aspects of this analysis is the relatively low increase in the Manufacturing sector. In 1970 Manufacturing ranked first in equipment costs among all private industry sectors. By 1975 that lead had been reduced and it is predicted that by 1980, equipment costs in this sector will no longer be in first place. The Financial Services sector has shown, and is continuing to show, the largest absolute increase in installation of equipment, although the reduction in growth rate (from 18% to 14%), suggests that the period of peak growth has passed.

Figures for personnel costs for 1975 and 1980, together with estimated growth rates are shown in Table 7. The differences between these estimates and estimates produced by the Secretariat model may be due to the fact that survey responses reflect the budgets of existing ADP organizations and do not include ADP staff in other branches of a corporation, nor do they make allowance for establishment of new ADP organizations after 1975.

Again, it will be noticed that the largest absolute increase in personnel costs arises in the Financial Services sector. The increase in personnel in the Manufacturing sector is somewhat at variance with forecasts of growth in equipment costs, and suggests some caution in placing too great a reliance on the estimates.

A consideration of the penetration of ADP into different sectors of the economy would be incomplete without some estimate of the use of data transmission facilities and services. Table 8 gives estimates of costs for the different industry sectors. The annual average rate of increase of 18% is somewhat lower than the increase of 21.5% predicted in the Secretariat model, for reasons similar to those affecting Table 7. However, it is expected that comparisons among the different sectors should remain valid.

2.2 The pattern of demand for ADP services

The pattern of demand for ADP services has been changing over the years. In Canada, information on the types of use in the Federal Government is published in the annual Treasury Board report[4] and information on the types of services sold by the computer services industry is published by Statistics Canada[3]. The distributions and rates of change indicated by these two sources show some important differences, as indicated in the first part of Table 9.

Estimates of total user demand in 1975 were derived from an average of the Treasury Board and Statistics Canada distributions[8]. To extrapolate these estimates to other years, the trends shown by the Treasury Board series were used, with some modifications to achieve the usual "S-type" curve. The resulting user demand distribution estimates appear in the second section of Table 9. The Statistics Canada series was used to forecast the changes in the Canadian commercial market for computing services, which are shown in the third part of the table.

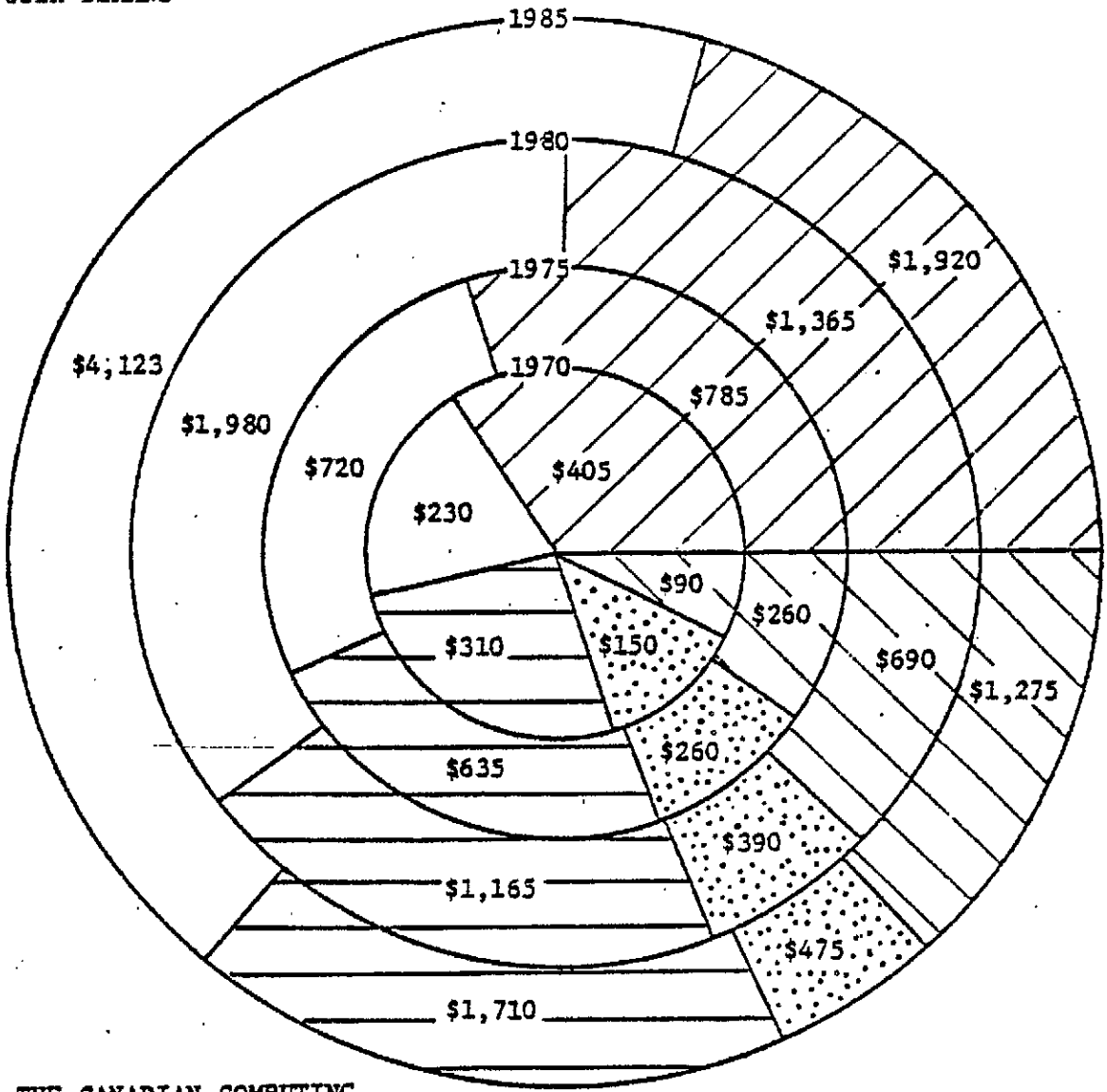
These estimates of user demand and of the computing services market are illustrated in Fig. 3, which also indicates the relative size of the two totals. If we compare the values of these two sets of estimates and forecasts, some interesting possible trends emerge. The Canadian commercial share of user needs for over-the-counter service appears to have been declining since 1970. This is coupled with a steady and continuing increase in the share of user needs for data conversion and for systems and programming obtained from the commercial market. There also appears to have been a steady increase in the share of user needs for remote computing provided by commercial suppliers but this is expected to taper off after 1980.

FIG. 3

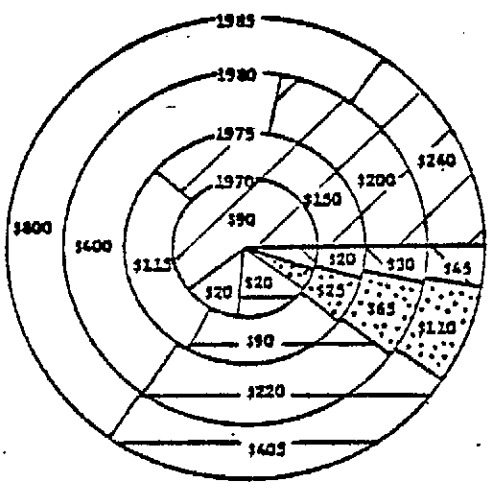
GROWTH AND DISTRIBUTION OF USER DEMAND AND THE CANADIAN COMPUTING SERVICE MARKET, 1970-1985

(Values in C $'000,000)

A. USER DEMAND



B. THE CANADIAN COMPUTING SERVICE MARKET



Batch, over-the-counter

Remote computing

Software and programming

Data conversion

All other services

SOURCE: Computer/Communications Secretariat

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These forecasts, based as they are on fragmented and incomplete information, should be treated with some caution. Perhaps the major point to emphasize is that estimates of commercial supply do not adequately reflect user demand for the different types of services. This is not surprising, for users will provide internally those services which they can most readily supply and will be selective in the types of services they purchase. This analysis illustrates the dangers of relying on estimates of supply as a basis for estimating or forecasting user demand.

3. Organizational Structures

In Canada, policy requirements related to ADP have been considered from three perspectives: acquisition and use of computers within the Federal Government; broad national implications of the use of computers and data communications; and aspects related to personal privacy. Each has been dealt with in a relatively independent manner but some recognition was given to interrelationships among the issues and cross-impacts of possible approaches for dealing with them.

In considering requirements in Canada, it is necessary to recognize that in some areas (privacy, for example), there is a complex mixture of federal and provincial jurisdiction. Some provincial governments have developed their own approaches for dealing with issues that fall within their areas of jurisdiction. While these fragmented approaches might lead to incompatibilities and confusion, there have so far been no major divergencies.

3.1 Government

3.1.1 Acquisition and use of computers within the Federal Government

Many government departments have their own in-house computer systems. The Treasury Board Secretariat controls the allocation of funds for all government spending, including the purchase of ADP

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equipment and services. The Department of Supply and Services provides a procurement service for departments and all major purchases are made through this Department. The Government Telecommunications Agency of the Department of Communications provides a similar service in regard to the provision of data (and other) communications services and facilities for Government use.

The development of Federal Government policy related to the acquisition of ADP goods and services is outlined in Part II (section 3.2.1). It has evolved steadily away from primary concern with the acquisition of equipment towards concern with the effective planning for and use of ADP resources. Government policies in this area have generally been implemented effectively: there is now a cohesive policy framework, greater coordination has been achieved, and senior management has become involved in the EDP planning and evaluation process. The central role of the Treasury Board's Information Systems Division in developing and monitoring federal ADP policy and activities in this area is paralleled in several provincial governments.

3.1.2 National policies

Responsibilities for implementation of policies related to ADP and the use of data communications at the national level devolve on a number of different departments: for example, Finance is responsible for implementing taxation changes and fiscal policy in general; Communications for policies related to the provision of data communications; Industry, Trade and Commerce for policies related to manufacturing; Consumer and Corporate Affairs for legal protection of software and data banks; etc.

From 1973 to 1978 the Federal Government maintained an Interdepartmental Committee for Computer/Communications Program and Policy Coordination, with a small supporting secretariat (the Computer/Communications Secretariat), to achieve compatibility in the actions of

the various government departments and agencies. An ad hoc committee now meets periodically to review issues in this field while alternative arrangements are under consideration. Further detail on the development of national policies will be found in Part II, especially section 3.1.1.

