Interdepartmental Task Force on Transborder Data Flows : background papers

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1. [Background papers]

Interdepartmental Task Force on Transborder Data Flows

A Discussion Paper Based on the Work of the Economic Aspects Working Group

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1. GENERAL INTRODUCTION

1.1 Background

Information has always been an essential resource for business. It is a critical ingredient of virtually all the decisions which need to be made in a business environment, including what needs to be produced, how, where, and when production should take place; and what resources should be devoted to a particular product or service. The effective application of information resources involves the creation of efficient information flows which form an integral part of all business transactions in the market place, as well as of intracorporate activities.

Since World War II, as a result of the increasing role of governments, specialization of production, size of firms, development of multinational enterprises, the importance of international trade and investments flows, and the environment in which businesses operate at the domestic and international levels has grown more complex, enhancing the value of information and the economic significance of information flows. At the same time, the advent of computers and major progress in computer/communications technology has tremendously improved the ability and dramatically reduced the costs to transmit, process and access information. This in turn has increased the demand for information.

These developments have been the major contributing factors to the rapid diffusion of computer/communications technologies which have taken place throughout the world over the last two decades. As a result, major changes have occurred in the way economic activities are conducted and are distributed among various countries. This has significantly affected the international movement of goods, services and capital and has caused major increases in computer-based information flows.

Transborder data flows (TBDF) are defined as: "electronic or machine readable data or instructions which are transmitted or move across national boundaries for purposes of processing, storage or retrieval in most cases utilizing computer-communications systems and interfaces".

These flows can be effected by the physical transport of magnetic tapes, disks, punched cards, or other media containing computer-readable data. Increasingly, however, electronic means of communication are used. This presupposes the availability of an appropriate telecommunications infrastructure, particularly the existence of transnational computer/communications systems which can effectively accomodate the transmission of data between sophisticated computers and terminals located in several countries.

The growth of TBDF over the last two decades is raising concerns in a growing number of countries. Some of these are essentially non-economic in nature pertaining to the impact of these flows on the privacy of individuals and the sovereignty of nations. In addition, growth in TBDF has also raised a number of legal, social, cultural as well as economic issues. Although

many of these are specific to the countries where they are raised, they all tend to reflect a common uneasiness that TBDF may result in the redistribution of economic activities, possibly detrimental to some (particularly host countries of multinational corporations) and cause a concentration of information resources in a few economic entities, which may perpetuate the economic dominance of the "information-rich" over the "information-poor" countries.

Some of these concerns are particularly relevant to Canada by virtue of:

(i) the high degree of foreign ownership, particularly U.S., in Canadian industry;
(ii) the importance of trade to the Canadian economy, particularly that with the U.S.;
(iii) the highly integrated North American communications systems.

Multinational enterprises (MNEs) make extensive use of computer/communications systems. Since there is a very large presence in Canada of both foreign and domestically owned multinational enterprises, it may be expected that a large proportion of TBDF takes place within MNEs. These internal corporate data flows could potentially have major differentiated impacts on the economies of the host and home countries.

The high degree of integration between the Canadian and U.S. economies implies that the economic viability of major industrial sectors of the Canadian economy is critically dependent on the ability of these industries to export to the U.S. In addition, important sectors of the Canadian economy depend on imports from the U.S. In both cases, accurate and timely information flows are of vital importance to Canadian-based firms, whether multinational or purely domestic.

Because the Canadian and U.S. telecommunications facilities are so easily accessed, one by the other, Canada is particularly open to imports of computer-based services from the U.S. by electronic means. It also means that, given the right conditions, Canadian industry is well placed to take advantage of export opportunities to the U.S. market, the largest, most dynamic and one of the most open markets in this field.

To assess the significance of some of these concerns for Canada an Interdepartmental Task Force was formed. The Task Force consisted of a Steering Committee chaired by the Department of Communications and included representatives of twenty-two Federal departments and agencies. Three Working Groups of federal officials were established to study economic, sovereignty, and international aspects of TBDF issues. An Industry Advisory Committee was also established consisting of representatives of various Canadian EDP industry associations.

The purpose of this report is to present the findings of the Working Group set up to assess the Economic Aspects of TBDF.

