

A STUDY TO ANALYSE THE CURRENT AND PROJECTED
EXTENT OF TRANSBORDER DATA FLOWS INTO AND OUT OF
CANADA AND THE ECONOMIC IMPLICATIONS OF THESE FLOWS

DEPARTMENT OF COMMUNICATIONS

A REVIEW OF THE ECONOMIC IMPLICATIONS OF
CANADIAN TRANSBORDER DATA FLOWS

FEBRUARY, 1981

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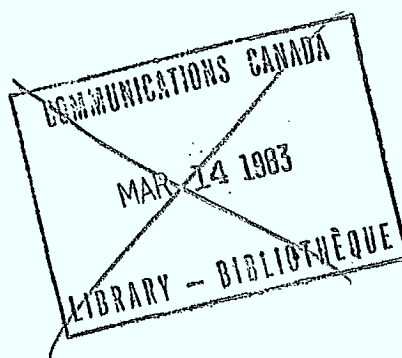
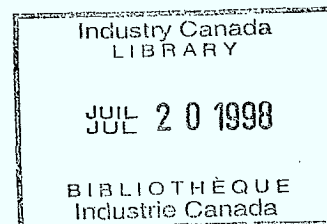
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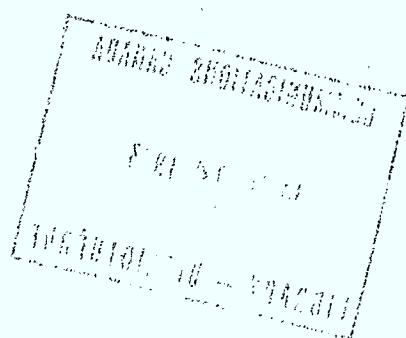
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DEPARTMENT OF COMMUNICATIONS

A REVIEW OF THE ECONOMIC IMPLICATIONS OF
CANADIAN TRANSBORDER DATA FLOWS

1. Background

Transborder data flows (TBDF) has emerged as a major international issue over the past three years. It is the subject of several initiatives underway in the Council of Europe, the Organization for Economic Cooperation and Development (OECD), and the Intergovernmental Bureau for Informatics (IBI). Canada will be actively involved in OECD Expert Group on transborder flow of non-personal data.

The Canadian Government has identified transborder data flow (TBDF) as an area that should receive Government policy attention. Concerns about TBDF are in the following three main areas:

- . National Sovereignty;
- . Privacy; and
- . Economics.

Only the latter, the economic implication of transborder data flows, is the subject of this review. Although transborder data flows covers a broad range of activities, we were primarily interested in the international flows of data between computers in regard to the following:

- . computing services purchased on an international open market;
- . computing services provided to Canadian operations or branches of a foreign affiliated company or organization; and

- . computer data transmissions essential to the proper international functioning of multinational enterprises.

The primary purpose of this study is to give the Department of Communications (DOC) an independent assessment of external studies and of their internal studies. The internal studies estimate the current and projected extent of transborder data flows and their economic implications for Canada. Quantitative analysis of the economic issues is required so that problem areas can be substantiated in a manner that permits policy options to be realistically assessed. We, therefore, were directed to critically review the March 1978 paper of the Computer/Communications Secretariat entitled, "The Growth of Computer/Communications in Canada".

Depending upon the outcome of our review, we were to either:

- . update the data and trends identified in the 1978 growth paper; or
- . outline requirements for original research which would provide the necessary information and data for policy development.

The scope of our work was limited to a review of existing studies. We did not carry out any original research.

2. Summary of Findings

2.1 Review of External Studies

We have reviewed a variety of background reports and studies supplied by the Department of Communications. These are listed in Appendix B. A great deal has been written on the economic aspects of TBDF. There have been several good attempts to conceptualize the issues and underscore their complexity. Some have developed an analytical framework as a guide for subsequent discussion of the issues or for future research. Unfortunately, none of this material contains results of studies dealing specifically with the economic impacts of TBDF.

Some of this background material contains fairly specific statements about the economic and managerial behaviour of commercial enterprises. These statements appear to stem from a concern or belief that trends in computer/communications technology and costs will result in greater centralized decision-making. This, in turn, will result in a migration of economic activity and managerial autonomy towards corporate head office, at the expense of subsidiary operations and the host country. However, many of these issues and their underlying beliefs are still speculative at this stage. We have seen little evidence of research to produce conclusions that would support these concerns or even outline the potential magnitude of their negative economic impact.

This is not surprising at such a formative stage in our understanding of the economic dimensions of the TBDF issues. However, there has been some exploratory work involving about 30 multinational companies in Europe. The study concludes that TBDF is generating significant positive economic benefits to companies that are advanced in the use of computer/communications technology. These benefits result from increased productivity and the ability to better plan, coordinate and control international financial, production, distribution and

marketing activities. This may explain multinationals' strong interest in unimpeded and unregulated TBDF.

Computer/communications technology, and the resulting TBDF, apparently improve the efficient international allocation of resources by improving firms' productivity and quality of management. Will these benefits outweigh the sum total of possible negative effects for all members of OECD? Will some member countries enjoy net positive benefits at the expense of other member countries? The Secretariat of the OECD has just raised these issues. Extensive study and research will be required to resolve them. They may never be resolved by quantitative economic data because of the technical complexity of such an approach. These issues are likely to be regarded as political, ultimately, and will probably be resolved through extensive multilateral negotiations.

Studies to date have tended to be exploratory. They describe which data flows across computer networks and how some companies use these networks. This work is useful in understanding the broader picture. It is not specific enough to assess net economic impacts associated with the overall activities of multinational companies or, more specifically, with their EDP related activities.

2.2 Review of Internal Studies

"The Growth of Computer/Communications in Canada", published in March 1978 by the Computer/Communications Secretariat, is the key internal study. It is the only study that attempts to quantify specific economic aspects of TBDF into and out of Canada. It estimates the economic activity derived from Canadian users of computer based products and services, and those of the computer services industry.

With regard to commercial users, it focuses on economic impacts from the management of the firm's EDP function - from the provision of

computer based services for use by other functional areas of the firm. Its purpose was not to estimate the economic impacts arising from the broader, much more complex issues surrounding:

- . the role of TBDF in the overall management of multinational enterprises;
- . the economic impacts that may arise from improved productivity, coordination and control of firms' international operations through the use of TBDF;
- . the economic impacts that may arise from a migration of managerial and internal, non EDP, economic activity towards corporate offices from subsidiary operations through the use of TBDF.

The work we reviewed provides a good, 1975 order of magnitude estimate for the total amount of money spent by Canadian users for computer based products and services. It includes services provided by internal resources, affiliated companies or through purchases from the computer services industry. Total expenditures by Canadian users for computer based products and services amounted to about \$2.7 billion in 1975. Although we have less confidence in the future estimates because of weaknesses in available data, it is not unreasonable to anticipate expenditures of about \$9.5 billion by 1985 (in 1985 dollars). This is equivalent to an average annual growth rate of about 13%.

From a balance of trade perspective, the current situation is not at all encouraging. Future prospects look considerably worse - assuming a continuing lack of effective policies in this area. Virtually all of the computer based hardware used in Canada is imported. Industry, Trade and Commerce have attempted to counter this trade deficit through a policy of rationalization. They attempt to encourage

multinational firms operating in Canada to rationalize their global or North American activities. However, staff at IT & C are not entirely satisfied with the results.

Excluding computer equipment, DOC estimates that the trade deficit in computer based services amounted to about \$125 million in 1975. It estimates that this will grow to about \$1.4 billion by 1985 (in 1985 dollars). We can not concur with that estimate for reasons discussed in subsequent sections. However, we do believe that an extensive deterioration in balance of trade in computer based services is quite possible.

Our concern about a potentially large increase in lost Canadian economic activity stems from a belief that there will be increasing importation of: specialized computer processing services; data base information services; systems and software development services; and applications packages developed for sale by large software houses. Commercial users are finding it increasingly difficult to hire and keep data processing professionals and increasingly costly to develop and maintain all their own systems and software. This may have two results: a greater use of centralized in house resources and a greater proportion of computer services purchased on the open market. Given the relatively high proportion of direct foreign investment in Canada, both these results could translate into greater importation of computer based services at the expense of highly skilled Canadian jobs.

2.3 Conclusions

Our conclusions are based on a review of the external and internal studies listed in Appendix B; discussions with senior staff at DOC; internal discussions with senior professional staff in our own EDP consulting practice; meetings with a limited number of user and

industry executives; and our general knowledge of the subject matter acquired through a variety of studies in the computer services industry, including previous interviews with many users of computer/communications technology.

In summary, our conclusions are:

- 1) Although there is no hard data on the extent of TBDF, available information suggest that growth in TBDF stems from:
 - (a) the increasing role of information activities in the developed market economies;
 - (b) the growth of international trade;
 - (c) the growth of foreign direct investment and of multinational corporations; and
 - (d) international specialization in the provision of information services.
- 2) The growth in TBDF will continue and may even accelerate for a while due to:
 - (a) improvements in computer/communications technology and improving performance vs cost;
 - (b) continued growth in direct foreign investment and multinational corporations; and
 - (c) increasing need for improved management of multinationals' global business activities. This will increase data and information flows to improve planning, coordination and control of geographically dispersed operations.
- 3) We believe that there is adequate cause for concern about a significant deterioration in our trade deficit, particularly with the U.S., in the area of computer

based services. It is quite possible that Canadian users will obtain a growing proportion of their service requirements from foreign based commercial suppliers or from internal resources located at foreign based parent companies.

- 4) There appears to be three broad subject areas concerning the economic dimensions of TBDF:
 - (a) International trade in computer based services. This includes general purpose and specialized data processing services; applications software packages; data base information services; consulting and turnkey systems implementation services*.
 - (b) Specialized computer based information networks. These support a variety of special purpose services involving airline reservations, international banking, stock and commodity exchanges, weather forecasting, scientific and technological information retrieval, credit verification and charge card services.
 - (c) Data and information flows generated by the intra-corporate needs of commercial enterprises and other organizations. This may be further subdivided:
 - i) the role of TBDF in the management of the overall business activities of multinational companies and their associated positive and negative economic impacts;
 - ii) the role of TBDF in the management of the EDP function within commercial enterprises and the economic impacts associated with the way these companies obtain computer based services.
- 5) The DOC internal studies focused on quantifying the Canadian economic impacts associated with items 4(a) and 4(c)(ii) above. The estimates and forecasts quantifying the trade deficit aspects (dollars and lost

* Parallel attention is required on the equipment or hardware aspects of these international trade issues.

employment) are not based firmly enough for policy formulation and assessment of options.

- (6) A proper assessment of policy options requires better information on trends, and their underlying causes, by type of computer based service or product. Although public discussion to date has emphasized data transmission and processing outside Canada, most of the potential job loss is probably related to imported software.

2.4 Recommendations

The DOC's initiative in quantifying the economic aspects of TBDF has focused on computer based services rather than computer or communications hardware and equipment. Our trade performance in equipment appears to be the responsibility of Industry, Trade and Commerce. It falls within their policy on corporate rationalization of manufacturing and other functional activities such as R & D. The DOC has limited the scope of its previous work to: the services side of the commercial computer services industry; and to the economic impacts arising from the EDP function within commercial enterprises and other organizations.

In the short to medium term, we recommend that DOC continue with work in these two key areas until policies have been formulated, assessed and implemented. We believe that this is the most productive area for immediate work because:

- . there is reason to believe Canadian commercial users will obtain a higher proportion of their computer based service requirements from foreign sources, either commercial vendors or affiliated companies;

- . the Canadian computer services industry and Canadian commercial users are generating substantial economic activity now; there is likely to be strong growth in this activity and these two groups lend themselves to fairly specific, quantifiable research in the short term; and
- . implementation of policy initiatives in this area are feasible in the short term. They can probably be implemented unilaterally and thereby avoid prolonged negotiations with GATT or OECD partners. The prospects for a payback in the near term is reasonably good.

Further research on the role and economic impacts of TBDF in the management of the overall business activities of multinational companies is desirable. However, this is a very complex area of investigation and will require a sectoral approach. A great deal of descriptive and exploratory work will be required before you can even attempt to develop a methodology to quantify the associated economic impacts. In the final analysis, these issues are likely to be more political than economic and will involve extensive multilateral negotiations. Notes from the Secretariat of the OECD (Paris, 19th December, 1980) provide a fairly realistic outline of the issues and scope of work that could be undertaken in this area. The OECD Expert Group on Transborder Data Flows may be the best vehicle for initiating research in this area.