3.1.3 Provincial governments

Provincial Governments are also responding to developments in ADP. In the area of Government use of computing, provinces have developed their own approaches and policies. In order to provide a vehicle for exchange of experiences and to cut down on work duplication an Association of Canadian Informatics in Government was established about two years ago. Its formation followed two years of informal discussions and exchanges and it includes federal as well as provincial representation. It meets periodically to discuss problems of mutual interest and concern.

In the broader area of provincial ADP policies, the most wide-ranging approach was taken by Quebec in its "Dimensions d'une politique de téléinformatique pour le Québec"(11). The provincial Department of Communications is taking a lead role in this area.

However, the heaviest use of computers is by Ontario. It is estimated that the 1977 annual cost of ADP services to the provincial government was about $80 million. Most of this is for six major applications, including an integrated payroll, personnel and benefit system (IPPEBS), a hospital billing system, and a personal property security registration (PPSR). The general policies governing use of computers are given in Volume I of the Manual of Administration of the Government of Ontario (cf. sections 45.2, 50.5, 55.2 and 55.5)(12).

Newfoundland has released the report(13) of a provincial Task Force which prepared proposals to meet the province's objectives related to computer use. This report concentrates on pragmatic operational-type issues. Nova Scotia has prepared a number of reports

dealing with different aspects but has not released a comprehensive report. The Science Council of Saskatchewan is in the process of examining the broad issues in this area. Other provinces have not allocated resources to an investigation of these broader issues.

3.2 Legal aspects

3.2.1 Privacy

At a very early stage in the work of the Canadian Computer/Communications Task Force, the issue of privacy was split off as a subject for separate study. The report[14] of this separate investigation, "Privacy and Computers", was published late in 1972. It dealt primarily with questions arising from the storage of personal information in Federal Government data banks.

The results of subsequent work were incorporated into the Canadian Human Rights Act[15], passed by Parliament last year. Section IV of that Act is devoted to "Protection of personal information" and provides for access by individuals to information about them stored by the Federal Government and for making corrections where necessary. Certain data banks (e.g. those related to security and law enforcement) are not included under the Act. The Act establishes a Privacy Commissioner to deal with complaints, such as wrongful disclosure of information, or inability by an individual to access information on himself.

Nova Scotia earlier this year passed similar legislation. Three other provinces have Privacy Acts but these are concerned with the physical aspects of privacy and phone-tapping and do not deal with privacy of information.

Recently there has been a growing concern, now being reflected in the press, about the use of the Social Insurance Number (SIN) to link personal records. Other than this, there is no strong evidence that

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Canadians regard privacy of information as one of their major ADP concerns. Of definite concern are impacts of computerization on employment, errors perpetrated by computers, depersonalization of computer systems, and fair information reporting.

3.2.2 Other legal aspects

There is a great deal of legislation, federal and provincial, requiring the maintenance of books of account and other records in Canada. It is not clear whether computer print-outs received in Canada from foreign locations, where the actual records are stored and processed, are sufficient in all cases as a method of compliance with these "in Canada" record storage requirements.

Certain Acts, relating to the issue of a permit or a licence, permit the responsible Minister to institute limitations or constraints that could relate to ADP activities. This has been done, for example, in regard to seismic data processing for the retention of an exploration permit. In this case, expenses incurred for data processing outside Canada are not allowable in meeting the minimum expenditure requirement for land development.

A number of provinces have statutes controlling the activities of credit reporting agencies. Some of these relate to the storage of information and to the accuracy of information reported by the agencies.

3.3 The computer industry in Canada

Canada does not have its own domestic computer mainframe manufacturing industry, although Control Data has established a manufacturing plant for its Cyber line of computers. IBM has assembly plants in Toronto and Sorel, Quebec, as well as a development laboratory in Toronto. The policy of the Federal Government places particular

emphasis on rationalization, and multi-national computer firms are expected to aim towards balancing their imports of computers (and other goods) with exports of equipment that they manufacture in Canada.

However, there is more to the "computer industry" than manufacture of equipment. The Government's Green Paper on Computer/Communications Policy[16], for example, stated explicitly that "government procurement policies ... will emphasize stimulation of the Canadian computer and communications industries, and particularly the Canadian-controlled computer-service industry". This has also been reflected in the Treasury Board's statement of policy for ADP in the Government of Canada[17]. In addition, there is considerable production of software in Canada: most of it written by companies for their own use. Although software costs are an increasing proportion of total costs (see Fig. 3) there are no data on the relative amounts spent on software produced in Canada and on that that is imported.

3.4 Other influences on government policies

The Law Reform Commission of Canada has written a report[18] on electronic funds transfer highlighting some of the legal questions raised by these developments. The Government of Ontario has established two Royal Commissions relating to privacy: one on the "Freedom of Information and Individual Privacy", and the other on the "Confidentiality of Health Records".

The Institute for Research in Public Policy (Montreal) has recently initiated several policy studies on computers and their implications. Two reports - "The Electronic Briefcase" and "Computers in the Home" - are to be published in 1978. It is also involved in a consideration of transborder data flows, and a study of the effects of computerization on employment is underway.

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A number of industry associations, as well as the Consumers Association of Canada, have discussed with Government officials their own views and concerns, resulting, at times, in modifications to Government approaches.

Professional associations, such as the Canadian Information Processing Society (CIPS), have been slow to devote attention to national policy issues, but recently articles in the CIPS Review[19] have discussed a number of issues and there is evidence of growing interest.

With the possible exception of privacy, the mass media have shown little interest in these issues but the trade press, particularly Canadian Datasystems, has given some coverage to national issues.

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PART II: CURRENT TRENDS AND CHANGES UNDERWAY

1. Changes Underway in Computer Applications

1.1 New techniques

The computer industry has been characterized by fierce competition and rapid innovation. Computers have increased dramatically in capability, while decreasing in physical size and cost. The merging of computer technology with telecommunications technology has only been apparent for little over 10 years, and it is only in the present decade that major developments have occurred in the data communications market place.

Canada was the first country to introduce a public digital data network. These services were announced in 1973, and resulted in significant reductions in costs to many users for long-distance slow speed transmission. More recently, the Canadian telecommunications carriers have introduced packet switched services that are expected to reduce user costs over a wide range of requirements. Digital transmission is likely to become the principal transmission technique for voice and other analogue signals as well as for data traffic.

Canada has also been in the forefront in the use of satellite technology, being the first country to have a geostationary domestic communications satellite. It is expected that recent arrangements for closer cooperation between Canada's Telesat Corporation and the telephone companies will lead to integrated planning for improved data (and other) communications services. The use of low-cost roof-top antennae will provide greater flexibility in the use of satellite technology, but will also introduce complications into the regulatory framework for communications.

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Fibre-optics, with their enormous capacity and their ability to virtually eliminate noise and interference, coupled with low costs and the low error rates of digital technology, will provide the communications pipeline of the future. Plans have been developed for a field trial with 150 households in a rural community in Manitoba.

These rapid technological developments are putting increasing pressure on standards organizations. International agreement on X.25 (access protocols for public data networks) was achieved in record time in the ITU (International Telecommunications Union). Closer working arrangements have now been established between the ITU and the ISO (International Organization for Standardization), to achieve greater compatibility between communications standards and computer standards.

1.2 Developments in particular areas

1.2.1 Electronic funds transfer

Branching Out (Vol. II) reviewed developments at that time (1971) in the use of computers and communications for the provision of financial and financially related services. The Green Paper on Computer/Communications Policy stated the Government's concern to ensure "the continuing development of an efficient and equitable payments system". A working group was subsequently established under the aegis of the interdepartmental committee and recommendations were developed for government consideration.

In January 1975, the Government issued a report entitled "Towards an Electronic Payments System"[20], outlining its approach to developments in this area. It emphasized the need for a "common user communications network", the need to develop appropriate payments system and communications interface standards, and the need to safeguard the

rights of individuals and users and suppliers of the payments system. A private sector committee was subsequently established to consider and make recommendations on standards requirements. About the same time that the Government published its report on the electronic payments system, the Canadian Law Reform Commission released a report on "The Canadian Payments System and the Computer: Issues for Law Reform"(18). This report provides a comprehensive review of the subject and indicates areas where legislative changes may be necessary, particularly in regard to social responsibilities.

In August 1976, the Government issued its White Paper on the revision to the Bank Act(21), a process undertaken every ten years. This took into account the earlier position paper on the evolving electronic payments system, and the proposals have been carried forward into the current Bill before Parliament.

Canada has five major federally chartered banks: all have developed effective computer systems for their operations, with bank tellers having easy access to computer terminals. In addition, automatic "cash dispensers" are becoming increasingly common. The use of bank credit cards, such as Visa or Master Charge, provide for greater flexibility in meeting user requirements for cash and credit. Effective methods for clearing payments between banks have evolved.

These developments in government policy, the expanding use of computers and communications in the banks and the "near-banks", and consumer acceptance of the changes that have already taken place have established a firm foundation for further developments in this area.

1.2.2 Personal computers

The reductions in cost and physical size of computers have created a small but expanding market for personal microcomputers which can now be purchased off the shelf for a few hundred dollars. Certain applications of general purpose or specialized microcomputers, such as

video games attached to the home television, are already gaining widespread popularity.

The potential for home computers is very much greater, and includes terminals for shopping and directory services, educational use, electronic mail, meter reading, and monitoring to detect the presence of hazards. Which of these applications actually come to be implemented depends on a complex interplay of economic, legal, political and social factors, not least of which is consumer acceptance. Beginnings are being made in giving attention to the many related issues, and to the possible consequences of computers becoming common household consumer products. Some of the problems are discussed later in section 1.4.

1.2.3 Public access to data banks

Data base services are receiving a boost from the recent introduction of packet-switching techniques, and from developments in storage technology and retrieval software. There are now some half dozen commercial on-line data base distributors in Canada. They cover a wide range of information dealing with a variety of subject matter including business and management, pollution, energy, agriculture, engineering, education, and more. Subscribers in Canada are using these services at a rate of about 20,000 connect hours per year and there has been a doubling every year for the past three years. There has so far been little penetration of the consumer market, but this is expected to change as access is made simpler and costs of terminals are reduced further.

In August 1978, the Minister of Communications announced the development of a new two-way TV system, Videotex, at the Communications Research Centre of the Federal Department of Communications[22]. In addition to retrieving information stored in various computer

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data bases for display on modified home TV receivers or business video terminals, users would be able to transmit information to each other, through direct terminal-to-terminal interaction, as well as to a central data bank.

The system is similar to Prestel (Viewdata) in the United Kingdom, or Titan (Antiope) in France. But the Canadian system offers a higher resolution of images, greater flexibility, and compatibility of data bases with different terminals. Public interest in videotex, as evidenced by recent newspaper articles, is increasing, and preparations on the part of the carriers appears to be mounting. Field trials are expected to start in 1979, and the cost of Videotex modules is expected to fall to within reach of the mass market within the next four or five years.

1.2.4 Office automation

An area of major growth is the automation of many office functions. These include the preparation, transmission, processing and storage of correspondence, purchase orders, invoices and statements by electronic means (i.e. word processing and electronic mail); funds transfer and credit transactions directly through the electronic payments system; and the storage and retrieval of information through data bank systems (filing and registry office functions). It has been suggested that the potential market for these applications may well equal the value of all of today's business data processing applications. It is expected that Canadians will spend as much on word processing equipment this year as on "stand alone" typewriters - a point reached in the U.S. about three years ago. It is expected that in the early eighties expenditures on typewriters will be less than a quarter of those for word processing equipment.

Facsimile printers rent for under $200 per month, and a new portable machine renting for only $62 p.m. was recently announced. Most offices are expected to have one or more facsimile printers

installed in the next few years. Developments in this area will have considerable impact on the physical transportation of mail and on such services as Telex and TWX.

1.2.5 Computer transactions and support in direct dealings with consumers

One of the world's first commercial on-line real-time systems was developed in the early sixties by Trans-Canada Airlines (now Air Canada) for its reservation system. Reservation clerks at all major airports and at downtown centres have direct access to terminals hooked into the system. Links are provided to SITA, for direct reservations on other airlines. Some hotels provide a computerized reservation system for booking guests into affiliated establishments. Canadian banks are heavily computerized with easy access to computer terminals by bank tellers, and some branches have automatic cash dispensers. Most of the larger department stores have installed point of sales terminals for ease of credit checking and inventory control.

One supermarket has experimented with automated check-out counters. The system uses the "Universal Product Code" now found on much of the merchandise. It was expected that costs would be reduced through faster processing at the check-out and through the avoidance of price-marking on the products sold. While many customers appear to appreciate the faster service, consumer organizations have expressed concern about the potential abuses that might occur, and its use is not yet spreading.

Perhaps the best example of computerized transactions is a service recently introduced by one large department store in the Toronto area. The customer uses his home telephone to make direct contact with a computer, which uses voice answer-back to give instructions for providing the necessary information on the articles to be purchased. The touch-tone

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telephone is used for entering the necessary information on the purchase. The customer may choose to have his account debited directly or have the merchandise delivered C.O.D., and can give (limited) instructions to the computer regarding delivery. If problems arise which cannot be resolved by the computer, the customer may choose to be phoned later by a live operator.

1.2.6 Computers in education

Heavy use is made of computers in Canadian universities, perhaps largely as a result of early support provided by the National Research Council (NRC) to universities for the acquisition of computing facilities. Courses in computer science are provided by all universities, and computers feature in many courses in other disciplines where they can be used as an operational or research tool. Enrolment in computer-related courses has been steadily increasing, and this year (1978) the University of Toronto has experienced a further dramatic increase (possibly up by a factor of two from last year).

A number of high schools also provide courses in computer programming, sometimes through terminals to the computer used by the local Board of Education.

The use of computer-aided learning (CAL) is spreading. In 1969 the NRC initiated a joint research and development programme in CAL in cooperation with Canadian educational institutions and industry. Educators develop course materials and evaluate the system while technologists at NRC and in industry concentrate on system hardware and software development. Functional specifications for a course-author language have been prepared, resulting in the development of NATAL-74 which is now operational in prototype form.

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As part of the programme, significant work in the development of CAL materials has been carried out at the Ontario Institute for Studies in Education (OISE) and at the University of Alberta. For example, well over a thousand students have taken the CAL-provided cardiology course during its seven years of operation at the University in Calgary. Seneca College, in Toronto, has participated in the CAL programme since its early days and makes heavy use of CAL techniques. Other universities and colleges across Canada are now becoming more active in this work[23]. It is also reported[23] that CAL is being extended to school systems in the Toronto and Calgary areas. But costs are still high, and it is unlikely that its use will spread rapidly.

1.3 New classes of user

No concerted effort has been made in Canada to study the characteristics and requirements of new classes of user.

The penetration of computer use into large businesses is virtually 100%, and most companies with annual revenues over $5 million use computers. Most of the very large companies have their own in-house installations, but use computers in service bureaus or affiliated companies for special requirements. However, even with companies having revenues in excess of $200 million, estimates suggest that almost 15% do not have their own computers (see Table 10A). In some cases use is made of outside services if requirements are low. But a number of large users with large requirements also make use of service bureaus for most of their ADP needs.

Out of 33 large leading-edge users covered in a survey in 1976, two of the five largest were in the process of switching from mainly in-house to mainly external processing. It is not yet clear, however, that a significant trend in this direction is developing.

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In some cases large companies, either singly or in a consortium, have formed a data processing subsidiary and transferred their work load to it.

Many medium size companies have their own in-house installations, but a large number make use of external services. One Canadian service bureau has claimed that a sizable proportion of its revenues is obtained from corporations that have removed their own in-house facilities. It is probable that a trend is developing here, but the major factor contributing to the increase in the proportion of users without computers (see Table 10B), is the growing number of small users.

Whether the projections forecast in Table 10B will materialize will depend on a number of factors. Perhaps the one that could have most impact is the marketing of low cost chip computers that have sufficient flexibility to meet the needs of small users. Suggestions have been made that a major break-through of this sort is imminent. There is then a question of whether the small, still largely unsophisticated user will succumb to pressures of hardware salesmen, or will learn from past experience: because the required applications software may still be the major cost.

There is little published statistical information on the use made by professionals of computing services in Canada. Research at the University of Montreal and at Queens University in Kingston has led to the development of services for the legal profession that are now being used by legal firms and government departments.

There is extensive and growing use of computers in the medical and health care areas. These uses cover a wide range of applications, from the initial recording of patient data (thus avoiding the use of

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medical practicioners' time in taking down routine information) through hospital management systems to esoteric research. A Health Computer Information Bureau was established in Ottawa and has published[24] since 1974 an annual catalogue and description of health computer applications in Canada. There is thus a growing awareness in the medical profession of the benefits to be derived from the use of computers. An issue of particular concern in the medical profession is the linkage of medical records to assist in research and in the provision of improved medical treatment.

The general public cannot yet be regarded as a new class of user. A large market has developed for "pocket calculators" which are more versatile and a fraction of the cost of their desk-top predecessors. But, apart from these and video games, the public appears to have as yet little awareness of, or interest in, the vast range of computer services that could be be made available to them. However, contenders for this market are beginning to prepare, and the recent announcement on Videotex by the Minister of Communications (Section II, 1.2.3) will give added impetus.

1.4 Changes in the role and policy of interested parties

The technological developments, the increasingly wide use of computers in various areas of application, and the introduction of new services are resulting in significant changes in the market place. These changes are leading to growing areas of conflict and new areas of competition, and are raising serious questions regarding which services should be regulated. Different private interests are struggling to maximize their own share of the informatics dollars spent by Canadian users.

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For example, until the beginning of the 1970's, banking, telephone and postal services could be regarded as distinct with little opportunity for competition among the organizations offering these services. With the evolution of an electronic payments system and growing use of "electronic mail" the separate and distinct nature of the services is being eroded.

These competitive battles are taking place within a framework of Canadian Government legislation. Perhaps the most obvious legislation affecting the competitive scene is the Combines Investigation Act. This was revised in 1976 to cover services as well as tangible goods and new legislation before Parliament would extend the powers of the Competition Policy Advocate to include, for example, interventions in regulatory hearings.

The Bank Act also has a direct bearing on the competitive environment for informatics in Canada, for it governs the types of service that may be offered by the banks, and the enterprises in which they may hold an interest.

The decisions of the Canadian Radio-television and Telecommunications Commission (CRTC), the federal regulatory agency, will affect competition between the two main telecommunications carrier groups and between the carriers and others offering informatics services. The new Communications Bill before Parliament will allow the federal Department of Communications to give policy direction to the CRTC.

Other government-related factors that influence or could influence competition for informatics services in Canada include taxation, standards development, government industry support and procurement policies, legal protection of software and data bases, and possible changes in the functions of the Post Office.

In the private sector, there are two major telecommunications groups in Canada: the Trans-Canada Telephone System (TCTS) comprising all major telephone companies in Canada and, more recently, the satellite corporation, Telesat; and Canadian National/Canadian Pacific Telecommunications (CN/CPT), traditionally responsible for telegraph traffic. These two groups are competing for the growing data communications business. Access by CN/CPT to the local distribution facilities of TCTS is an issue of major concern to CN/CPT.

Cable T.V. companies receive Canadian and U.S. television programs off the air and provide these through cable facilities into Canadian homes in urban areas. Each cable company services a small geographic area (in Ottawa, for example, the city is divided into two such areas) and is licensed by the CRTC. Pressures are arising for a national hook-up of these independent companies to provide pay-TV services. If this is done there could be another major competitor in the telecommunications field for providing data (and other) services.

A state of intense competition is developing between computing equipment manufacturers and the traditional manufacturers of telecommunications equipment, which in Canada and the United States have close corporate ties with the telecommunications carriers. In addition, there is already conflict between the carriers themselves (in this case TCTS rather than CN/CPT) and the computer manufacturers in regard to software standards, for they have a direct impact on the types of services that carriers offer. Technological migration from traditional products and services to computer-based products and services creates a fundamental challenge to traditional assumptions in telecommunications, and opens up the basic question of competition vs. regulation.

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Another area of competition is between the hardware suppliers and the Canadian service bureaus in the provision of services. Concern has been expressed about the potential use by equipment suppliers of their knowledge of the computing requirements of their customers (including their service bureau competitors) to increase their share of the services market. While the level of concern appears to have diminished in recent years, it still remains and could become a major factor in the face of new developments and trends.