In summary, our recommendations are:

- 1) develop and implement policies for the short to medium term by building on the work already started by doing additional research among Canadian commercial users of

computer/communications and the Canadian computer service industry;

- 2) quantify the imports of computer based services by type of service and by type of source (e.g. service bureau, software house, parent);
- 3) identify trends in Canadian commercial user requirements and sources of services, and their underlying causes, by type of service;
- 4) explore how multinational companies with Canadian operations plan to organize and manage their EDP functions - computer processing, systems development, software development and maintenance - and how much flexibility they have in allocating these activities among the various host countries; and
- 5) explore, in general terms, how trends in computer/communications and TBDF are likely to affect the way they manage and control their global business activities. Assess the impact this may have on their demand for computer based services and the migration of other economic and managerial activity towards corporate offices.

A concentrated and well planned effort as proposed in Sections 6 and 7 can give DOC the information it needs to develop credible policy proposals. We feel that this is a practical and a feasible approach that can generate tangible benefits for Canada in the near term. This additional research could be completed before the end of spring, 1982.

3. Overview of Economic Issues

This section provides an overview of the economic issues raised in previous studies of TBDF. Some of the economic effects hypothesized in the literature would be drastic and sweeping. The supporting evidence, however, generally consists of individual examples, limited number of case studies, quotations from other authors or theoretical generalization. Since there are legitimate questions as to the importance or even the existence of these effects, available evidence is inadequate as a basis for any major policy initiatives.

"The Growth of Computer/Communications in Canada", a paper by the former Computer/Communications Secretariat (C/CS), is different. It attempts to estimate and forecast Canada's total imports and exports of computer services and the resulting employment impact. Section 4 provides a summary of these estimates and our critique the supporting data.

In the balance of this section, we provide a general assessment of the literature on the economic impact of TBDF under the following headings:

- . industrial organization and the international division of labour;
- . corporate organizational structure;
- . employment;
- . balance of payments;
- . competitiveness of Canadian computer service industry;
- . cost/benefit to corporations;
- . economic sovereignty;
- . redress of consumer grievances; and
- . sources of supply of materials.

3.1 Industrial Organization and the International Division of Labour

Many of the studies reviewed focus on the possible effects of TBDF on industrial organization and the international division of labour. It is hypothesized that the ability to transmit data for planning, co-ordination and control was a key factor enabling large multinational enterprises to be established since World War II. It is also argued that TBDF allows production and inventory levels to be rationalized on a worldwide basis, providing multinationals with cost advantages over national firms. A related assertion is that TBDF makes it easier to balance production in one country with sales in distant countries, reducing locational constraints.

These hypotheses are certainly related to the international flow of information, but in many cases it is probably a summary of key item information. Summary data is very often transmitted by courier telex or long distance telephone, rather than by a computer to computer. Moreover, no one has yet seriously questioned the need of multinationals to send some summary information across national boundaries.

This is a very complex area for conducting research and it may not be possible to quantify the economic impacts arising from these types of TBDF issues. In our opinion, long-term research, on a sectoral basis, is probably required to further explore these issues and to develop a methodology to estimate their economic impacts.

3.2 Corporate Organizational Structure

TBDF has been associated by some authors with a centralization of key management decisions at the headquarters of multinationals.

As a rule, the types of decisions made by senior managers are likely to be based on summary or key item information, combined with a large measure of qualitative input or data from outside the company's normal

information system. Moreover, if the volume of information used is relatively slight, it is implausible to suggest that the location of data processing would dictate the location of decision-making, or vice versa.

Computerization does, however, make the production of summary information simpler and less expensive. This would make it easier for a corporation whose management prefers to centralize to do so. Moreover, in some functions such as cost management and production scheduling, there may be a real prospect of greater cost savings through centralization. On the other hand, management theory has generally favoured decentralization, with accountability based on a limited number of indicators such as return on investment.

The issue of the impact of computerization on corporate organizational structure cannot be resolved on a theoretical basis or by isolated examples. Systematic research is necessary. However, the case studies done to date show how difficult it is to collect reliable information on such a broad and sensitive topic. These issues, like those in the previous section require a longer term focus and research effort using a sectoral approach. Different industries face different economic constraints and the companies within any given industry are likely to exhibit a variety of management styles.

3.3 Employment

TBDF has been hypothesized to effect employment on at least four levels:

- . computer operations;
- . systems development;
- . managerial and staff positions outside the EDP function; and

- . changes in the location of production facilities.

The possibility that TBDF may result in changes in the location of production facilities is related to the hypothesis that it effects the international division of labour. Moreover, we are not aware of any systematic attempt to quantify effects at this level.

The relationship of TBDF to employment in managerial and staff positions outside the EDP function was discussed earlier under the heading of Corporate Organizational Structure. We understand that the impact of TBDF was very questionable. Computerization generally may have an effect, but it would be very difficult to quantify and we are not aware of any systematic attempt to do so. This also is likely to require a long-term research effort.

TBDF will obviously have a direct effect on employment at the other end of the spectrum, those in computer operations. However, the actual operation of the computer requires few people and they are not highly paid.

There has been relatively little discussion of the effect of international trade in computer services on employment in systems development. There are indications that the effects may be very considerable. There is a worldwide shortage of systems analysts and programmers, and of people to manage them. Partly because of this shortage, systems development has become a very expensive process.

Multinationals may, therefore, be inclined to develop systems at the corporate level where possible, rather than duplicate effort in each country. This implies a greater degree of standardization in administrative procedures, reducing the discretion of subsidiaries in this area. Such corporate-wide systems need not necessarily be developed

at head office. This may be an area where public policy can have an influence.

The cost, time delays and uncertainty of in-house systems development appear to be resulting in a rapidly growing market for standardized software packages. Most of these currently originate in the United States. It may also be increasingly difficult for new suppliers to penetrate this market because of the importance of maintenance throughout the software package's life cycle. Maintenance includes modifications to the programs to take into account changes in computer technology, legal requirements or business practices, or to correct deficiencies. Corporations will probably prefer to buy from well established software houses which are more likely to remain in business and, therefore, to maintain their software packages.

Some argue that the shortage of systems development personnel makes the loss of employment opportunities purely theoretical since qualified Canadians are not available. However, government could seek to overcome such problems through manpower programs.

It should also be noted that the loss of employment opportunities in systems development is only partly related to TBDF. A multinational might well decentralize systems development but leave processing centralized. Or it could conceivably centralize systems development, but distribute processing activities among its subsidiaries. In our opinion, however, it is more useful for government to consider all forms of trade in computer services, not just those where TBDF is involved. The transmission of summary or key item information would, however, be excluded because it does not involve trade in any normal sense.

To summarize, we believe that Canada faces the threat of losing a significant number of well paid systems development jobs. Multinationals

will tend to centralize in-house systems development outside Canada and corporations of all types will rely increasingly on imported software packages. However, no systematic data is available to show how significant the problem is or what strategies computer users expect to follow in the future.

3.4 Balance of Payments

The first step in evaluating the balance of payments impact of TBDF is obviously to quantify total imports and exports of computer services. The only estimates of which we are aware are those in the paper, "The Growth of Computer/Communications in Canada".

One major complication in estimating the balance of payments impact is that a parent company may not make any explicit charge to its subsidiary for processing or for programs developed at head office. Instead, the cost may be recovered through dividends or a general management services fee.

A second complication is that there is effectively no tariff on computer software, and no evaluation made for customs purposes. Therefore, there is no standard source of information on software imports.

Apart from imports and exports of computer services, TBDF may also be said to have an effect on short-term capital flows. It has been suggested that the international cash management practices of multinationals contribute to exchange rate fluctuations. Such management clearly depends on the flow of information.

3.5 Competitiveness of Canadian Computer Service Industry

Large scale imports of computer processing or systems development services could threaten the viability of Canadian service bureaus and software houses. Their domestic market base might become inadequate.

On the other hand, firms in this industry are very anxious to maintain their access to export markets, and have therefore generally opposed barriers to imports.

Canadian service bureaus have generally been more concerned about the high cost of computer equipment in Canada. Most such equipment is imported, and faces tariffs as well as federal sales tax. It has also been argued that long distance telecommunications rates are higher in Canada than in the U.S., and that this creates a further disadvantage for Canadian service bureaus. On the other hand, those firms have generally been quite successful in terms of revenues. Also there does not appear to be large scale penetration of the Canadian market by U.S. service bureaus to date.

The competitiveness and survival of the Canadian software industry may be a cause for more immediate concern, as explained earlier. Moreover, the survival of both industries may be linked. Service bureaus would previously offer low-cost computer time because of economies of scale in hardware. However, equipment costs continue to decline and economies of scale are decreasing. The survival of service bureaus may therefore depend on their ability to offer not just computer time but the use of high quality proprietary software. However, we again lack systematic information about Canadian service bureaus. Where are they obtaining their software and what factors really influence users in choosing a service bureau? A short- to medium-term research program could answer these questions and provide information for policy development in this area.

3.6 Cost/Benefit to Corporations

If corporations choose to engage in trade in computer services, they presumably expect some cost saving or other benefits. The potential cost advantages of centralizing systems development or providing

systems packages are clear. Whether centralization of data processing saves money is less clear, given the cost of data communications and the falling cost of computer processing, particularly for smaller machines.

If imports of computer services do offer cost savings to corporations, it may ultimately be passed on to consumers through lower prices, depending on competitive conditions. An attempt to prevent businesses in Canada from profiting from such savings could also impair Canada's international competitiveness in all sectors. However, we have no idea at present about the extent of the cost savings which may be involved. A survey of users of computer based services could provide valuable information for policy development in this area.

3.7 Economic Sovereignty

Some authors have expressed concern that TBDF will result in corporate data vital to national economic policy being inaccessible to a government because it is stored outside the country. It is a legal question whether governments could gain access to such information.

There could also be concern that the centralization of decision-making at the headquarters of multinationals could make it more difficult for the governments of host countries to influence such decisions. The relevance of TBDF to such concerns depends on the validity of arguments about its effect on corporate organizational structure.

3.8 Redress of Consumer Grievances

Concern has been expressed that Canadian protection laws may be ineffective in relation to data on Canadians stored outside the country. How these laws could be rendered effective is a legal question. The centralization of decision-making by multinationals could also reduce their responsiveness to consumer complaints generally or to those in

other countries. However, this is only a hypothesis, and one that would be very difficult to test.

3.9 Sources of Supply of Materials

TBDF might also conceivably effect the choices corporations make about the sourcing of materials. This could occur if production planning and control of inventories, including ordering of materials, were highly centralized with the help of TBDF. Negotiations with key suppliers would, however, be centralized without TBDF because the volume of data required is small. Again, the linkage between those concerns and TBDF is not well known. These issues should be addressed along with other similar issues in a long-term research program.

3.10 Summary

In our opinion, it is reasonable to believe that transborder flows in computer services has an impact on employment, the balance of payments and the competitiveness of Canadian service bureaus and software houses. The information available on this impact is, however, inadequate. Better data on the costs and benefits to corporations would also be useful. The broader impacts hypothesized for TBDF in areas such as industrial organizations, corporate organizational structures, economic sovereignty, redress of consumer grievances and sources of supply of materials are not promising subjects for quantitative research. The possible impacts are either too general to be measured reliably or are not related specifically to transborder flows in computer services.

We have grouped the economic aspects of TBDF on the basis of whether short- to medium-term research or long-term research is required to provide additional information for policy development.

. Short- to medium-term research - can provide the information required for economic policy development in the following areas:

- international trade in computer based services such as those provided by Canada's computer service industry;
- the management of the EDP function within commercial enterprises (domestic and multinational) and the economic impacts associated with the way they obtain computer based services.

. Long-term research - is required to explore and develop a methodology for estimating economic impacts and to provide information for policy development in the following areas:

- the use of computer/communications technology and the role of TBDF in the overall management of multinational corporations' diverse operations and its cost/benefit impacts;
- migration of managerial and staff positions from subsidiaries back to corporate head office;
- costs and benefits of requiring copies of specified data and information to be maintained in Canada or other approaches to protect economic sovereignty or redress consumer grievances.