The service bureaus are also involved in competition with the carriers in the ill-defined region between communications services and computer services. The Federal Government has stated that carriers will be allowed to provide computing services only through an "arms-length" subsidiary. But this does not help in clarifying how far the bureaus can go into the communications area, in providing such services as an "electronic mail-box", nor how far the carriers can go into the computing services area in regard, for example, to the provision of software that controls data processing as well as data communications.

The competition issue of most concern to the service bureaus in recent years has been the possibility of banks being allowed to provide data processing services. The current Bill before Parliament to revise the Bank Act has to a large extent allayed these fears and their perceived potential for unfair competition.

The evolving electronic payments system is opening up a new area of conflict between the banks and the carriers with regard to who will control what in the design and operation of the network. Some aspects of this are covered in the Law Reform Commission's report on "The Canadian Payment System and the Computer: Issues for Law Reform" (cf, Section II, 1.2.1).

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Another new area of competition is evolving in regard to the use of credit cards. Large retail stores have their own credit cards and many will not accept those issued by banks, in spite of their growing acceptance by hotels, other large businesses, and most of the smaller firms.

A further new area of competition arises in regard to the traditional services provided by the Post Office. The evolution of the electronic payments system, the growing use of text-processing equipment, and new methods being promoted for the simplification of trade procedures will cause a significant decline in the volume of first class mail. Small private firms already involved in the physical transport and delivery of goods and letters are increasing their business. Decisions made by the Post Office in dealing with these erosions of its revenues will have a significant impact on the information communications infrastructure in Canada and therefore on the provision of ADP services.

Beyond all these domestic issues, the juxtaposition of Canada to the innovative and competitive forces originating in the United States is always an important factor.

1.5 New types of services

New uses of computers continue to arise, particularly as the decreasing costs of equipment (especially mini and micro computers) make certain applications, formerly too expensive, worth doing. Examples of these new services are mentioned in various sections of this report. In addition, the following provides some further examples of applications

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which have been introduced in Ontario in the last three years. Some of these are operational elsewhere, but are recent to the Ontario scene.

- Personal Property Security Registration (PPSR): providing an on-line enquiry (for a fee) as to whether there are liens on personal property;

- Scheduling in courts (CYCLOPS): incorporating scheduling information relative to judges, witnesses, prisoners, etc;

- Forest fire prevention: based on data obtained from satellites, and used to direct aircraft searches to areas of danger;

- Municipal transportation scheduling: users can phone in to determine when the next bus will be arriving at their nearest bus-stop.

2. Wider Implications of the Current Changes

2.1 Impact of computers on employment

A British trade union, the Society of Civil and Public Servants, recently passed a motion which, while recognizing that computers do have an impact on jobs, called for rejection of "alarmist" forecasts about their negative effects on employment. At about the same time the British Minister for Energy was expressing concern about computer Technology "cutting like a scythe through employment".

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These two viewpoints are illustrative of the two schools of thought on the impact of computers on employment. What is interesting is that there is a reversal in positions from those one might have expected.

In Canada, the same two schools of thought exist. On the one hand, there are those who argue that computers do not cause unemployment. They point to the fact that in virtually all cases where computers have been installed, the number of employees has actually increased often beyond the level predicted. In many cases, while job requirements have changed after the introduction of computers, the mere fact of introducing the computer has not resulted in any employees being put out of work - they have retrained to meet the new requirements or been transferred to other areas. It is argued therefore that computerization not only does not result in lay-offs, but, moreover, results in an increase in the number of jobs - and in a more challenging area.

On the other hand, there are those who argue that it is not a matter of jobs that existed at the time the computer was installed, but of the non-creation of additional jobs that would have been necessary otherwise. They point to current unemployment problems in Canada and in other industrialized nations as the direct effect of earlier computerization. This effect has only recently become apparent, because in earlier years, with an expanding economy, those affected by computerization could easily find jobs elsewhere. They further point out that it is the younger generation of workers that comprise the majority of the unemployed - again a matter of lack of job creation, rather than older workers being thrown out of jobs.

These arguments have been continuing for some time, and, except for growing militancy on the part of unions, have tended to be more in terms of philosophical discussions rather than in terms of a real concern and an increasing need for action. It may be conservatively estimated that the number of unemployed in Canada attributable to automation and computerization is in the region of 200,000 and could be well over half

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a million. This is based on the fact that there are some 100,000 directly involved in ADP activities, and that computers in most cases were introduced to save on labour costs.

The complacency that has existed in Canada is only now beginning to be replaced by some doubts and by growing fears of an escalating problem. But reliable information and hard facts, rather than opinions and calculated guesses, are now required as a basis for developing effective approaches.

At present, labour concerns and actions are directed at management of affected companies and organizations. There appears to be little encouragement from either labour or management for increased government intervention. Until this arises, or work dislocations threaten economic development more seriously, or incontrovertible evidence of the dimensions of the problem is accumulated, it is unlikely that specific government policies and approaches will develop.

2.2 Impact of computers on working conditions

Computerization in the Canadian Post Office has caused more public awareness of the impacts of computers on employment and working conditions than computerization in any other area. The strikes that have resulted from disputes between labour and management over problems in this area have led to a great deal of public concern. But this concern is not yet focussed on the impacts of computerization - it is more related to direct impacts of the non-delivery of mail on the individual.

The President of the Canadian Union of Postal Workers has called for greater militancy on the part of workers - in all areas - to deal with what he regards as a growing major threat, and the Union is seeking to exercise a veto power over the introduction of new equipment.

Traditionally, unions have not been anti-automation per se, but it is possible that they will become increasingly so as unemployment levels stay high.

Computerization is also occurring in the newspaper publishing business. In Ottawa, for example, one of the local newspapers computerized its operations several years ago, and has already been through a difficult change-over period. More recently, the other local newspaper decided to make the switch. This resulted in a long drawn-out strike, and, almost two years later, pickets still carry placards complaining about lack of severence pay. It was seven or eight years ago that a Toronto newspaper computerized its operations. In that case also there was a lengthy strike, which resulted in a weakening of the union. It is not inconceivable that this story will be repeated with other newspapers, and also in other industries.

Again the results of computerization have been drawn to the attention of the public. Again there appears to be a general apathy. Until this apathy changes there is little likelihood of any significant government intervention in this field.

A number of questions related to government policy have arisen recently however, in another area where computerization is affecting jobs and working conditions. Some multinational corporations have developed or already implemented plans for moving their ADP activities from Canadian subsidiaries to headquarters, primarily located in the United States. This has meant a transfer of personnel to the new location or individual moves to other employment in Canada. There is growing Government concern over what appears to be an increasing trend, and work is now underway to develop appropriate policy and action.

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Similar concern has been expressed by some provincial governments less in regard to the transfer of ADP activities from Canada, than in regard to the possible concentration of computing activities in central Canada, as greater use is made of the improvements in communications facilities and services. Evidence drawn from the CIPS Computer Census, however, does not yet support this supposed growing concentration of computers in the central provinces.

2.3 Changes in organization

There has been over the years since computers were first introduced, a continuing argument over the relative merits of centralization and decentralization. There has been an ebb and flow in interest in this debate, but, basically, it would appear that a decision on the centralization-decentralization issue is based primarily on management style in the corporation.

Technological developments - in computing hardware, in communications services, in storage technology, in software - have continued to increase the options open to management. The new so-called distributed processing (which appears to mean different things to different people) provides additional computing power at the distributed locations, but also provides for increased central control over planning, development and operations.

It appears likely that those multinationals now transferring their data processing activities out of Canada and taking advantage of recent developments, are doing so primarily because of corporate management style. For there are still a number of multinational subsidiaries in Canada that continue to obtain all or virtually all of their information processing needs from Canadian sources.

It is also clear that in many organizations which centralize hardware facilities or exercise central control over the acquisition of hardware, many user departments have their own application development staff or utilize their own funds for direct purchase of specialized ADP services. In these circumstances, which appear to be fairly common, the budgets and expenditures of ADP centres do not reflect total corporate spending on ADP requirements.

Up to about ten years ago, firms using computers acquired their own hardware and developed their own internal staff, for there was little alternative. Since that time there has developed a growing service bureau industry, with the revenues of some firms increasing by as much as 50% from one year to the next. While growth in revenues has been high, however, profits have been low or non-existent and the early days saw many service bureaus fold.

Today revenues continue to increase (though perhaps not as rapidly), profits have tended to become more common (though still at a low level) and dangers of discontinuation of service through bankruptcy have largely disappeared. The reluctance of corporations to use service bureaus because of this risk has therefore virtually been eliminated. A number of smaller corporations have in fact removed their in-house facilities, and, as pointed out earlier, even some of the larger corporations are moving in this direction. The trends shown in Table 9 and discussed in II.1.3 indicate a growing number of users turning to service bureaus for their requirements.

The information processing services provided by the suppliers of computing equipment, particularly IBM, were at one time the only services available from external sources. They filled an essential need and grew as demands increased. However, this virtually total reliance on services provided by manufacturers has

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disappeared with the development of viable independent service bureaus across Canada. In recent years IBM's share of the information processing market has been steadily declining. It is possible that its effective sales force and large financial resources would allow it to recapture a larger share of the market if it chose to do so. There are still some lingering fears in this regard, particularly in view of its involvement in Satellite Business Systems, and its potential re-entry into the services market next year in the United States. Forecasters, however, while expecting an increase in volume of IBM's sale of services, predict a continuing decline in market share.

2.4 Competitiveness of the economy

Corporations in different sectors of the economy have introduced computers into their operations to maintain or improve their competitive position relative to others in the same business. It is therefore regarded as axiomatic that computers can help Canadian companies to maintain their competitiveness with foreign companies in domestic and foreign markets. However, as far as the authors are aware, no formal investigation has been undertaken of the impact of computers in this regard.

2.5 Legal questions

2.5.1 Authentication of documents

As more and more documents are transmitted electronically the question of authentication will become increasingly important. This will occur, for example, in regard to the evolution of an electronic payments system, and will raise the related question of liability in cases of delays or errors in payment. Already problems have arisen from the use of bank credit cards in cases where the merchandise was faulty, for there is no way of withholding payment until the customer is satisfied.

The area where these types of problems are receiving greatest attention is perhaps in the area of trade facilitation. Authentication is required for example for customs and other official purposes and for control of the transfer of ownership or custody of goods in transit as well as for payment purposes.

Authentication may take a number of forms including a handwritten signature, one printed in facsimile, or use of perforations, particular stamps or symbols. The legislation of different countries is not consistent in regard to what is permissible, and a need is seen to harmonize national laws, with particular reference to what is feasible electronically, and bearing in mind the need for effective control and security. This general question encompasses a number of other problems, such as requirements in some cases for multiple authentication, the negotiability of certain documents, including bills of lading, and statutory customs requirements.

It has been suggested[25] that unilateral changes in national legislation to meet these requirements could have a counter productive effect on international trade data flow. Independent action by different governments could lead to even greater incompatibilities than now exist, and delay further the required harmonization.

In Canada, the focus for dealing with issues relating to the flow of information in trade is COSTPRO - the Canadian Organization for the Simplification of Trade Procedures - a joint government-industry organization established by the Department of Transport. It is active in the Economic Commission for Europe (ECE) and in the International Chamber of Commerce in dealing with these problems.

2.5.2 Legal protection of software

The legal protection of software has been a matter of concern in a number of countries, and studies undertaken in the World Intellectual Property Organization led, in 1977, to proposals for a draft law.

In Canada, the issue assumed major importance in 1973 and 1974 after a patent was issued which appeared to cover software for accounting purposes. Complaints were lodged by the holder of the patent in Canadian courts against alleged infringement by IBM and two other organizations. In two cases the complaints were eventually withdrawn and in the third they were dismissed by the court as the charges were not pressed. These events caused a great deal of concern among service bureaus and others in Canada, and strengthened opinion against a patent approach for protecting software.

There is nevertheless a feeling that some form of legal protection is necessary. Some maintain that present laws related to trade secrets are adequate. Others feel that a copyright type of approach is required.

The basic question is what is to be protected against what? The documentation of a program could clearly fall under copyright protection. But this is not the major problem. Similarly, a listing of the program could also arguably be covered by copyright. It is perhaps questionable, however, that copyright protection would be available if numerous, but superficial changes were made to the listing. But the basic problem is what happens to a program once it is put into the machine. Is the running (i.e. use) of that program similar to the performance of a play or piece of music, and therefore covered by copyright? Is it only the act of copying that is a breach of the copyright? And must the copy be in human-readable form?

In Canada proposals have been prepared for revision of the Patent Act and of the Copyright Act. A report[(26)] prepared for the Department of Consumer and Corporate Affairs (C.C.A.) on a "Proposed Patent Law" was released in 1976. In section 17(1) of the proposal, it was suggested that the following items should <u>not</u> be patentable:

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- mathematical methods or algorithms
- programs for computers, or use of computer programs
- a general or multipurpose computing or data processing apparatus adapted to execute a given computer program as an instance of an ability to execute a variety of computer programs.

A report[27] on "Copyright in Canada: Proposals for a Revision of the Law" was released by C.C.A in 1977. This report, prepared for C.C.A by Keyes and Brunet, recommended that:

- computer programs per se not be protected by copyright
- where they fall under existing categories of protected material, computer programs embodied in that material be accorded the protection attached to those categories.

No final decisions have yet been taken.

2.5.3 The legal responsibilities of computer professionals

A consideration of the legal responsibilities of computer professionals must start with a consideration of the term "professional". In Canada, as in most other countries, those engaged in computer-related activities usually belong to one or more related associations. These are such that membership depends primarily on the payment of a fee, and does not require any specific qualifications. The debate on "professionalism" has been growing in recent years, and the June 1978 issue of the "CIPS Review" contains a number of articles on this topic[28].

Without a concept of professionalism it is pointless to think in terms of legal responsibilities; it is more a matter of moral responsibilities on the part of each individual.

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A separate question, however, is the legal obligation of a service bureau to its clients. This is an area that was briefly reviewed some time ago by the Computer/Communications Secretariat. It was found that Canadian service bureaus in general were very conscious of the needs, requirements, and concerns of their customers and that customers were not pressing for a clarification of the legal situation. Under these circumstances attention was redirected to other areas.

The pressure for further consideration of the general area of legal responsibilities in computing has been lessened in recent years by the establishment of "Computer Ombudsmen" in some of the major centres in Canada. This is a joint venture by CIPS and the Consumers Association of Canada, to deal with complaints and frustrations of the general public in their dealings with computers. Recent newspaper articles suggests that these ombudsmen have been "underwhelmed" with problems. They do, nevertheless, provide a safety valve, and could well render unecessary a more "heavy-handed" legislative approach by government.

2.5.4 Evidence

The question of computer records as documentary evidence has been considered in a number of courts and some have admitted them under the general rules of evidence. The new Competition Bill before Parliament contains a section covering the status of a print-out of a document on a terminal in relation to prosecutions under the Act.

"Computer Law and Tax Report" (a U.S. publication) in 1977 published a list of recommended procedures for lawyers in preparing for submission of computer records as evidence. The Evidence Act of South Australia contains a check-list of what a lawyer will have to prove about the data processing in order to have computer records admitted as evidence. In the United Kingdom, the Civil Evidence Act and the Criminal Evidence Act extended the meaning of "documents" to take account of new techniques, but the rules differ under which computer records may be produced as evidence.

In Canada, as in most other countries, the situation has not yet been formally clarified.

2.5.5 Mixed federal and provincial jurisdiction

Of particular importance in Canada is the division of powers between the federal and provincial governments. This division was formally laid down in the British North America Act of 1867, which, understandably, makes no specific reference to computers.

In some areas issues fall clearly within the jurisdiction of the federal Government, while others are clearly within provincial jurisdiction. In a number of significant areas, however, there is mixed jurisdiction which is subject to varying interpretations. For example, education is designated a provincial responsibility, while communications is federal. The results is that jurisdiction over educational use of television is not yet clearly established.

This and other difficult problems have arisen in telecommunications and cable television, although in some areas (e.g. computer/communications) good working relationships have been established between the provinces and the Federal Government. Good relationships will need to continue and be improved if fragmentation and incompatibilities are to be avoided.

2.6 Computers and civil liberties

As discussed in Part I section 3.2, the federal Government and one provincial Government (Nova Scotia) have Acts covering the storage of personal data in Government data banks. In addition a number of provinces have Acts pertaining to the operations of credit reporting agencies, and the accuracy of the personal information they maintain.

No other Canadian legislation relates directly to computers and civil liberties, and no announcements have been made about pending legislation.

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2.7 The political debate

Little concern has yet developed among the general public regarding developments in computing. A survey report[29] entitled Public Attitudes Towards the Computer" was prepared for the Computer/ Communications and Privacy Task Forces, and released in 1973. The survey covered some 1030 households. Table 11 shows the five issues considered most important by respondents at that time.

The Consumers Association of Canada has expressed concern over billing errors and anomalies, and over possible misuse of automated check-out in supermarkets. These concerns, however, have not been strongly expressed, nor have they received wide publicity. The establishment of "Computer Ombudsmen" (section II 2.5.3 above) may have helped here to overcome a problem that might have escalated.

The popular press has not directed attention to the issues, although there have been a few articles recently about growing foreign dominance in this field. Magazines and some newspapers have run a few articles on the major developments taking place. But whether these are regarded as science fiction, whether they have no more credibility than the much publicized picture-phone, whether there is a surfeit of "future shock", or whether there is just plain apathy is not entirely clear. In any event, there is little public discussion of these events.

The trade press, on the other hand, is increasingly running articles on recent developments, particularly in regard to the "office of the future".

While some unions, particularly the Canadian Union of Postal Workers, are expressing growing concern about increased automation, and while, in some cases, strikes result, the target of the unions is management.

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In virtually all of these cases, then, there is little public focus on the underlying basic issues. Many discussions centre on the technology. But the technology per se is not a problem, for it already outstrips our capability of using it to its full potential. The basic issues arise from political, economic, social, cultural and legal impacts of technological development.

With this general lack of public pressure in Canada, the political parties have not yet addressed the issues. The structural changes taking place in society are too diffuse and too complex and events are moving too rapidly to permit the development of a thorough understanding and a concise definition that can lead to meaningful political debate.

2.8 Computer research

There has been no formal investigation of trends in computer research in Canada.

The National Research Council which has a long history in supporting computer research in universities provided about $2½ million in the current year for research grants for computer and information science and operations research. These funds are for basic and applied research but do not cover research on the impacts of the technology. The new Social Sciences and Humanities Research Council does fund some research projects (perhaps 2 or 3 per year) which bear some relationship to computing. But again, no project was identified in which the impacts of technology in a political, economic, social, cultural or legal sense were under study.

This may be a reflection of the general lack of public awareness and interest in the significant developments now taking place. It may, perhaps, more be a reflection of the difficulty of organizing and funding interdisciplinary research in a university environment.

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Recently, the Institute for Research on Public Policy has undertaken a Future Studies program, and many of the projects relate to the impacts of computer developments. The first publications resulting from these studies are now appearing.

3. Changes and Trends in Public Policies

3.1 National policies

3.1.1 General Policy framework and institutional responsibilities

It was through dynamic developments in telecommunications, together with the merging of computer and communications technologies, that Canada began to look at requirements for national policies in informatics. During 1970, the federal Department of Communications, with the assistance of experts from government, industry and universities, studied the whole field of telecommunications. The summary report[30] of this wide-ranging study, "Instant World", highlighted computer/communications as a key area requiring particular Government attention.

The Canadian Computer/Communications Task Force was subsequently established "to speedily develop and recommend specific policies...". Its final report, "Branching Out", was published in 1972 and contained some 39 recommendations. It became clear early in the work of the Task Force that policies could not be viewed solely (or even primarily) from a technological aspect. "Branching Out" highlighted the breadth of policy issues in this area and the need for a coordinated approach to deal with them.

It also became clear that if policies were approached solely from the different aspects of supply - supply of equipment, of computing services, and of data communications - it was difficult to develop a

cohesive policy framework because of conflict among and within the different supply sectors. It was only when policies were developed primarily in the light of user requirements that a cohesive framework began to emerge.

After a review of the recommendations, the Canadian Government published in April 1973 its Green Paper on Computer/Communications Policy. It was presented "not as a firm statement of settled government policy" but to "provide a positive basis for discussion....". In essence, it endorsed the recommendations in "Branching Out", but instead of identifying a lead department to coordinate policy development, it established an interdepartmental committee with a full-time chairman, supported by a small professional secretariat.