In the latter part of this report, we have outlined an approach to gather information required for policy development in the areas discussed under short- to medium-term research. We have focused on these areas because: the issues are reasonably well focused; there is currently a large amount of economic activity associated with these issues which will increase substantially in the future; there is a strong need for policy development and implementation in the medium

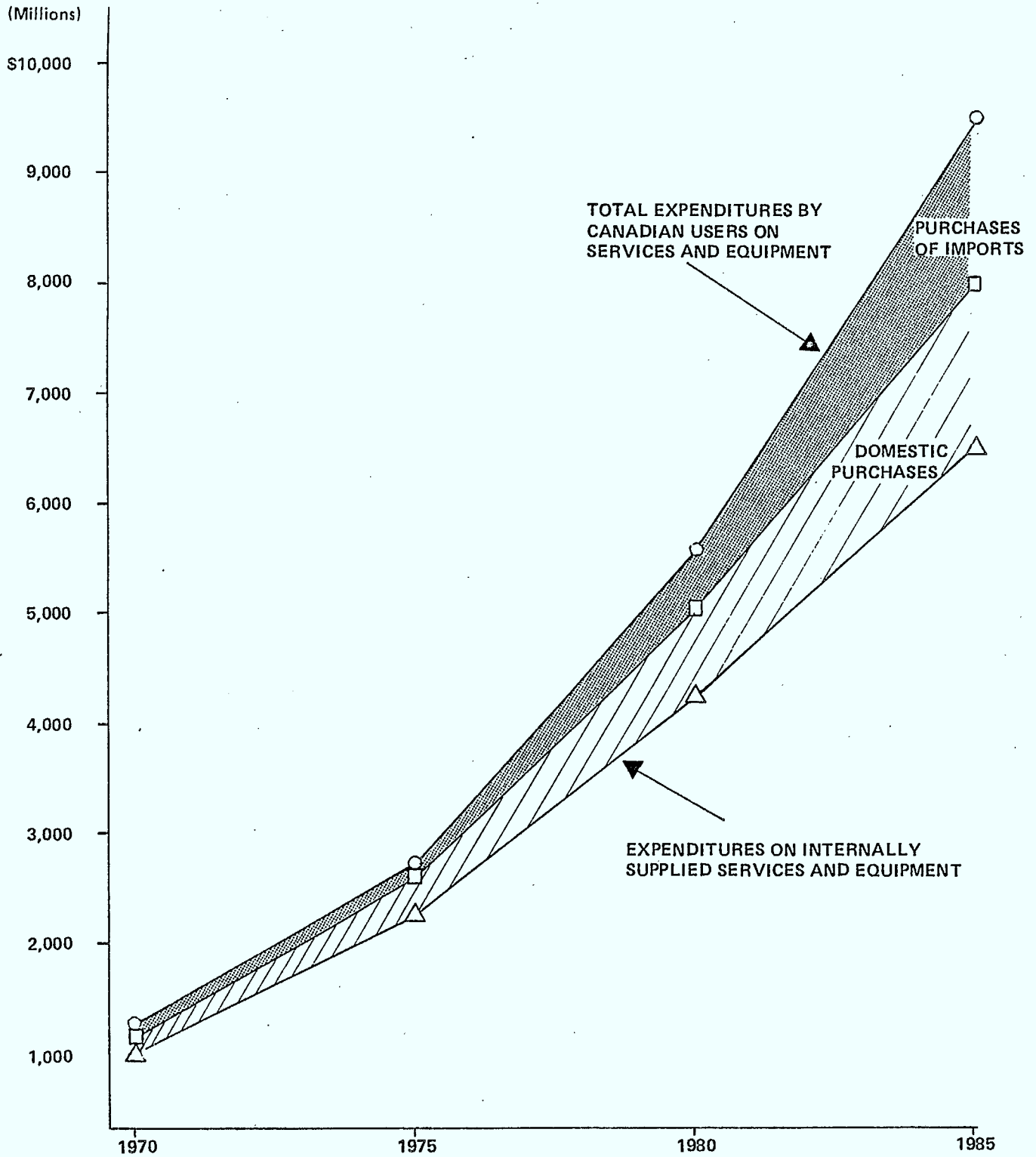
term to avoid a potentially large trade deficit and loss of Canadian employment; and the prospects for a payback through unilateral action is reasonably good.

The issues discussed under long-term research are equally, if not more, deserving of government policy attention. However, they are more fundamental and complex. They will require more exploratory research to better focus the issues and estimate their economic impacts. It will be difficult to implement policy without due regard for the economic and political consequences for our GATT and OECD partners because the issues largely arise from the activities and behaviour of multinational enterprises. Furthermore, the scope of policy initiatives cuts across numerous government departments. It will probably be impossible to implement, or even formulate policy options, without a major restructuring of government responsibility, authority, accountability and organization to face the TBDF challenge. Traditional, departmental approaches to policy development and responsibility are probably inadequate to deal effectively with such broad, complex issues. In our opinion, it is not feasible to outline a program of long-term research until these government organizational issues are resolved.

THE CANADIAN COMPUTER BASED SERVICES
AND EQUIPMENT MARKET

EXHIBIT I

BASED ON "THE GROWTH OF COMPUTER/COMMUNICATIONS IN CANADA"



4. Analysis of "The Growth of Computer/Communications in Canada"

4.1 Overview of the Estimates of Economic Impacts

This overview of the economic impacts of transborder data flows was obtained from, "The Growth of Computer/Communications in Canada". Our critique of the methodology used to produce these estimates of economic impact follows this overview.

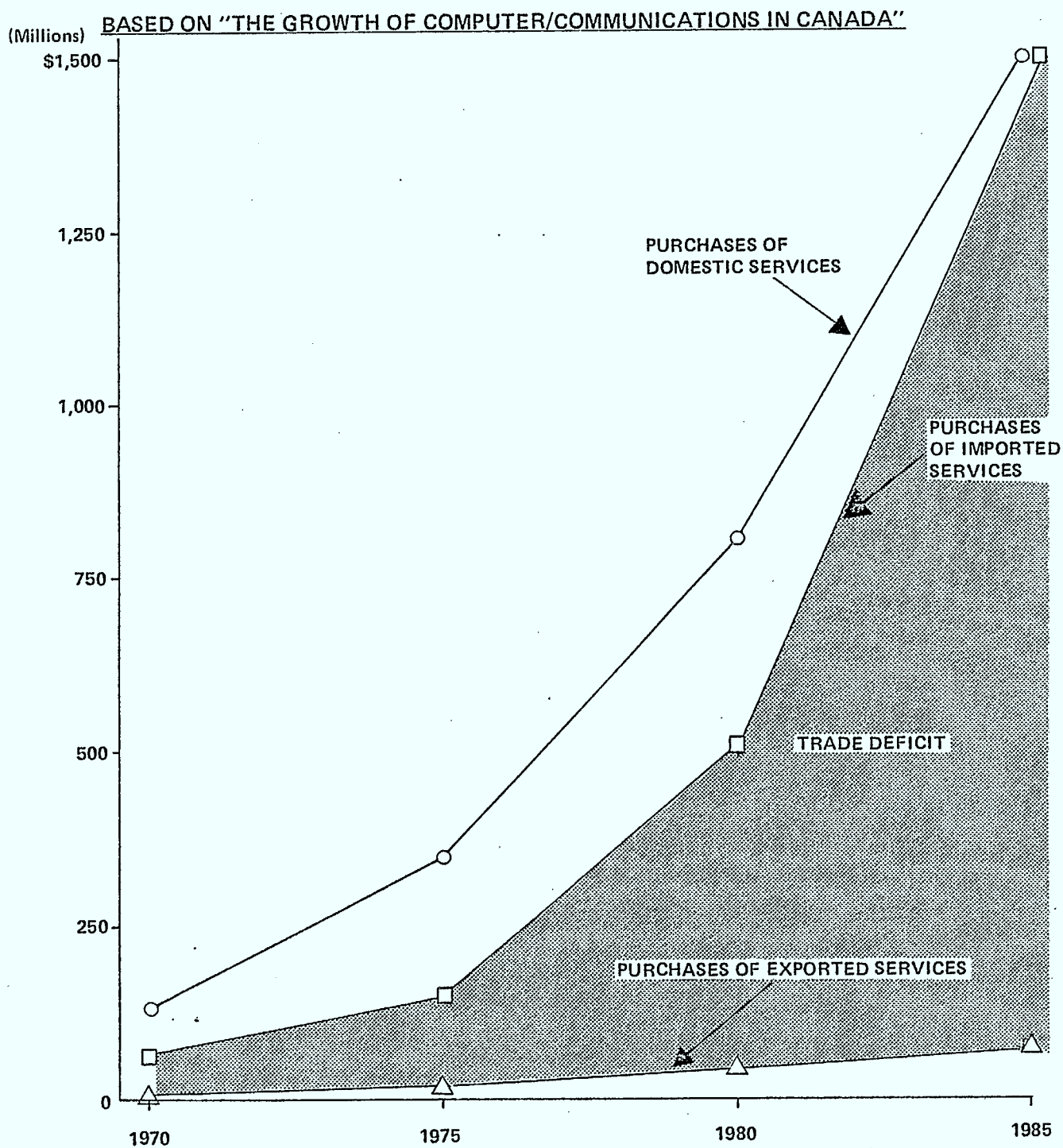
The growth in expenditures on computer/communications services during the period 1970-1985 is shown in the facing graph. The Canadian market for computer based services and equipment is defined as the sum total of expenditures by Canadian users. As can be seen from this graph, the total expenditures breaks down to the following components:

- . expenditures on internally supplied services and equipment. This includes expenditures on staff, data processing equipment, telecommunications and other items to provide computer based services from internal resources;
- . open market purchases of domestic services. This includes computer based services provided primarily by commercial service bureaus and software houses;
- . purchases of imported services including open market purchases from foreign based service bureaus and software houses, as well as closed market purchases or transactions mainly between Canadian subsidiaries of foreign parent companies.

The two shaded portions of the graph represent the amount of services being provided from sources external to the Canadian operation. In

EXTERNAL SOURCES AND FOREIGN TRADE
IN COMPUTER BASED SERVICES
(EXCLUDES EQUIPMENT)

EXHIBIT II



other words, Canadian users are expected to obtain a growing proportion of their total computer based requirements from outside sources and a lesser amount from in-house resources located within Canada. These proportions and the associated dollar amounts are shown in Exhibit A-1 in the Appendix.

The various growth rates implied by the previous graphs are summarized in the following table.

Table 1

GROWTH RATES IN THE CANADIAN COMPUTER
BASED SERVICES AND EQUIPMENT MARKET

<u>Period</u>	<u>Total Expenditures</u>	<u>Internal Cost</u>	<u>Domestic Purchases</u>	<u>Imported Services</u>
'80-'85	11%	9%	12%	22%
'75-'80	16%	14%	19%	30%
'70-'75	18%	17%	22%	16%

Much of the data used to generate the estimates shown in Exhibit I were carried out in the early to mid 1970's. The average rate of price inflation then was about 6%. Therefore, the above estimates do anticipate significant real growth in expenditures for computer based services.

The growth in computer based services supplied by external sources, both domestic and foreign is summarized in Exhibit II opposite. The shaded portion of this graph represents Canada's trade deficit in computer based services which is projected to be quite large by 1985.

The graphs also show that Canadian users are expected to spend as much on the purchase of domestic services as on the purchase of imported

services by 1985. Imported services refers to those provided on the open market by foreign based service bureaus and software houses. It also includes those purchased from or provided by affiliated companies or organizations located in a foreign country (i.e. closed market transactions). Purchases of domestic services on the other hand refers only to open market transactions between Canadian users and the Canadian computer services industry. The value of exported services refers primarily to open market purchases by foreign companies or foreign affiliates of Canadian based companies.