Recommendations for implementation action were developed by this committee and took into account inputs from the provinces and the private sector. They were passed on to appropriate departments for consideration. Subsequent action by several departments has been taken in a number of areas including: the evolution of an electronic payments system; data processing services offered by telecommunications carriers and banks; government procurement; taxation; manpower development; decentralization of government ADP activities.

Statement 19 of the Green Paper made particular reference to industry and science policies in the following words: "The Government endorses the need for selective stimulation of the Canadian computer industry, and particularly the Canadian-controlled computer industry, and will take this into account in the formulation of its industrial, procurement, and science policies".

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The Department of Industry, Trade and Commerce has put particular emphasis on its rationalization policies for the multinational computer manufacturers in which it is expected that these companies will attempt to balance as much as possible computer and other imports with exports of equipment they manufacture in Canada.

The Minister of State for Science and Technology recently announced a new national priority for research and development. While none of the measures proposed relate specifically to computing, the tax incentives announced have been welcomed by small Canadian businesses developing computing and associated communications products.

In general, a Green Paper is regarded as a first step towards legislation. In this particular case, because of the diffuse nature of the issues and requirements, no omnibus type of legislation was envisaged. Instead, it was felt that legislation, if necessary, or administrative action, would be taken in specific areas by the different departments concerned.

Over the years, the initial focus provided by the Green Paper disappeared as action was taken in some areas and as issues and requirements changed. Earlier this year, the Committee for Computer/Communications and its Secretariat were disbanded. Alternative methods for considering the issues are now being developed.

There is now growing recognition in Government that structural changes are taking place in society and in the economy as the impacts of computer use increase and as more national effort is put into the "information economy". With this growing recognition it is possible that a new focus on the new requirements may be developed.

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3.1.2 Economic, social and cultural implications

Perhaps the most important report on the economic implications of developments in computing is that prepared by the Computer/Communications Secretariat on "The Growth of Computer/Communications in Canada" and released earlier this year(8). This has been released in draft form to provide opportunity for discussion, comment and criticism. Some of the information it contains has been summarized in Part I of this report.

Prior to its release, the approach and the main findings were discussed with provinces and with the private sector in order to ensure as wide a representation as possible of views and relevant inputs. The report provides a detailed description of the rationale and assumptions that were made, so that opportunity is provided for detailed criticism and for organizations to substitute their own ideas in places where it may be felt advantageous.

This report and an earlier draft(7) have been used by a number of companies operating in Canada for their own corporate planning purposes. The report has also been used as a basis for re-assessing government approaches to issues. In particular it provides, for the first time, an estimate of the dollar volume of transborder data flow and its impact on employment.

Another, shorter report was also released earlier this year assessing trends in various sectors of the economy. Much of the information in that report has also been summarized in Part I.

Apart from the report of the Task Force on "Privacy and Computers" (published in 1972) and the report on "Public Attitudes Towards the Computer" (published in 1973), Government has not published any other reports on the social implications. However, a number of reports and speeches, primarily technological in nature, make reference to developments in computer aided learning, in telemedicine, and in the variety of services that could be offered in the home.

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Canada's bilingual and multicultural society may perhaps be expected to have some concern over cultural implications of developments in computing. These concerns, however, seem to be directed to the now more obvious information media, such as television, broadcasting, magazines and other published material. It is not yet clear what cultural impacts, if any, are likely to arise from computing applications. As the introduction of Videotex brings more services into the home these issues may become clearer.

For example, in broadcasting, regulations specify a required minimum Canadian content. It may be difficult, however, to define and insist on similar minima in computer data bases, in the software used for providing the services, or in the amalgam of services offered to the public. Broadcasting undertakings must be Canadian owned: it is not clear whether a similar restriction may be feasible or desirable in regard to the suppliers of information and information services of a cultural or social nature. Governments have expressed concern about the Canadian publishing industry and action has been taken to remove the privileged position of some U.S. magazine publications. It is too early to predict whether this type of concern will extend to computerized information services.

3.1.3 Government awareness

Individual departments in general maintain an in-house computer facility, and many opportunities exist for keeping abreast of developments in computing. In addition to the usual professional society meetings, and specific courses provided by manufacturers, consultants and universities, the Data Processing Institute (one of several professional bodies in the Federal Institute for Management) provides a forum for exchange of views and for discussion on topics of mutual interest specifically for Federal Government servants. Its objective is to promote the development and utilization of efficient ADP practices in the federal government and membership is open to personnel in any Federal Government department or agency.

Until earlier this year the Computer/Communications Interdepartmental Committee and its Secretariat provided a focus for consideration of a broad range of issues related to informatics, telecommunications and their applications. An ad hoc committee is now meeting as required to maintain an awareness of developing requirements.

3.1.4 International dimensions

There is growing concern in many countries about transborder data flow. This concern started with the potential for invasions of personal privacy, and a number of governments in Europe have enacted data protection legislation that impacts on the flow of information across national boundaries. It is now recognized that the issue is much broader encompassing important economic, social, political and legal aspects.

Foreign intiatives in this area are of considerable interest to Canada, and Canada's proximity to the United States places particular importance on developments in that country. On September 6, 1978, a workshop on Issues in Canadian/U.S. Transborder Computer Data Flows was conducted to help shed additional light on problems and requirements(31).

Governments are still attempting to come to grips with measuring, in an effective manner, the computing activities within their borders, and with measuring the international flow of data. Economists are struggling to improve their understanding and to refine their definitions and methods of analysis. Although these problems exist, there is no doubt that transborder data flow is having an economic impact on balance of payments and on job opportunities.

The present exodus of computing activities from Canada has been likened to the "brain drain" of the late 40's and early 50's, by the Hon. J. Hugh Faulkner, then Minister of State for Science and Technology(32). This exodus, he went on, "creates the potential of

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growing dependence, rather than interdependence, the loss of employment opportunities, an addition to balance of payments problems, the danger of loss of legitimate access to vital information, and the danger that industrial and social development will largely be governed by the decisions of interest groups residing in another country".

He went on to talk about international trade in data and pointed out that while "we have centuries of experience in dealing with tangible goods, there have been only a few short years in which it has been technically and economically feasible" to directly import and export computer-based services. He added that we may not be able to rely on traditional means for trading in these invisible intangibles, and that there was a growing need for international agreement on a generally accepted set of ground rules.

More recently, the Parliamentary Secretary to the present Minister of State for Science and Technology has made the following comments(33):

"While the Government of Canada, like many other Governments in the developed world, has not yet completed its study of all the elements of a policy concerning transborder flows of data, it seems quite unlikely that a Canadian Cabinet will decide in favour of an entirely unregulated regime; it appears to me that there are too many forces at play to allow ourselves, indefinitely, the luxury of zero regulation, no matter how reluctant we might be to leave such a stance".

In these and other areas of concern, Canada is participating in the work of a number of international organizations. Canadians have been involved on a continuing basis in the OECD meetings and discussions on the privacy issue, and are now committed to participating in the extension of this work to the broader implications of transborder flow of non-personal data.

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Canadians are also active in the work of the U.N. Economic Commission for Europe and the International Chamber of Commerce related to the transborder flow of data related to trade facilitation. Parallel activities covering some of the same problems are also taking place in the Customs Cooperation Council. Solutions to some of the specific issues now identified in this area could have important implications in the more general aspects.

The work of the ITU (International Telecommunications Union) is directed specifically to developments in telecommunications. But with the merging of the communications and computer technologies, the impacts of work in the ITU on computing activities is increasing in importance. This fact was not missed by the computing community in the agreement reached on X.25, a project involving considerable Canadian participation.

The work of the ISO (International Organization for Standardization) has a more obvious direct influence on computing. Its work and that of the ITU have become more closely related in certain areas in recent years. Agreement has now been reached on appropriate measures to keep each other informed in advance of the work taking place.

It is not intended to give here a comprehensive list of all the international organizations in which Canadians are participating in work related to computing policies. In addition there are, for example, the U.N. itself, UNESCO, WIPO, IFIP and a number of others. What becomes apparent here, is the extent to which computing-related issues are being discussed, and the dangers of duplication, fragmentation and incompatibility.

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3.1.5 Manpower development

It has been suggested[34] that the "the most critical problems the data processing industry faces are the productivity of the applications software development process and the quality of the end products of that process". Further quotes from the same source include:

- "Problems of education and technology transfer are becoming more severe".

- "All segments of the industry must become more interested and involved in the problems of selecting, educating and training data processing personnel at all levels".

- "There is a need for a better coupling between the community of users and suppliers of data processing, on the one hand, and the research, development, and academic community, on the other".

These remarks refer to the United States, but they are equally applicable to Canada - and to many other countries.

In Canada, education is a matter of provincial jurisdiction and therefore was not a matter that could be addressed by the Federal Government. However, discussions with provincial officials and with private sector representatives elicited a common concern. As a first step in attempting to clarify training and education requirements, it was felt that a set of occupational profiles generally acceptable across Canada was necessary[35]. There was no dearth of work in this area. On the contrary it was found that the Federal Government, a number of provincial Governments and a number of corporations had devoted a great deal of resources to this requirement, with resulting duplication, incompatibilities and some confusion.

The Employment and Immigration Commission is now in the process of developing the required occupational profiles. This is receiving support from the provinces and the private sector and interest has been demonstrated by the academic community.

3.1.6 Taxation

The computer services industry, has indicated that it is not particularly interested in Government "hand-outs", and is more concerned with the removal of impediments to development and the creation of a climate that will permit effective planning. There were a number of taxation aspects that were regarded as impediments.

One of these was the capital cost allowance for computing machinery. The provisions in Canada were not as advantageous as those in the United States, and did not recognize the technological obsolescence of the equipment. This was rectified in the Government's 1976 Budget. A relatively new issue that was dealt with in the same budget was the depreciation allowance on purchased software. The private sector is still concerned about the taxation treatment applied to leased software. This is an area where precedent and analogy are particularly difficult to apply, because of the unique nature of software.

Import duties on computing equipment and components continue to be a source of concern to the private sector. The Tariff Board - an independent semi-judicial body - has recommended[36] that import duties be reduced to zero, because there is little manufacture of computing equipment in Canada to protect through import taxes, and because many of the components imported are eventually exported after incorporation in goods produced in Canada.