The following table summarizes the growth rates implied in the facing graphs:

Table 2

GROWTH RATES IN EXTERNAL SOURCES AND
FOREIGN TRADE IN COMPUTER BASED SERVICES

<u>Period</u>	<u>Total Purchases</u>	<u>Domestic Purchases</u>	<u>Imported Services</u>	<u>Exported Services</u>
'80-'85	16%	12%	22%	8%
'75-'80	23%	19%	30%	10%
'70-'75	20%	22%	16%	20%

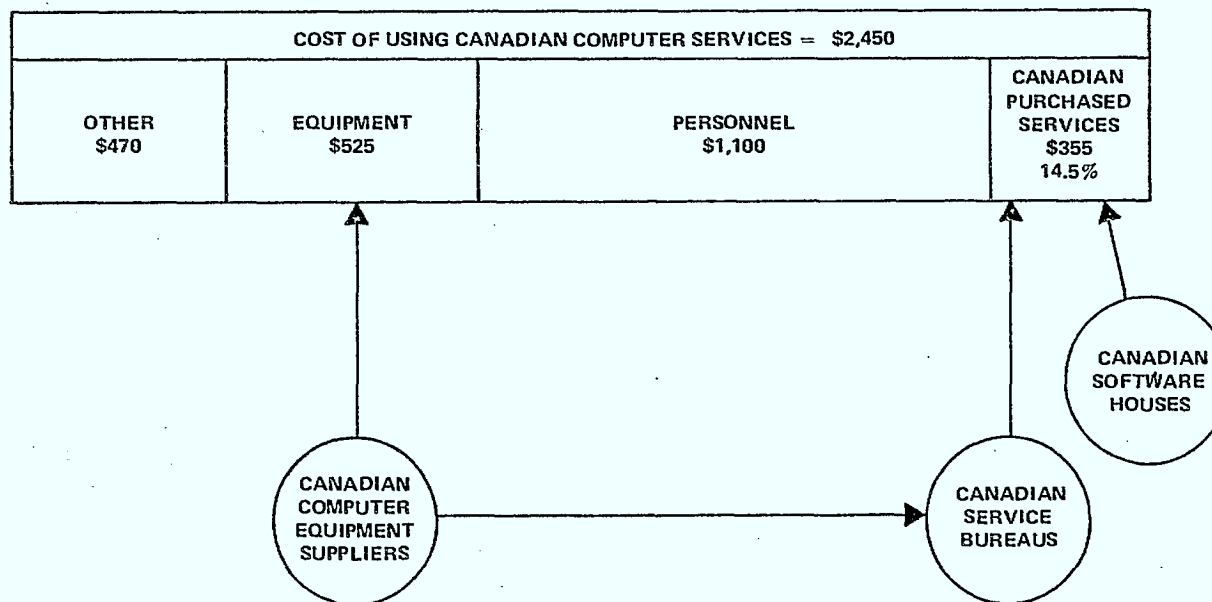
This data was developed when the annual rate of price inflation was averaging about 6%. The graphs imply fairly significant real increases in purchases of domestic services. However, the authors of the growth paper anticipated a much more rapid increase in the purchases of imported services. The resulting large increase in trade deficit occurs because of the minimal growth in the value of exported services to offset growing imports.

The dramatic increase in Canada's trade deficit in computer based services is based on the following premises:

- . multinational corporations are following a trend towards centralized computer processing at their foreign head office due to recent improvements in data communications reliability and costs;
- . computer systems development and program maintenance activities of foreign multinationals will gravitate towards their foreign based computer centre;
- . a rapid increase in the importation of computer applications packages, specialized computer processing and data base information services, primarily from open market transactions with U.S. based suppliers;
- . as Canadian service bureaus penetrate the U.S. market, they will open computer centres there instead of exporting services from their Canadian operations because of the cost advantages enjoyed by a U.S. based facility.

Although the forecasted trend in our trade deficit is based on the above, there is no documented evidence to support these premises. They are the opinions of staff within the Department of Communications. They are believed to be an accurate reflection of the opinions of some knowledgeable executives within the Canadian computer services industry and the views of some executives with major Canadian users of computer based services.

DOMESTIC MODEL FOR 1975
SIMPLIFIED FROM "THE GROWTH OF COMPUTER/COMMUNICATIONS IN CANADA"
(IN MILLIONS OF DOLLARS)



4.2 Structure of the Model for 1975 Estimates

The only existing estimates of Canada's external trade in computer services are in a paper entitled, "The Growth of Computer/Communications in Canada", issued by the Computer/Communications Secretariat in 1978. We reviewed this paper in depth, together with various supporting documents and working papers. In our opinion, it provides a good order of magnitude estimate of total computer/communications user costs in 1975. It also shows the elements of the analytical framework required to study trade in computer services. However, the paper's estimates and forecasts of external trade are not firmly enough based or sufficiently detailed to permit a satisfactory assessment of policy options.

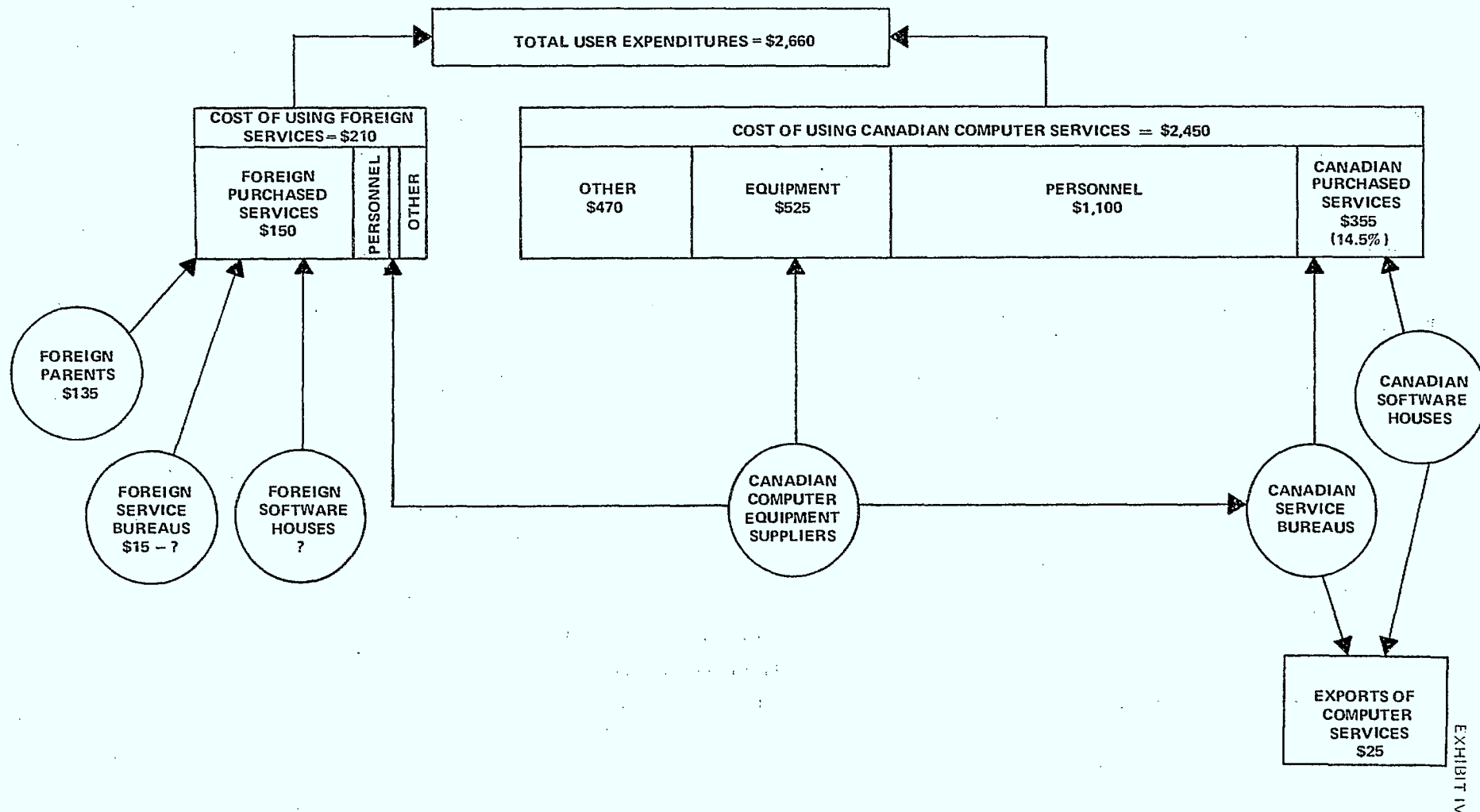
The model was originally developed from data on the use of Canadian computer services. A simplified version is shown in Exhibit III opposite. Data on the sales of Canadian computer equipment suppliers, service bureaus and software houses were taken from Statistics Canada's annual survey of the Computer Service Industry (catalogue 63-222). Estimates of the percentage distribution of user budgets were developed based on the following sources:

- . The annual "Review of EDP in the Government of Canada" published by Treasury Board;
- . The budget data for computer service firms (service bureaus and software houses) which is part of the Statistics Canada publication; and
- . special tabulations of budget data collected in the course of the DATACOM '76 survey of leading data communications users, conducted by Price Waterhouse for the Department of Communications.

EXTENDED MODEL FOR 1975

SIMPLIFIED FROM "THE GROWTH OF COMPUTER/COMMUNICATIONS IN CANADA"

(IN MILLIONS OF DOLLARS)



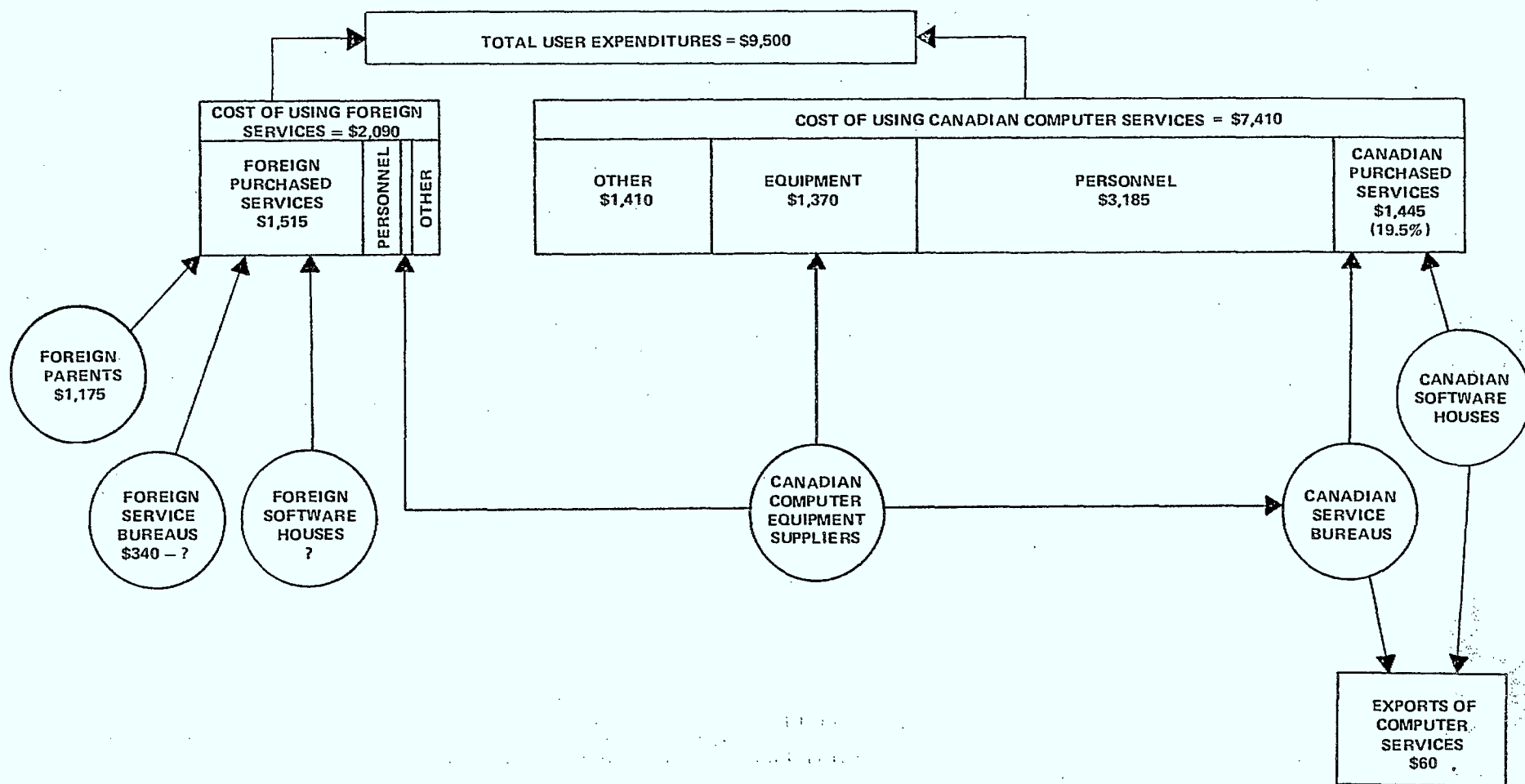
Total user costs for computer services* were then estimated by taking the dollar amounts for purchased services or equipment costs and dividing by the corresponding budget percentages. In the simplified version in Exhibit III, the \$355 million estimated to have been spent in 1975 on purchased services is divided by 14.5%, the estimated percentage of user budgets devoted to purchased services, to arrive at an estimate of \$2,450 million for total user costs. This roundabout procedure obviously increases the risk of error. However, there is no better approach given the data available. The results appear to be reasonable.

The extension of the model to include external trade in computer services, as shown in Exhibit IV opposite, is much more tenuous. The percentage of computing carried out in 1975 using computers outside Canada was estimated at 5.8% based on a series of small telephone surveys. This percentage of foreign computing was applied to the estimated cost of using Canadian computer services to produce a figure for the cost of foreign purchased services. Canadians using foreign computer services still incur some costs in Canada, for example, data entry terminals and people to operate them. Based on the nature of these costs, it was judged that 28% of the EDP budgets of these users would be spent in Canada. The total cost of using foreign computer services was therefore estimated by dividing the estimated cost of the services themselves by 72%.

With respect to exports of computer services, figures on export sales by Canadian service bureaus and software houses were available from the Statistics Canada survey. However, these sales were believed to be seriously understated because foreign parent company users are often billed through a Canadian subsidiary, and therefore appear to be Canadian users. The figure of \$25 million actually used in the model was based on discussions with major service bureaus.

* Total user costs for computer services included hardware, personnel, service bureau charges, accommodation, supplies, and other miscellaneous costs associated with the use of computer services.

EXTENDED MODEL FOR 1985
SIMPLIFIED FROM "THE GROWTH OF COMPUTER/COMMUNICATIONS IN CANADA"
(IN MILLIONS OF DOLLARS)

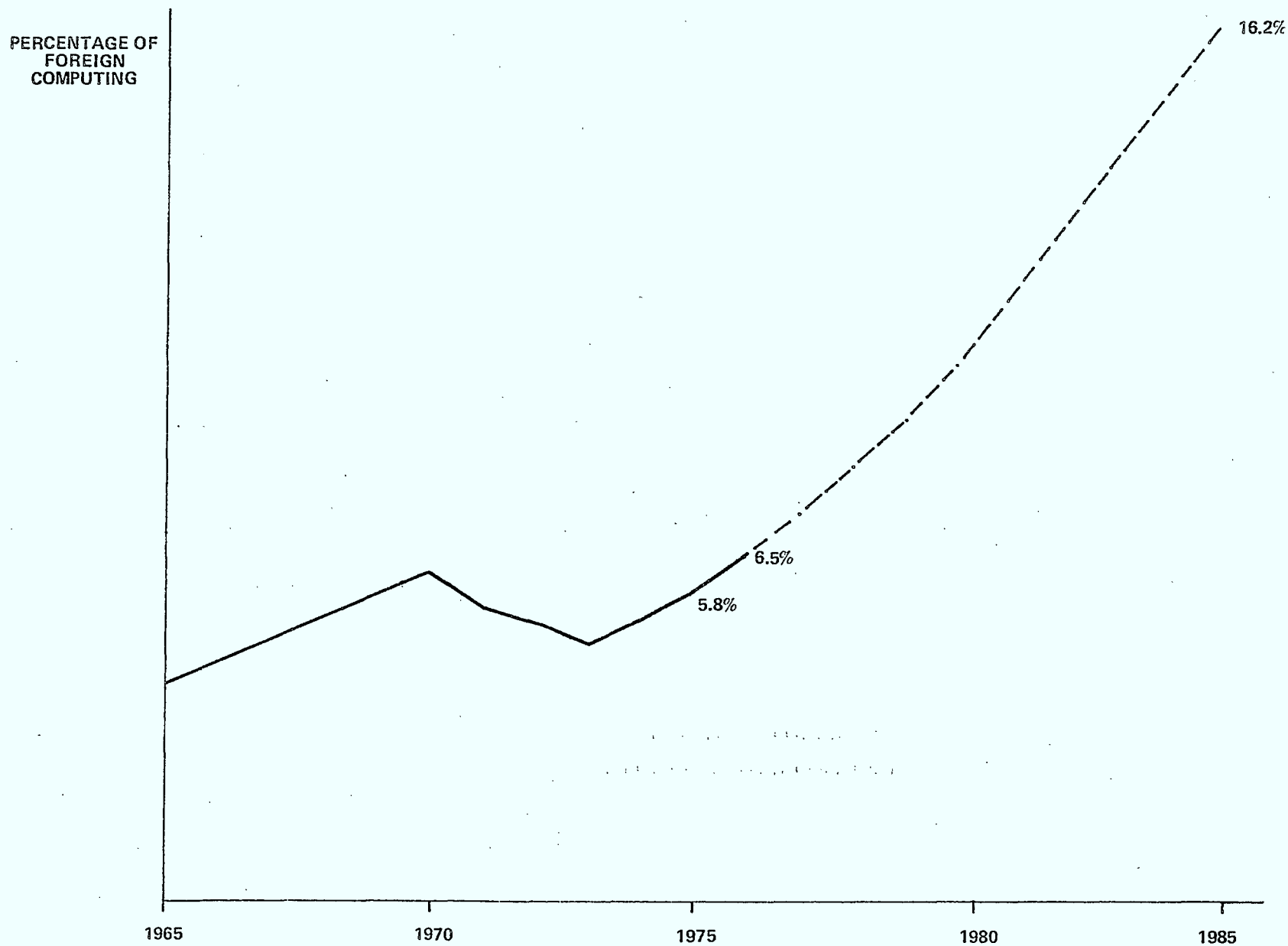


4.3 Use of the Model in Forecasting to 1985

The process of forecasting using the model is complex, and requires a series of judgements about growth rates and the relationships among variables. To simplify, the steps involved in developing the estimate shown in Exhibit V opposite for the cost of foreign purchased services are as follows:

1. Forecast total dollar sales of Canadian computer equipment suppliers. This is done by adding together projections of unit sales within four different value classes of computers. These projections are made by fitting "S" curves to historical data on the computer population collected by the Canadian Information Processing Society (CIPS). The "S" curve is a normal technological forecasting tool.
2. Make an assumption about the percentage of computer related activities in Canada which will be carried out using service bureaus or software houses, rather than directly by end users. This results in a forecast of the percentage of computer equipment which will be purchased by service bureaus, and hence of their equipment costs.
3. Make an assumption about the budget distribution of the Canadian computer services industry (service bureaus and software houses combined) in 1985. Based on the estimated dollar cost of equipment purchases, and the assumed budget percentage for equipment, calculate total revenues for the industry.

ESTIMATED % FOREIGN USE
FROM "THE GROWTH OF COMPUTER/COMMUNICATIONS IN CANADA"



4. Make an assumption about the budget distribution of users of Canadian computer services. Divide the percentage assumed for purchased services into the estimate of total revenues for the Canadian computer services industry to arrive at the total cost of using Canadian computer services, including in-house services.
5. Project the percentage of foreign computing based on the trend observed in the Computer/Communications Secretariat telephone surveys, and shown in Exhibit VI. Multiply this percentage by the estimated total cost of using Canadian computer services to arrive at a figure for the cost of foreign purchased services.

The sequence used in making this forecast is not based on cause and effect relationships. Instead, it begins with quantities and relationships for which relatively good historical data is available, and proceeds to those where the data is limited and questionable. This approach was a practical one given the information available. However, the fact that it is not based on causal relationships makes it difficult to understand and reduces its creditability.

In forecasting imports of computer services, the key variable is the percentage of computing done outside Canada. This percentage was forecast in a reasonable manner based on the only quantitative data available. However, we do not believe that it provides an adequate basis for analyzing policy alternatives now because:

- . the surveys on which it is based were carried out at various times in 1977, and the data is assumed to apply to 1976;

- . the uptrend in foreign use is based on 26 firms which report that they began to use foreign computers in 1974-1976. This is a very small number of cases on which to project such a major and sustained trend considering the lack of information about the sampling frame and the sampling bias and questionnaire design problems noted below;
- . the sampling procedures were likely to bias the results in favour of a high percentage of foreign use and a strong shift in this direction over the 1974-1976 period, despite the various adjustments made to the data. The reason is that 39% of the firms in the sample were included because they had previously been in the CIPS computer census but had dropped out. Half of the 26 firms on which the trend was based were included in the sample for this reason;
- . no information on the volume of computer use was collected because of definitional problems and the inherent limitations of a phone survey where respondents are not asked to consult their files. To estimate foreign use as a percentage of the total, assumptions had to be made about the relative volume of computer use among different groups;
- . historical figures on foreign use were based on the respondent's recollection of when such use began. It is difficult to know whether this introduces a bias into the observed trend, or simply makes it less reliable;

- . no information was collected about when the use of computers, as opposed to foreign computers, began or on the growth of volumes. Estimates of total usage had to be derived separately from data on the number of computers and service bureau revenues;
- . respondents were not asked if they had switched from foreign to Canadian computing, either completely or partially, although one or two did volunteer this information. The trend toward foreign computing will therefore tend to be overstated; and
- . no information was collected specifically on the acquisition of software, although the percentages were used as if they included systems development as well as computer operations.

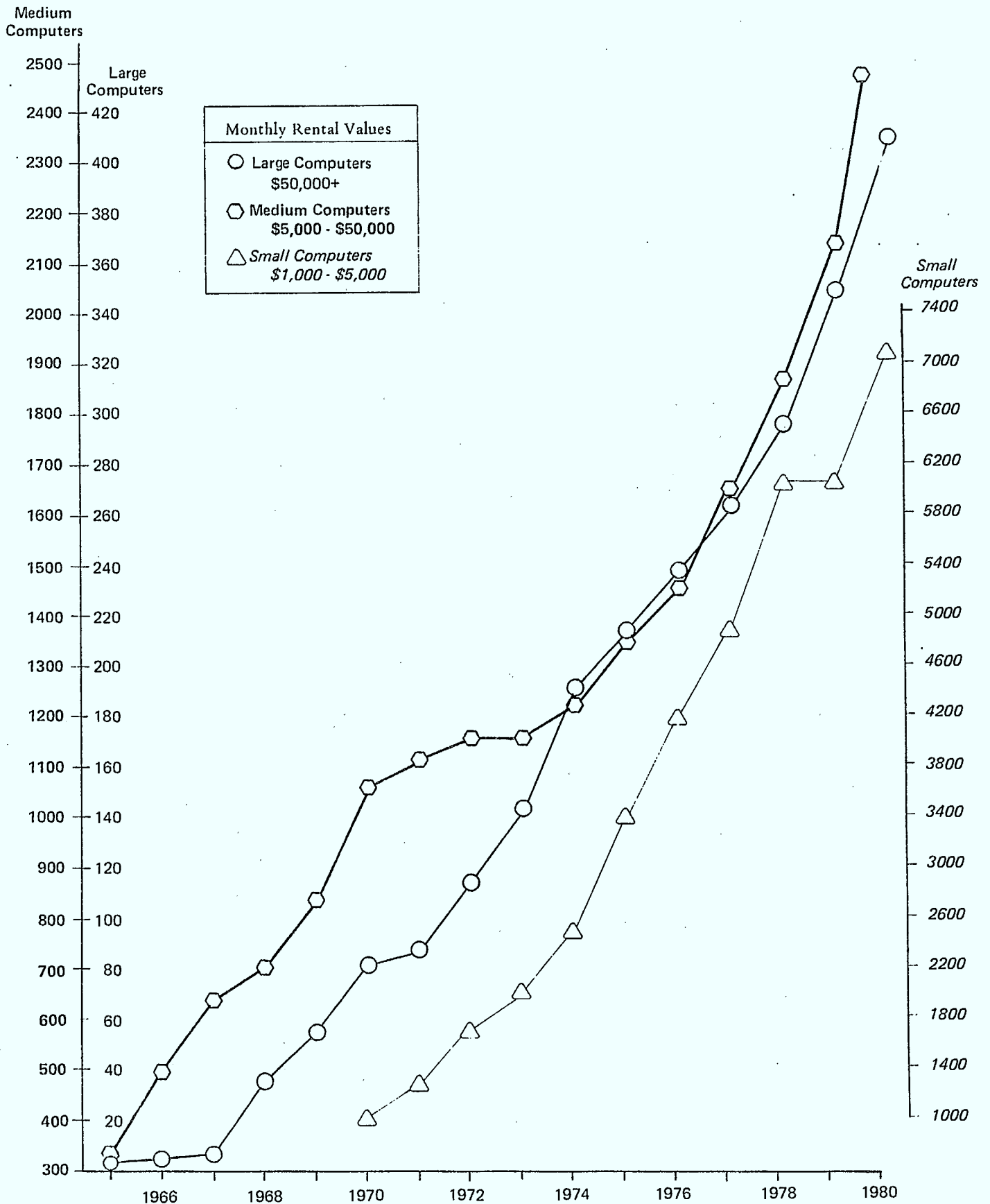
We recognize that many of these weaknesses were caused by schedule and budget constraints and by the fact that the survey served other purposes such as measuring the coverage of the CIPS computer census.