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The Tariff Board also referred in its report to the question of federal sales tax on computing equipment, but refrained from making any recommendations on this item as it was outside its terms of reference. The matter is again one of some concern to the private sector. Import duties and federal sales tax together make computers some 25% more expensive in Canada than in the United States. This factor enters into the competitive position of Canadian service bureaus vis-à-vis their U.S. competitors, influences the decisions of Canadian service bureaus regarding the location of additional facilities which might compete in the U.S. market, and affects decisions whether foreign-owned user firms may purchase and locate computers in Canada, or must use the facilities of affiliated companies south of the border.

3.1.7 Regional development

Most computers in Canada are located in Ontario and Quebec. Although concern has been expressed about a possible growing concentration in these two provinces, the figures presented in the CIPS annual census of computers indicates a decreasing share of computing capability in these two provinces. It might be noted, for example, that Calgary (in Alberta) has achieved world recognition as a centre of expertise for computing activities in the petroleum industry.

So far, no concerted attention has been paid to impacts and influences of computerization on regional development. The questions that arise in an examination of this issue include: Will lower, largely distance-independent communications costs provide incentive for the establishment of service organizations outside central Canada - as they will be assured access to the central market? Or will these changes in costs tend to concentrate further the activity in Ontario and Quebec?

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Is the local supply of information-processing services of major economic and social importance to all provinces and regions of Canada? Or will a greater net gain arise from ensuring that the existing major economic activities in each region have ready and inexpensive access to the required computing services?

It is clear that Canada as a whole cannot be totally self-sufficient in regard to all the services required by users. How far then is it feasible for individual regions or provinces to meet their computing requirements from local sources? There is some danger that political pressures could fragment the Canadian market to such an extent that services could be most economically supplied from foreign locations.

3.2 Policies for computer use in the federal government

3.2.1 Evolution of policies

Concern about the rapid growth of expenditures on electronic data processing (EDP) within the federal government, and uncertainty about the effectiveness and efficiency with which computers were being used led the Treasury Board to initiate the EDP Policy Project in February 1971. The report[37] of this Project, issued in November 1971, "concluded that the area most requiring corrective action in the development of new policies and guidelines is the planning, development and evaluation of EDP activities". It pointed out the fragmented approaches within the federal government, with too much emphasis on hardware, and the lack of any consistent government-wide policy. In addition, the areas of personnel and procurement were identified as requiring improvement.

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The recommendations in the report were generally accepted and, in February 1972 a policy statement was released. As a result of the recommendations, an Information Systems Division (ISD) was created within the Administrative Policy Branch of the Treasury Board Secretariat "to develop, disseminate and interpret policies and guidelines for EDP applications procurement and operations; monitor the progress of Government EDP; and ensure that experiences with EDP are shared among all departments and agencies".

The first step in expanding on the new ADP policy was the preparation of an overall implementation plan. This was published in December 1972. Next, the ISD, in regular and frequent consultation with departments, undertook the preparation of a "Guide on EDP Administration" for departments and agencies of the Federal Government(38). This was published in 1974.

Federal government ADP policy has not been developing without important changes in detail. For example, cost recovery was strongly favoured in the Policy Project report and in the Master Plan, but was largely abandoned in the "Guide". The Guide has also been updated in the light of experience. For example, in its 1975-76 "Review of EDP in the Government of Canada" the basic policy statements were modified to reflect the policy concepts more accurately. In addition, revisions to a number of chapters have been issued covering for example, management responsibilities for ADP, project approval and development, security and standards. These revisions, based on increasing experience in an effective planning process, and on experience in the use of the guidelines, are leading to continuing improvement in planning for and evaluation of ADP activities in the government.

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The ISD publishes an annual report giving information on expenditures and employment in government ADP. These reports include changes to the guidelines and provide information on other projects being undertaken. They also summarize each year the ADP activities of about six different departments and agencies.

One of the special projects undertaken by the ISD was a review of the state of ADP training and policies governing that training. Its report on this project was issued in July 1976.

Perhaps of more significance in the context of this present report, the ISD, in consultation with the Department of Communications has prepared an administrative guide[39] on the use of telecommunications resources in the government. This guide was distributed in 1977 for implementation by departments and agencies. It will be evaluated to determine its impact in the first year of use and to identify any immediate changes necessary to ensure its continued relevance.

The latest "Review of EDP and Telecommunications in the Government of Canada" (for 1977-78) has added a section on telecommunications as indicated by the change in title. The report points out that "the introduction of telecommunications in the Treasury Board Secretariat's review of EDP was inevitable, as the technologies of EDP and telecommunications progress towards greater interdependence in the field of managing information. This merger places greater emphasis on the need for the systems approach to information management".

There are several interdepartmental committees related to ADP activities within the government. The first was a senior EDP Advisory Committee, initially established to advise on the work of the EDP Policy Project, and which was retained to advise on the policies and guidelines to be developed by the Treasury Board Secretariat and on other government-wide issues. Its name was changed some 18 months ago to the Advisory Committee on Information Systems, reflecting a change in responsibilities to encompass requirements in telecommunications.

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The second committee, the Government EDP Standards Committee, was established by Treasury Board to develop ADP standards required for the federal public service where suitable national or inernational standards do not exist. The secretariat for this committee is provided by the Department of Supply and Services. The third, a Telecommunications Advisory Committee was established to advise and assist the Department of Communications in the planning and coordination of the use of telecommunications within the federal government. Two more committees were established recently: one an EDP Training Advisory Committee, and the other a Committee on the Impact of Technology in the area of information. All four of these committees report to the Advisory Committee on Information Systems.

The question of centralization/decentralization has been reviewed and some steps have been taken to move certain ADP operations from the national capital region. These include the establishment of a number of taxation data centres across the country, and the move of the cheque reconciliation activities of the Department of Supply and Services to a location in Quebec. However, these moves are associated with the government's general policy of moving selected activities from the national capital region rather than with a particular focus on ADP. The decentralization of ADP activities per se has been rejected as a practicable and effective measure.

Experience in the Government of Ontario, where as mentioned earlier the total expenditure on computers is large, is also relevant to this report. The question of centralizing or decentralizing computer resources has received considerable attention. As a result of a report prepared by a Committee on Government Productivity, all the computer resources, both hardware and software, were centralized. The system did not fit well with the strongly independent ministries in the province.

Since April 1978, systems development and user responsibility has been moved back into the respective ministries (although the hardware is concentrated in three sites) - a scheme which is working

much better. Consideration is now being given to setting up an integrated province-wide communications and teleprocessing network to serve the needs of the government generally.

3.2.2 Changes in organization

The policies, directives and guidelines issued by the Treasury Board have led to internal changes in departments in order to comply with the requirements. The emphasis in these changes has been directed towards improved planning and effective evaluation of the services provided by Government facilities, and to increased central control over growth in expenditures and manpower resources. There have been no major changes in government organization or services which can be attributed solely to the development of ADP activities.

3.2.3 Changes in working methods

The working methods of the administration have been greatly affected by the computer in almost all government departments. Some of these changes are indicated in the Treasury Board's Annual "Review of EDP in the Government of Canada" in the section on "Departmental Use", which summarizes activities in about six departments and agencies each year. For example, the latest "Review" (for 1977-78) indicates the complexity of the Benefit Pay System, operated by the Canada Employment and Immigration Commission, which in 1977 made about 25 million payments. This system uses 550 computer programs and performs up to as many as 100,000 transactions in a single region in a single day. This type of service could not be made available to the public without the benefit of computer use.

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Other examples include: automated financial and personnel systems in most departments; an automated cartography system in the Department of Energy Mines and Resources; a meteorological system in the Department of the Environment; a personal income tax processing system and a cargo entry processing system in the Department of National Revenue; a property management system is the Department of Public Works; an air registration system in the Department of Transport; a terminology data bank and computer-assisted translation in the Department of the Secretary of State; and the "Datastream" system in the Public Service Commission which has resulted in important changes to staffing procedures.

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TABLE 1: ESTIMATES OF ADP COSTS IN CANADA, 1965-1985

	1965	1970	1975	1980	1985
			(C $'000,000)		
Costs Incurred by Users	235	1,185	2,660	5,590	9,500
For personnel	110	515	1,135	2,245	3,500
For computing equipment	55	255	530	990	1,445
For purchased computing services	30	200	500	1,370	2,960
For data transmission	..	25	110	285	570
For other requirements	40	190	380	700	1,025
Canadian Computing Service Revenues	20	150	400	915	1,600
From users	20	130	355	820	1,445
From exports * [1]	..	10	25	40	60
From/to other Canadian C.S. suppliers	..	10	20	55	95
To personnel	10	70	170	380	650
To computing equipment	5	35	80	170	280
To data transmission	..	5	15	45	95
To imported computing services *		..	5	10	25
To other requirements	5	40	100	180	265
Profit **	-..	-10	10	75	190
Imported Computing Services Value	10	70	155	560	1,540
Computing Hardware Revenues	80	345	735	1,320	1,880
From users	55	255	530	990	1,445
From Canadian computing services suppliers	5	35	80	170	280
From revenue/cost surplus	20	40	90	80	5
From data transmission suppliers *	..	5	10	20	35
From other hardware suppliers *	..	10	25	60	115
To other requirements * [2]		50	110	200	280
Data Transmission Revenues	..	30	125	330	665

SOURCE: Computer/Communications Secretariat

.. Less than $5 million.
* Nominal value - no basic data available.
** Residual value.
1 Includes allowance for services to branches of Canadian multinationals.
2 15% of revenues.

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TABLE 2: ESTIMATED NUMBER AND INSTALLED VALUE OF COMPUTERS IN CANADA

	1965	1970	1975	1980	1985
A. Number of Computers					
Large (monthly rental $50K up)	3	90	240	350	410
Medium (m.r. $5K-$49.9K)	427	1,370	1,750	2,110*	2,310*
Small (m.r. $1K-$4.9K)	580	1,640	5,070	11,740	16,080
Very Small (m.r. under $1K)	-	760	8,900	28,600	51,400
TOTAL	1,010	3,860	15,960	42,800	70,200
B. Installed Value		(C $'000,000)			
Large	7	260	860	1,580	2,410
Medium	258	860	1,130	1,400*	1,580*
Small	70	190	510	1,000	1,170
Very Small	-	20	270	860	1,550
TOTAL	335	1,330	2,770	4,840	6,710

* Current (1978) data suggest that these figures may be conservative.