With respect to exports of computer services, a forecast was made separately based on the author's judgement and contacts with industry. The growth of exports (9% annually) was projected to be substantially less than that of domestic sales of computer services (15% annually). This lower growth is due to the assumption that Canadian service bureaus will have to establish U.S. branches in order to compete in that market. It is also assumed that Canadian based multinationals will not centralize their computing in Canada, partly because tariffs make hardware more expensive. These assumptions may well be true, but

GROWTH IN NUMBERS OF INSTALLED COMPUTERS

(FROM CIPS CANADIAN COMPUTER CENSUS)

Price
Waterhouse
Associates



we believe that they require some further validation before they can be used as a basis for major policy decisions.

4.4 Overview of CIPS Canadian Computer Census

This Census, published annually by the Canadian Information Processing Society (CIPS), provides the most extensive information on trends in Canada's computer population. The CIPS Census reports number of computers by monthly rental categories*. Growth trends for different sizes of computers can be identified by grouping the data into a few categories. Although different size categories appear to have somewhat different growth patterns, the number of installed computers in the small, medium and large categories are still showing substantial growth. DOC staff assumed an "S" shape curve for forecasting, beyond 1976, increases in the number of installed computers for these three categories. However, more recent CIPS Census data indicates that the growth rates have not yet declined as much as was assumed in 1976. It is premature to assume that growth in installed computers, in these categories, have passed the mid-point of their S-curve. There may be other factors at work that may even result in accelerated growth over the short to medium term as shown by the facing graphs.

Although the CIPS Census provides a pretty good picture of trends in Canada's computer population, it can not provide a direct indicator of associated economic impacts. Related economic activity is probably growing faster than the number of computers, because technological advances have dramatically increased computing capacity for any given rental category. The rapidly decreasing cost of computing capacity has also dramatically expanded the market for computers. Small businesses and individual consumers can now afford such equipment.

This leads to a major problem in using the CIPS Census data to identify trends in the usage of all sizes of computers. The survey

* The CIPS Census reports the number of installed computers by monthly rental categories such as \$1,000 to \$1,999 per month.

coverage for small computers - monthly rental values (MRV) between \$1,000 and \$5,000 - is not very good. There is no trend data for very small computers - MRV less than \$1,000. This is unfortunate since these two computer size categories are the most dynamic area of hardware development and are likely to show very high growth rates. The quality and extent of information on small computers is likely to deteriorate as their use becomes more widespread through further improvements in performance and cost. Although the small computers account for a small proportion of total installed computer value, their economic impacts may be different than those associated with medium and large computers. Their large numbers could generate a very large market for proprietary software applications packages, for example. Many users of small computers probably do not have their own in-house systems and software development resources or capabilities.

The Census organizers are attempting to broaden it by measuring trends other than the number of installed computers by rental categories. Such additional information may enhance the Census' value and provide additional trend information in areas that have important economic impacts.

Unfortunately, the CIPS Census is not designed to provide information on the areas of immediate interest to DOC with respect to this project. Even in the paper, "Growth of Computer/Communications in Canada", the CIPS data was of no direct use in estimating imports and exports of computer based services. Rather, it was used indirectly to forecast total Canadian user expenditures. Data from the DOC telephone surveys had to be used to estimate "% of foreign computing" to project purchases of imported services. Nevertheless, the annual CIPS Census probably provides the most important indicators of trends in Canada's computer population. Its value will increase in future years as trends in computer usage, software and operations/systems personnel ratios become apparent from recently gathered data.

INFORMATION REQUIRED FOR POLICY DEVELOPMENT

- . A CURRENT ESTIMATE OF THE MAGNITUDE OF IMPORTS AND EXPORTS BY TYPE OF COMPUTER BASED SERVICE OR PRODUCT AND THEIR ECONOMIC IMPACT.
- . TRENDS IN EXTERNAL TRADE BY TYPE OF COMPUTER SERVICE OR PRODUCT.
- . DECISION FACTORS AND TRENDS GOVERNING THE AMOUNT OF SOFTWARE DEVELOPMENT AND MAINTENANCE, AND COMPUTER PROCESSING, THAT WILL BE DONE IN CANADA.
- . FACTORS INHIBITING OR LIMITING DEVELOPMENT OF THE COMPUTER SERVICES INDUSTRY IN CANADA AND EXPORT BUSINESS.
- . INDUSTRY VIEWS ON WHAT, IF ANY, INCENTIVES OR SUPPORT PROGRAMS SHOULD BE AVAILABLE.
- . INDUSTRY VIEWS ON WHY AND HOW GOVERNMENT SHOULD FOSTER THE DEVELOPMENT OF DOMESTIC AND EXPORT SALES OF COMPUTER BASED SERVICES OR PRODUCTS.

5. The Scope of Additional Research

5.1 Information Required for Policy Development

The facing page outlines the information we believe necessary to formulate policy for the short to medium term.

There is no current, good estimate of the quantity of computer based services flowing across the Canadian border. Both current and future estimates of economic impacts from trade in computer based services are necessary to determine if national policies are warranted.

However, quantitative estimates alone are not an adequate basis for policy formulation. It is essential to identify trends and their underlying causes to properly formulate and evaluate policy options. Therefore, any future research in this area must have a relatively large qualitative component to gather crucial information on trends.

Computer based services cover a very broad range of activities. Distinct types of services or products must be identified since they are likely to: exhibit different trends; be influenced by different decision factors; and will probably require a variety of policies and policy instruments.

The last three points on the facing page address the need to solicit opinions of knowledgeable individuals. You appear to be at an appropriate stage in the policy development process to actively solicit informed opinion.

FOREIGN TRADE IN COMPUTER BASED SERVICES
(EXCLUDES EQUIPMENT)

	CLOSED MARKET TRANSACTIONS (MAKE)	OPEN MARKET TRANSACTIONS (BUY)
COMPUTER PROCESSING	1	2
COMPUTER SOFTWARE	1	2
DATA BASE INFORMATION SERVICES	1	2
DATA PREPARATION AND INPUT/OUTPUT	*	*
	<ul style="list-style-type: none"> PARENT - SUB TRANSFERS 	<ul style="list-style-type: none"> SERVICE BUREAUS SOFTWARE HOUSES DP CONSULTANTS

1 = FIRST PRIORITY

2 = SECOND PRIORITY

5.2 Policy Priority Areas

Based on our discussions with DOC staff we have summarized the policy priority areas in Exhibit VIII on the facing page.

The left hand column identifies four broad categories of computer based services. The top row identifies two broad types of user-supplier relationships:

- . closed market transactions involving transborder flows of computer based services between parent and subsidiary or affiliated companies. Situations where the parent actively influences the affiliated company's decision about sourcing of computer based services is also of particular interest;
- . open market transactions where users purchase imported or domestic computer based services offered on a commercial arms'-length basis.

From a policy development perspective, it is useful to distinguish between closed market and open market transactions. These two categories of economic activity will almost certainly require different policies and policy instruments.

The bottom row shows the areas of principle interest relating to the closed market and open market transactions. DOC staff has identified closed market transactions as a policy area of highest priority. They are particularly interested in transborder flows of computer based services between foreign parents and their Canadian subsidiaries or affiliated companies. The Department believes that these will still account for some 75% of all imported computer based services by 1985 vs. about 90% of a much smaller current figure.

IMPACT OF USER DECISIONS ON FOREIGN TRADE IN COMPUTER SERVICES

<div> <div> <div>USERS</div> <div>SOURCE OF SERVICES</div> </div> </div>		FOREIGN SOURCES		CANADIAN SOURCES		
		MAKE	BUY	MAKE	BUY	
CANADIAN OPERATIONS	CANADIAN CONTROLLED	1. IMPORTS	2. IMPORTS	5. DOMESTIC	6. DOMESTIC	OPERATIONS IN CANADA
	FOREIGN CONTROLLED	3. IMPORTS	4. IMPORTS	7. DOMESTIC	8. DOMESTIC	
FOREIGN OPERATIONS	CANADIAN CONTROLLED	9. LOST EXPORT OPPOR.	10. LOST EXPORT OPPOR.	13. EXPORT	14. EXPORT	CANADIAN PARENT
	FOREIGN CONTROLLED	11. OF LITTLE INTEREST	12. LOST EXPORT OPPOR.	15. OF LITTLE INTEREST	16. EXPORT	
		CANADIAN COMPUTER SERVICE INDUSTRY		CANADIAN COMPUTER SERVICE INDUSTRY		

5.3 Impact of User Decisions on Foreign Trade

Exhibit IX opposite provides a detailed categorization of users of computer based services and their sources of supply. Users have a variety of means for satisfying their needs. For example, they may decide to:

- . "buy" the required service on the open market; either from a Canadian supplier or a foreign supplier;
- . "make" the service rather than buy it - either by using local, internal resources, or by acquiring it from affiliated companies located either in Canada or in a foreign country. We have described the latter as a closed market transaction.

From a Canadian perspective, economic activity resulting from these decisions will be one of the following:

- . increased domestic economic activity due to demand for domestically supplied services;
- . increased domestic economic activity due to export sales;
- . increased foreign economic activity due to the purchase of imported services.

The matrix on the facing page shows the relationships between these types of activity, sources of services, and location and ownership of the user organization. The top row distinguishes between foreign sources of services and Canadian sources. Under each of these the

EXHIBIT IX

user faces a "make" or "buy" decision. For example, under Foreign Services a Canadian based and Canadian controlled operation may decide to "buy" on the open market from a foreign based service bureau, or "make" using the resources of affiliated companies located in a foreign country.

The first column on the left hand side of the matrix distinguishes users on the basis of their location - users located in Canada are designated Canadian operations, and users located in foreign countries are designated as foreign operations. Within each of these categories we make another user distinction based on ownership - either Canadian controlled or foreign controlled.

A few examples may help to clarify this matrix. Box 1 represents purchases of imported computer based services which result in economic activity in a foreign country. This could happen if a company such as Alcan (a Canadian controlled Canadian operation) decided to make its computer services rather than buy, but used foreign based resources from one of its U.S. subsidiaries. When Alcan obtains computer services from its American subsidiary, it is importing these services. If Alcan decided to buy these services from an American based service bureau, it would generate the imports indicated by box 2.

Another example is Ford Motor Co. of Canada (a foreign controlled Canadian operation) using the computer processing facilities located at its parent's headquarters. This produces imported services and foreign economic activity as indicated by box 3. If Ford Canada decided to "make" its own computer based services, using Canadian resources and a Canadian data processing centre, it would generate the domestic economic activity indicated by box 7.

Around the perimeter of the matrix we identify three sources of information on user decisions and future trends in foreign trade in

EXHIBIT IX

computer services. By contacting operations in Canada we can cover off information resulting in the imports and domestic activity indicated by boxes 1 through 8. Canadian parent companies (e.g. the headquarters of Canadian multinationals) can tell us about trends and activities of subsidiary operations in foreign countries. This covers off the economic activity indicated by boxes 9, 10, 13 and 14. Companies in the Canadian computer services industry should be able to discuss competitive conditions in the U.S. This would provide some information about economic activity or potential activity indicated by boxes 12 and 16, and provide a secondary source on boxes 2, 4, 6, 8, 10 and 14.

The remaining two boxes, 11 and 15, are shown as being of little interest. An example of economic activity indicated by box 11 would be Ford U.S.A. satisfying its computer services requirements from its U.S. resources. Box 15 represents export sales (i.e. Canadian domestic economic activity) if Ford U.S.A. were to obtain its computer services from its Canadian subsidiary. It seems unlikely that Ford U.S.A. will import a substantial amount of its computer services requirements from its Canadian subsidiary. However, it may be possible to encourage Ford U.S.A. to allocate some of its software development activities, for example, to its Canadian subsidiary. We would probably have to visit the foreign head office to properly explore this type of opportunity. The Canadian subsidiary may not know about these opportunities. Therefore, for the purposes of outlining immediate research needs, this box has been designated of little interest.

To design a research program and to identify trends and their underlying causes we need to anticipate:

- those factors that influence user decisions with regard to sourcing computer based services; and

FACTORS EFFECTING FOREIGN TRADE IN COMPUTER BASED SERVICES

DECISION RELATED
FACTORS

- . USER INDUSTRY
- . COMPANY SIZE
- . REGULATION
- . OWNERSHIP
- . H.O. LOCATION
- . MANAGEMENT STYLE
- . PURCHASING POLICIES
- . TECHNOLOGY & COST TRENDS
- . TELECOMM. TRENDS
- . CANADA VS. FOREIGN COSTS

TYPES OF COMPUTER
BASED SERVICES

- . GENERAL PURPOSE PROCESSING
- . SPECIALIZED PROCESSING
- . SYSTEMS SOFTWARE
- . APPLICATIONS PACKAGES
- . CUSTOM SOFTWARE
- . PROFESSIONAL SERVICES
- . DATA BASE INFO. SERVICES
- . DATA PREPARATION AND I/O

- an initial breakdown of computer based services to determine if different services follow different trends and therefore, require different policy approaches.

Exhibit X on the facing page summarizes what we believe to be the important decision related factors and an initial breakdown of types of computer based services.

Under decision related factors we anticipate that the amount of computer services a user requires will be related to his industry and his company's overall size. The propensity to import services will probably depend on whether the company is heavily regulated, its ownership, its head office location and management style. Canadian subsidiaries of foreign owned multinationals that have a highly centralized management style may import a higher proportion of their service needs. If companies are on a trend towards buying more of their computer services rather than making them in-house, purchasing policies could have a strong influence on our trade deficit. Trends in computer technology and costs, telecommunications, and Canada's cost advantage/disadvantage in providing computer based services will probably result in a variety of conflicting forces and counter trends.

Under types of computer based services we have tentatively identified two types of computer processing services and three types of computer software products.

General purpose processing refers to the type of service normally provided by commercial service bureaus and their networks, or internally by large computer users and their private networks. Specialized processing on the other hand refers to, for example, services provided to automobile dealers by Reynolds and Reynolds. It also refers to bank

payroll services and specialized text processing services such as those offered by Alphatext in Ottawa.

Systems software refers to the computer programs which manages the resources of the computer system itself. It is generally sold with the computer equipment but is not necessarily developed by the equipment suppliers. Applications packages are standard computer programs designed to carry out the same function for a large number of users, such as a general ledger package for a particular group of minicomputers.

There is a high degree of interaction between decision related factors and the types of computer based services. Computer technology and cost trends are leading towards greater use of distributed data processing. These trends may have a significant effect on the amount of general purpose processing carried out at a company's head office location. This may in turn have subsequent effects on the amount and location of custom software development.

Users may start buying more computer based services rather than developing them in-house. This could have a dramatic impact on the volume of sales generated by applications packages. Corporate purchasing policies may also dictate centralized purchasing of application packages. This may result in users dealing only with very large, proven, software houses that have the capability to maintain a package over its life cycle. At present this may favour U.S. based software houses over Canadian based software houses. The result would be a large amount of imported services with economic activity and development in the software area occurring in the U.S.

6. The General Design for Additional Market Research

6.1 Objectives

The market of general interest is the one for computer based services and equipment in Canada. This is represented by the sum total of all expenditures by Canadian users for these services and products, plus expenditures by foreign users for Canadian services.

The DOC, however, is specifically interested in the external trade aspects of this general market - both imports and exports. External trade in equipment or hardware is not of interest to the DOC since it is covered by an existing IT&C policy and does not involve transborder data flows. The purpose of further research, therefore, is to identify the quantity of trade in these services and its economic impact. This impact may be measured in terms of the total dollar value of purchases of imported services and sales of exported services, and the estimated amount of direct employment involved in the provision of these services, and the job loss due to imported services.

In summary, the objectives are to:

- . quantify the value of imported and exported services and provide an estimate of how these amounts break down by type of computer based service;
- . estimate the direct employment involved in the provision of these exported and imported services;
- . identify key user decision factors that determine the sourcing of computer based services, trends in these factors, their underlying causes and the likely effect on the growth of computer based

Price
Waterhouse
Associates

SOURCES OF DATA, INFORMATION AND OPINION

. STATISTICS CANADA:

- ANNUAL SURVEY OF THE COMPUTER SERVICES INDUSTRY
- SPECIAL SURVEY SERVICES

. THE CANADIAN COMPUTER SERVICE INDUSTRY:

- SERVICE BUREAUS
- SOFTWARE HOUSES

. COMPUTER EQUIPMENT MANUFACTURERS AND IMPORTERS

. CANADIAN USERS OF COMPUTER BASED SERVICES:

- CANADIAN COMPANIES AND ORGANIZATIONS
- CANADIAN CONTROLLED MULTINATIONALS
- FOREIGN CONTROLLED MULTINATIONALS

. U.S. BASED SOFTWARE HOUSES

services - particularly from a foreign trade and balance of trade perspective; and

- . solicit informed opinion from the computer services industry on why and how Government should foster the development of domestic and export sales of computer based services.

6.2 Study Scope and Approach

Exhibit XI on the facing page groups the principle sources of information for a Phase II study. The only source located outside Canada is U.S. based software houses. Information on imports of services from foreign service bureaus can probably be obtained from their Canadian branches or affiliated companies under the category, The Canadian Computer Service Industry.

Both quantitative and qualitative market research techniques will be required to estimate the following:

- . dollar values of imported and exported services;
- . associated direct employment;
- . factors influencing the amount and nature of user demand;
- . trends shaping future needs and future service demands;
- . user decision-making processes for make vs. buy decisions and subsequent purchasing policies; and

ANTICIPATED INFORMATION GATHERING PROBLEMS

- . THE EDP DEPARTMENT PROBABLY DOES NOT SEE ALL OF THE PURCHASES OF SERVICES AND PRODUCTS - PARTICULARLY DATA BASE INFORMATION SERVICES.
- . THERE MAY BE NO CHARGE FOR SERVICES OR PRODUCTS PROVIDED BY AFFILIATED COMPANIES.
- . PAYMENT MAY BE MADE TO A CANADIAN BASED OFFICE, BUT THE SERVICE OR PRODUCT MAY STILL BE IMPORTED. SIMILAR PROBLEM WITH SALES TO A CANADIAN BASED OFFICE WITH THE SERVICE OR PRODUCT BEING EXPORTED.
- . SOFTWARE THAT IS IMPORTED OR EXPORTED FOR SUBSEQUENT DISTRIBUTION WILL POSE DIFFICULT MEASUREMENT PROBLEMS.
- . SAMPLE SELECTION, STRATIFICATION, AND INFERENCES ABOUT THE DISTRIBUTION OF ALL CANADIAN USER EXPENDITURES WILL BE HAMPERED BY AN INADEQUATE SAMPLING FRAME AND LACK OF INFORMATION TO PROPERLY WEIGH SAMPLE RESULTS.
- . ACCESSIBILITY OF APPROPRIATE PEOPLE MAY BE DIFFICULT AND THE NUMBER OF REQUIRED CONTACTS PER COMPANY TO SECURE KEY QUALITATIVE INFORMATION MAY DICTATE A CASE METHOD APPROACH RATHER THAN A REPRESENTATIVE STATISTICAL SAMPLING APPROACH.

- trends in the management of subsidiaries or affiliates of multinational organizations and how these will influence intra-company transactions involving computer based services.

The quantitative information described in the first two points will be gathered by a relatively simple questionnaire, sent to users in advance, but completed by a researcher during a telephone interview. This should help to reduce the effort required by participants, improve response rates, provide an opportunity to clarify and explain the information required, reduce ambiguity and misinterpretation thereby improving survey accuracy and reliability.

Qualitative information on complex issues will have to be obtained through personal indepth interviews and perhaps through some focus group interviews.

An outline of the type of quantitative and qualitative information sought from these sources is shown in Exhibits A-3 through A-7 in the Appendix.

6.3 Anticipated Problems

At this time we foresee practical problems in gathering the required information. These problems are summarized in Exhibit XII on the facing page.

We also foresee some fundamental conceptual issues that will have to be resolved during the course of the study. These conceptual issues include:

- what constitutes external trade in computer based services;

- . is it possible to quantify imports and exports of these services and make reasonably reliable forecasts; and
- . how does Canada track its trade performance in these areas?

Not all TBDF represent external trade in computer based services. As an example, take the Canadian subsidiary that processes all its accounting data locally but transmits monthly financial statements and operating information to the head office of its foreign parent. This results in a transborder data flow. However, the parent and sub are not involved in an economic transaction involving trade of computer based services that has an associated economic impact. They have exchanged, electronically, management information. On the other hand, if the parent processed all of the sub's accounting data and extracted the financial and operating information that it needs to evaluate performance (as part of its management control function), there is trade in computer services with economic implications. However, it may not be measurable if there is no internal charge-back system; or the measurement may be unreliable if the charge is not reasonably close to its arms-length market value.

In light of the information gathering problems and conceptual issues, we recommend that the next phase of study be centered around a pilot survey of commercial enterprises.

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PHASE II - STUDY APPROACH AND METHODOLOGY

(A) PILOT SURVEY OF COMMERCIAL ENTERPRISES TO:

- DETERMINE WILLINGNESS TO PARTICIPATE
- RESOLVE KEY CONCEPTUAL ISSUES
- TEST THE PROPOSED INFORMATION GATHERING METHODOLOGY
- TEST TECHNIQUES TO ENSURE QUALITY RESULTS
- PROVIDE POTENTIAL SAMPLING ERROR IN QUANTITATIVE DATA
AND IMPROVE SAMPLING PLAN FOR A FULL SCALE SURVEY

(B) CADAPSO PARTICIPATION:

- REQUEST A FORMAL POSITION PAPER ON STUDY BACKGROUND,
KEY ISSUES AND INFORMATION REQUIRED BY DOC FOR POLICY
FORMULATION AND ASSESSMENT

(C) CBIIAC PARTICIPATION:

- HOLD A JOINT MEETING OF DOC AND CBIIAC MEMBERS TO
OUTLINE ISSUES, INFORMATION REQUIREMENTS, RESOLVE
CONCEPTUAL ISSUES, REVIEW DRAFT QUESTIONNAIRE AND
EXPLORE THE FEASIBILITY OF THE PROPOSED SURVEY OF
USERS OF COMPUTER BASED SERVICES

7. Phase II Study

7.1 Study Approach and Methodology

Our overall approach for additional research covered by a Phase II study is summarized in the facing exhibit. We recommend a pilot survey of commercial enterprises to obtain data and information from this key segment of Canadian users of computer based services. We also suggest involving two organizations during Phase II for the purpose of soliciting data, opinion, and to provide a forum for exploring issues, concepts and solutions.

The two organizations are:

- . Canadian Association of Data Processing Service Organizations (CADAPSO) which should help us to better understand the issues, problems and opportunities in the open market arena from the perspective of Canadian based service bureaus and software houses; and
- . Canadian Business and Industry International Advisory Committee (CBIIAC) which should give us a corporation's, including multinational, perspective on the subject of transborder data flows and their economic impacts.

We have recommended a pilot survey of commercial enterprises because:

- . of the cost of conducting the proposed research;
and

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PHASE II - PROPOSED PILOT SURVEY OF USERS

<u>SURVEY STEPS</u>	<u>ESTIMATED FEES</u>	<u>ELAPSED TIME</u>
1. PREPARATORY WORK	\$10,000	6 WEEKS
1.1 QUESTIONNAIRE DESIGN		
1.2 SAMPLE FRAME SELECTION		
1.3 SAMPLING PLAN AND SAMPLE SELECTION		
2. FIELD WORK EXECUTION	\$23,000	12 WEEKS
2.1 CONTACTING TARGET COMPANIES (90)		
2.2 TELEPHONE INTERVIEWING (60)		
2.3 PERSONAL INTERVIEWING (30)		
3. ANALYSIS AND REPORTING	\$12,000	8 WEEKS
3.1 DATA TABULATION, VERIFICATION AND ANALYSIS		
3.2 SUMMARY OF QUALITATIVE INFORMATION		
3.3 REPORT OF FULL SCALE SURVEY DESIGN		
TOTAL FEES	\$45,000	
OUT-OF-POCKET EXPENSES	\$ 5,000	
TOTALS	<u>\$50,000</u>	<u>26 WEEKS</u>

- . the need to pretest the proposed methodology to assess its feasibility and reliability given the complexity and sensitivity of the subject matter.

7.2 Pilot Survey Steps

We have outlined pilot survey steps, estimated fees, and elapsed time in the facing exhibit. With assistance from DOC staff in the preparatory work, and analysis and reporting steps, the budget for this pilot survey of users should be limited to about \$50,000, including fees and expenses. Assuming a start date of February 2, the pilot survey report and full scale survey design would be completed by the end of July. This provides a 24-26 week time frame.