SOURCE:

Based on estimates by the Computer/Communications Secretariat, which were derived from the annual computer census of the Canadian Information Processing Society. Installed value is 40 times monthly rental value.

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TABLE 3: ESTIMATED ADP EMPLOYEES OF COMPUTING USERS AND COMPUTING SERVICE SUPPLIERS IN CANADA

	1965	1970	1975	1980	1985
A. By Employer			Number		
Users with computers	21,00	51,000	70,000	92,000	104,000
Users without computers	2,000	9,000	13,000	23,000	39,000
Computing service suppliers	2,000	8,000	13,000	19,000	26,000
TOTAL	25,000	68,000	96,000	134,000	169,000
B. By Type of Employee			Number		
Managers	2,500	8,200	12,500	18,800	25,300
Analysts and Programmers	5,000	19,700	28,800	41,500	54,100
Data conversion	10,000	21,100	28,800	37,500	42,200
Data production	6,200	12,200	15,300	20,100	25,400
Others	1,300	6,800	10,600	16,100	22,000
TOTAL	25,000	68,000	96,000	134,000	169,000
			% of Total		
Managers	10	12	13	14	15
Analysts and Programmers	20	29	30	31	32
Data conversion	40	31	30	28	25
Data production	25	18	16	15	15
Others	5	10	11	12	13

SOURCE:
Based on estimates by the Computer/Communications Secretariat.

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TABLE 4: STATISTICAL INDICATORS USED IN COMPARISONS OF ADP GROWTH IN CANADA

	1965	1970	1975	1976	1977
A. National Indicators					
1. Population (thousands)	19,644	21,297	22,697	22,993	23,291
2. Total employment (thousands)	6,826	7,919	9,363	9,572	9,754
3. Gross National Product (C $ Millions)	55,364	85,865	165,445	190,027	207,714
B. Federal Government Indicators					
4. Purchases of goods and services (C $ Millions)	2,829	4,551	8,310	9,711	11,002
5. Planned continuing employment (thousands)	N.A.	255.9	306.6	322.8	328.6
6. Government ADP cost (C $ Millions)	26.8	80.1	244.6	270.6	310.2
7. Government ADP employment	2,300	4,540	7,734	7,715	7,919
C. Computing Indicators					
8. Number of computers	1,010	3,860	15,960	20,620	25,600
9. No. of computers, monthly rental $1K up	1,010	3,090	7,060	8,480	9,900
10. Value of computers (C $ Millions)	335	1,330	2,770	3,180	3,570
11. ADP employment (thousands)	25	68	96	108	114
12. User ADP costs (C $ Millions)	235	1,185	2,600	3,135	3,645

SOURCES: Statistics Canada: 1, 2, 3, 4.
Federal Government budgetary estimates: 5.
Treasury Board Secretariat: 6, 7 (except 1965, which are C/CS estimates).
Computer/Communications Secretariat: 8, 9, 10, 11, 12.

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TABLE 5: RATIOS OF COMPUTING INDICATORS TO NATIONAL AND FEDERAL GOVERNMENT INDICATORS IN CANADA

	1965	1970	1975	1976	1977
1. Number of computers per million population) all computers	51	181	703	897	1099
) $1K up computers	51	145	311	369	425
2. Installed value per capita (C $)	17	62	122	138	153
3. User ADP costs /GNP (%)	0.42	1.38	1.61	1.65	1.75
4. ADP employment/Total employment (%)	0.36	0.86	1.03	1.13	1.17
5. Fed. ADP cost/Total user cost (%)	11.4	6.8	9.2	8.6	8.5
6. Fed. ADP employment/Total ADP employment (%)	9.2	6.7	8.1	7.1	6.9
7. Fed. ADP cost/Fed. purchase of goods and services (%)	0.95	1.76	2.94	2.79	2.82
8. Fed. ADP employment/Total Fed. employment (%)	N.A.	1.8	2.5	2.4	2.4

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TABLE 6: ANNUAL COSTS OF INSTALLED EQUIPMENT, BY INDUSTRY SECTOR
(Based on a survey by the Informatics Institute of Canada)

	Estimated Equipment Expenditures			Annual Compound Growth	
	1970	1975	1980	1970-75	1975-80
		(C $000,000)		%	%
Industry Category					
Users-Public Sector	71	175	309	20.0	12.0
Federal Government	18	52	90	24.0	11.5
Prov./Mun. Governments	22	64	115	24.0	12.5
Other public institutions	31	59	104	14.0	12.0
Users-Private Sector	216	430	768	15.0	12.0
Financial Services	41	92	176	18.0	14.0
Distribution	19	43	95	18.0	17.0
Manufacturing	68	107	147	9.0	6.5
Resources	25	48	77	13.0	10.0
Transp./Utilities	40	84	161	16.0	14.0
Other industries	23	56	112	20.0	(1)
Computer Services Ind.	49	105	189	17.0	12.5
Total Revenues	335	710	1,266	16.0	12.0
Comp./Com. Secretariat Model Estimates (2)	335	710	1,260	16.0	12.0

NOTES:

(1) Information not adequate to establish meaningful growth rates.

(2) Estimates developed by the Secretariat. Computing equipment revenues less revenues from other equipment suppliers (see Table 1).

TABLE 7: PERSONNEL COSTS, BY INDUSTRY SECTOR

(Based on a survey by the Informatics Institute of Canada)

	1975 Estimates (C $000,000)	1980 Estimates (C $000,000)	1975-80 Growth Rates %	
Industry Sector				
Users - Public Sector	339	615	13.0	
Federal Government	99	170	12.0	
Prov./Munic. Government	120	246	15.5	
Other public institutions	120	199		(1)
Users - Private Sector	796	1,412	12.0	
Financial Services	172	315	13.0	
Distribution	82	150	13.0	
Manufacturing	201	341	11.0	(3)
Resources	67	104	9.0	
Transp./Utility	157	295	13.0	
Other industries	117	207		(1)
Total-User Organizations	1,135	2,027	12.0	
C/CS Model (2)	1,135	2,245	14.5	
Computer Services Industry	170	321	13.5	
C/CS Model (2)	170	380	18.0	
Total Personnel Costs	1,305	2,348	12.5	
C/CS Model (2)	1,305	2,625	15.0	

(1) Information not adequate to establish meaningful growth rates.

(2) Computer/Communications Secretariat Estimates including cost estimates for new user and industry entrants and users without in-house facilities.

(3) May be overstated because of abnormally high application development estimates supplied by the Manufacturing sector.

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TABLE 8: COSTS OF DATA TRANSMISSION, BY INDUSTRY SECTOR
(Based on a survey by the Informatics Institute of Canada)

	1975 Estimates (C $000,000)	1980 Estimates (C $000,000)	1975-80 Growth Rates %
Industry Sector			
Users - Public Sector	19	40	16
Federal Government	6.5 (1)	16	20
Prov./Munic. Government	7.5	13	12
Other public institutions	5	11	17
Users - Private Sector	91	221	19
Financial Services	20	48	19
Distribution	8	16	15
Manufacturing	11	16	8
Resources	8	16	15
Transp./Utility	32	98	25
Other industries	12	27	(2)
Computer Services Ind.	15 (1)	33	17
Total Expenditures	125	294	18
Comp./Comm. Secretariat Model Estimates	125	330	21.5

NOTES:

(1) Reported Expenditures.

(2) Information not adequate to establish meaningful growth rates.

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TABLE 9: PATTERN OF ADP SERVICES DEMAND AND SUPPLY IN CANADA

	Batch over-the-counter	Remote Computing	Data Conversion	Software & Programming	All other Services	Total
Distribution, 1974-76			(average %)			
Federal Government use	20.8	25.5	12.8	25.7	15.2	100
Commercial sales	38.4	28.5	6.7	22.0	4.4	100
Change in % Share			(% p.a.)			
Federal Government use: 1973-78	-3.3	+6.1	-5.9	-2.2	+5.1	--
Commercial sales: 1972-76	-9.8	+14.7	+5.4	+4.9	-4.6	--
Estimated Trend of User Demand			(%)			
1965	45	6	17	29	3	100
1970	34	20	13	26	7	100
1975	30	27	10	24	9	100
1980	24	35	7	21	13	100
1985	20	44	5	18	13	100
Estimated Trend of Commercial Sales			(%)			
1965	72	6	4	13	5	100
1970	60	14	5	16	5	100
1975	38	29	7	22	4	100
1980	22	44	7	24	3	100
1985	15	50	7	25	3	100

SOURCE:

Computer/Communications Secretariat: "The Growth of Computer/Communications in Canada" - March 1978.

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TABLE 10: CANADIAN USERS OF COMPUTERS: WITH AND WITHOUT IN-HOUSE INSTALLATIONS

A. Estimated number of users in 1976, according to sales volume.

Annual Sales Total	Total number of users	Users without computers	% Users without
Under $1 million	3,170	1,790	56.5
$1.0 - $4.9 million	6,500	3,520	54.2
$5.0 - $9.9 million	3,960	1,930	48.8
$10.0 - $49.9 million	2,870	850	29.6
$50.0 - $99.9 million	680	220	32.4
$100.0 - $199.9 million	360	90	25.0
$200 million and over	280	40	14.3
	17,820	8,440	47.4

B. Changes over time

1965	1,400	470	33.6
1970	4,410	1,750	39.7
1975	13,950	6,450	46.2
1980	34,230	19,680	57.5
1985	58,070	39,590	68.2

SOURCE:

Computer/Communications Secretariat

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TABLE 11: CANADIAN SOCIAL CONCERNS ABOUT COMPUTER USES

	Agree	Disagree	Not Sure
1. Automation Issue			
Computers cause unemployment	71%	24%	5%
2. Computer Error Issue			
Computers cause serious errors	69%	19%	12%
3. De-personalization Issue			
Problems caused by poor and unresponsive systems design	62%	29%	9%
4. Fair Information Reporting Issue			
Misuses and abuses of personal information	53%	36%	11%
5. Privacy Issue			
Invasion of personal privacy	37%	48%	15%

SOURCE: "Survey of Public Attitudes towards the Computer", 1973.

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