Overall timing and cost estimates are subject to the time allotted by DOC for their staff to participate in the project, and the involvement of consulting staff in obtaining Statistics Canada approval for the pilot survey. We have assumed that the latter would be minimal and that DOC staff would handle virtually all of the interaction required to obtain Statistics Canada's approval. We have also assumed that DOC staff would be able to provide assistance during Steps 1 and 3 - particularly with the summary of qualitative information which is normally very time consuming. We have planned on having about 350 hours of DOC staff time over and above that required to interface with Statistics Canada.

Our approach and cost estimates for a Phase II study refers exclusively to a pilot survey of commercial users of computer based services. This is probably the most demanding element in the full scope of required additional research.

However, gathering data, information, and opinions from selected Canadian and U.S. software houses and Canadian based service bureaus

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PHASE III - TENTATIVE FULL SCALE USER SURVEY

<u>SURVEY STEPS</u>	<u>ESTIMATED FEES</u>	<u>ELAPSED TIME</u>
1. PREPARATORY WORK	\$10,000	4 WEEKS
1.1 PW TEAM ORIENTATION		
1.2 SAMPLE SELECTION		
1.3 STUDY PLANNING AND CONTROL		
2. FIELD WORK EXECUTION	\$90,000	24 WEEKS
2.1 CONTACTING TARGET COMPANIES (385)		
2.2 TELEPHONE INTERVIEWING (315)		
2.3 PERSONAL INTERVIEWING (70)		
3. ANALYSIS AND REPORTING	\$30,000	12 WEEKS
3.1 DATA TABULATION, VERIFICATION AND ANALYSIS		
3.2 SUMMARY OF QUALITATIVE INFORMATION		
3.3 REPORT		
TOTAL FEES	\$130,000	
OUT-OF-POCKET EXPENSES	\$ 20,000	
TOTALS	<u>\$150,000</u>	<u>40 WEEKS</u>

is a very important element of a short to medium term research program. This additional research could be conducted concurrently with Phase II, but it is probably more advantageous to do it afterwards. You would then have the benefit of Phase II results and the written submission from CADAPSO to assist with the design of the required additional research.

7.3 Tentative Full Scale User Survey

Without the benefit of the pilot survey, it is difficult to estimate the size and cost of a full scale user survey. Nevertheless, estimates are required to indicate the required level of funding.

Our estimates are provided in the facing exhibit. These figures are in addition to the cost of a pilot survey shown in Exhibit XIV. The total cost for pilot and full scale user surveys is about \$200,000. At the end of the full user survey we would have interviewed about:

- . 375 users by telephone;
- . 100 users by telephone and in person.

This would give us quantitative data on trade in computer based services for about 475 commercial users.

The telephone interviews would be more rigorous and demanding than those carried out by DOC staff during 1976. This will require that target companies receive:

- . an initial telephone call to confirm the nature of their operation, their address and the name of the person that should receive correspondence outlining the study's purposes and requirements;

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POTENTIAL SAMPLE STRATIFICATION DESIGN

<u>COMPANY</u> <u>CATEGORIES</u>	<u>ANNUAL SALES OR ASSETS IN MILLIONS</u>			
	<u>UNDER \$5</u>	<u>\$5-\$50</u>	<u>\$50-\$200</u>	<u>\$200+</u>

FINANCIAL INSTITUTIONS *

OTHER SERVICES

CANADIAN INDUSTRIALS

FOREIGN INDUSTRIALS

* FINANCIAL INSTITUTIONS MAY INCLUDE:

- . BANKS AND TRUST COMPANIES
- . LIFE INSURERS
- . PROPERTY AND CASUALTY INSURERS
- . REAL ESTATE DEVELOPERS
- . INVESTMENT DEALERS AND BROKERAGE HOUSES

- . a follow-up telephone call to determine if the material arrived and who should be contacted for a subsequent interview;
- . a call to the indicated respondent to solicit the information if he is prepared or to set up a time and date for another attempt.

Several attempts will probably be required for each successfully completed telephone interview. These calls, plus getting the correspondence to the right individual in the first place, will require good organization and will be fairly time consuming.

Whatever the required size of the full survey to produce satisfactory results, it is quite likely that sampling efficiency can be increased by a carefully designed stratified sampling plan. For example, it is highly likely that the proportion of a user's computer based service expenditures that are for imports will be greater for foreign controlled operations than for Canadian controlled ones. Therefore, ownership is probably an excellent basis for sample stratification. Likewise, the overall amount that a user spends on computer based services is probably directly proportional to the size of the company. Company sales or assets probably provide another useful basis for stratification.

Exhibit XVI on the facing page shows a potential sample stratification design using: company size; type of company; and its ownership. The size of financial institutions such as banks and trust companies is usually best measured by assets. However, there are other types of institutions where assets are also a better indicator of size such as:

- . life insurers;
- . property and casualty insurers;

. real estate developers.

Investment dealers and brokerage houses such as Wood Gundy or Dominion Securities pose special size ranking problems. However, they probably should be included under the banner of financial institutions. This category, in total, probably comprises up to about 150 companies. Since they are primarily Canadian controlled, there may be no additional value in distinguishing on the basis of ownership.

A review of the DATACOM '76 survey results may help determine the best way to stratify the sampling frame. Selection and analysis of the sampling frame itself, however, will be another major challenge.

PRICE WATERHOUSE ASSOCIATES

TORONTO, February, 1981

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A P P E N D I X A

THE CANADIAN COMPUTER BASED SERVICES AND EQUIPMENT MARKET
BASED ON "THE GROWTH OF COMPUTER/COMMUNICATIONS IN CANADA"

	<u>TOTAL DEMAND</u>	<u>TOTAL SOURCES OF SUPPLY</u>					
	<u>EXPENDITURES BY CANADIAN USERS (\$ MILLIONS)</u>	<u>* INTERNAL COST FOR SERVICES & EQUIPMENT (\$ MILLIONS) (% OF TOTAL)</u>		<u>PURCHASES OF DOMESTIC SERVICES (\$ MILLIONS) (% OF TOTAL)</u>		<u>** PURCHASES OF IMPORTED SERVICES (\$ MILLIONS) (% OF TOTAL)</u>	
1985	9,500	6,500	68%	1,500	16%	1,500	16%
1980	5,600	4,200	75%	850	15%	550	10%
1975	2,700	2,200	81%	350	13%	150	6%
1970	1,200	1,000	83%	130	11%	70	6%

* Includes total expenditures by users for staff, equipment, telecommunications and other items to provide computer services from internal resources.

** Includes open market purchases of services from foreign based sources (mainly service bureaus and software houses) as well as closed market purchases mainly between Canadian subsidiaries of foreign parent companies.

ANALYSIS OF EXTERNAL SOURCES AND FOREIGN TRADE IN COMPUTER BASED SERVICES
(EXCLUDES COMPUTER EQUIPMENT)
BASED ON "THE GROWTH OF COMPUTER/COMMUNICATIONS IN CANADA"

	<u>TOTAL PURCHASES OF COMPUTER SERVICES (\$ MILLIONS)</u>	<u>PURCHASES OF DOMESTIC SERVICES (\$ MILLIONS) (% OF TOTAL)</u>	<u>*PURCHASES OF IMPORTED SERVICES (\$ MILLIONS) (% OF TOTAL)</u>	<u>VALUE OF EXPORTED SERVICES (\$ MILLIONS) (% OF IMPORTS)</u>
1985	3,000	1,500 50%	1,500 50%	60 4%
1980	1,400	850 60%	550 40%	40 7%
1975	500	350 70%	150 30%	25 17%
1970	200	130 65%	70 35%	10 14%

* Includes open market purchases of services from foreign based sources (mainly service bureaus and software houses) as well as closed market transactions mainly between Canadian subsidiaries and their foreign parent companies.

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SERVICE BUREAUS AND SOFTWARE HOUSES

(QUANTITATIVE DATA)

<u>SERVICES AND PRODUCTS</u>	<u>DOMESTIC SALES</u>	<u>EXPORT SALES</u>	<u>PURCHASES OF SERVICES</u>		
			<u>IMPORTED</u>	<u>DOMESTIC</u>	
GENERAL PROCESSING					
SOFTWARE - ROYALTIES					
- APP. PACKAGES					
- CUSTOM SOFTWARE					
- SYSTEMS SOFTWARE					
PROFESSIONAL FEES					
DATA BASE INFO. SERV.					
DATA PREPARATION & I/O					
OTHER REVENUES/PURCHASES					
<u>BUSINESS TRENDS</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>
TOTAL REVENUES					
TOTAL EMPLOYMENT					

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SERVICE BUREAUS AND SOFTWARE HOUSES

(QUALITATIVE INFORMATION)

- . TRENDS BY SERVICE OR PRODUCT
- . EXTERNAL TRADE TRENDS
- . NATURE AND EXTENT OF FOREIGN COMPETITION IN
THE DOMESTIC MARKET
- . CANADIAN USER TRENDS RE INTERNALLY SUPPLIED
VS PRUCHASED SERVICES ON THE OPEN MARKET
- . FACTORS INHIBITING OR LIMITING DEVELOPMENT OF
THE COMPUTER SERVICES INDUSTRY IN CANADA
- . FACTORS INHIBITING OR LIMITING DEVELOPMENT OF
EXPORT BUSINESS
- . WHAT, IF ANY, INCENTIVES SHOULD BE AVAILABLE
- . HOW SHOULD GOVERNMENT FOSTER THE DEVELOPMENT
OF DOMESTIC AND EXPORT MARKETS

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COMPUTER EQUIPMENT MANUFACTURERS AND IMPORTERS

- . NOT INTERESTED IN HARDWARE TRADE; THIS IS COVERED BY AN EXISTING IT&C POLICY

- . INTERESTED IN THE DEVELOPMENT OF SOFTWARE FOR MAIN FRAME AND MINICOMPUTERS AND THE ABILITY OF MANUFACTURERS TO DECENTRALIZE AND LOCATE IN CANADA SOME OF THE DEVELOPMENT ACTIVITY FOR:
 - SYSTEMS SOFTWARE
 - APPLICATIONS PACKAGES

CANADIAN USERS OF COMPUTER BASED SERVICES
(QUANTITATIVE DATA)

(A) EXPENDITURES ON INTERNAL RESOURCES

PERSONNEL - OPERATIONS; SYSTEMS DEVELOPMENT; MAINTENANCE; OTHERS
EQUIPMENT
COMMUNICATIONS
ADMINISTRATION AND SUPPLIES

(B) PURCHASED COMPUTER BASED SERVICES AND PRODUCTS

	<u>ON THE OPEN MARKET</u>		<u>FROM AN AFFILIATED COMPANY</u>	
<u>SERVICE AND PRODUCTS</u>	<u>DOMESTIC</u>	<u>FOREIGN</u>	<u>DOMESTIC</u>	<u>FOREIGN</u>
COMPUTER PROCESSING				
COMPUTER SOFTWARE				
DATA BASE INFO. SERVICES				
PROFESSIONAL SERVICES				
OTHER				

(C) <u>EXPENDITURE TRENDS</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>
TOTAL EXPENDITURES					
TOTAL COMPUTER SERVICES EMPLOYMENT					

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CANADIAN USERS OF COMPUTER BASED SERVICES

(QUALITATIVE INFORMATION)

- . TRENDS IN COMPUTER PROCESSING ACTIVITIES AND INTRA-COMPANY SERVICE ARRANGEMENTS
- . POLICY AND TRENDS RE PURCHASED OR INTERNALLY DEVELOPED SOFTWARE AND INTRA-COMPANY USE
- . WHERE DOES SYSTEMS DEVELOPMENT ACTIVITY OCCUR NOW AND HOW WILL IT BE ORGANIZED AND MANAGED OVER THE NEXT 10 YEARS
- . WHERE ARE CORPORATE DATA BASES LOCATED AND HOW ARE THEY MAINTAINED AND MANAGED NOW AND OVER THE NEXT 10 YEARS
- . TO WHAT EXTENT IS THE COMPANY ITSELF A SUPPLIER OF DATA BASE INFORMATION SERVICES OR EXPECT TO BECOME ONE
- . WHAT BENEFITS OR COST SAVINGS DO USERS FORSEE THROUGH GREATER USE OF COMPUTER/COMMUNICATIONS TECHNOLOGY
- . WHAT IMPACTS WILL TRENDS IN COMPUTER/COMMUNICATIONS TECHNOLOGY HAVE ON THE OVERALL MANAGEMENT OF INTERNATIONAL OPERATIONS IN THE FOLLOWING FUNCTIONAL AREAS: STRATEGIC PLANNING, MARKETING, PURCHASING, PRODUCTION, DISTRIBUTION, FINANCE AND RESEARCH AND DEVELOPMENT

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