1.2 Mandate, Organization and Work Program of the Economic Aspects Working Group

The mandate of the Economic Aspects Working Group (EAWG) was to undertake joint interdepartmental research to establish the conceptual, factual and analytical basis required for the development of policy recommendations pertaining to the economic and industrial aspects of TBDF.

The scope of the work concerned both the economic implications of TBDF and the likely economic impacts of the regulation of TBDF. Impacts on the balance of payments, employment, the competitiveness of Canadian service bureaus and software houses, the costs and benefits to firms, industry structure, the international division of labour, and corporate organizational structures were to be considered.

To conduct an assessment of TBDF and its impact on the Canadian economy, it was necessary to examine the conditions giving rise to these flows and what was likely to influence them in the short and medium term. The Working Group first attempted to distinguish between various forms of TBDF in terms of the activities supported by these flows. Three major groups were identified:

(i) transborder data flows in support of international commercial activities;

(ii) transborder data flows in support of trade in computer/communications services, and

(iii) transborder data flows in support of the internal corporate activities of multinational corporations.

Transborder data flows in support of International Commercial Activities represent one element of the information flows necessary to conduct international market transactions. They are generated as part of the procedures or activities involved in these transactions such as ordering, inventory control, invoicing, financial transactions related to payments, delivery of goods and services, etc. Transborder data flows in support of International Trade in Computer/Communications services are generated in the purchase and sale across international borders of such services as data processing, software and information retrieval services. Transborder data flows in support of the Internal Corporate activities of MNEs are generated by operational activities and those related to corporate planning/financial control functions. The Working Group devoted most of its attention to the last two groups of TBDF defined above because data flows in support of international commercial activities were perceived as having raised the least concern from an economic point of view.

To conduct its analysis of international trade in computer/communications services, the working group regrouped these services and the international data flows associated with the sale and purchase of these services in major categories with common characteristics which could then be examined separately. Four types of services are identified in this classification: data processing, software development, information retrieval and a residual category which includes consulting, education and other related services. While most computer service companies usually provide a combination of these services, the distinctions between them appeared useful to take into account their different economic characteristics. These different characteristics can be expected to have a bearing on the impacts of TBDF on these services, as well as on the possible policy prescriptions which may be considered for each.

The EAWG also felt that it was necessary to investigate certain horizontal issues likely to affect the provision and use of computer/communications services in Canada and abroad. The likely impact of shortages in critical skills appeared to be of particular relevance, since a shortage could increase the need to import these services and jeopardize the ability of Canadian providers of computer-based services to compete effectively both at home and abroad.

Based on these considerations the Working Group identified the following areas for immediate attention:

"Open Market"

- Open Market Data Processing
- Canadian Software Industry
- Information Retrieval Services

"Closed Market"

- Computer Management Function in Multinational Enterprises operating in Canada

"Horizontal"

- Skilled Workforce Supply and Constraints

These five areas were made the subject of five projects, led by appropriate members of the Working Group. The objectives and scope of each project are outlined in the following paragraphs. The results are presented in the five project reports (Ref. 1, 2, 3, 4, 5).

The purpose of the Open Market Data Processing project was to provide to the extent feasible, an assessment of trends in trade flows and the balance of trade in computer services, using existing data. It required a quantitative assessment of the size of the Canadian commercial data processing industry, its growth trends and likely future evolution in light of expected changes in the technological and economic environment.

It also was to identify issues of concern to the industry and assesses whether the industry could maintain its competitive position in Canadian and foreign markets.

The study of the Canadian Software Industry was to provide a descriptive and qualitative profile of the software industry in Canada, as well as an order of magnitude assessment of its size and growth trends. The demand and supply sides of the industry and international trade in software were to be examined. The strengths and weaknesses of the Canadian industry were to be assessed, together with its ability to compete effectively in the North American market during the next decade.

The Public On-Line Information Industry project was to provide a descriptive and qualitative profile of Public Online Information Retrieval Services, together with an order of magnitude assessment of their size and growth trends. The extent to which such services are being, or might be, imported from the U.S., was to be examined. The strengths and weaknesses of the Canadian suppliers of such services vis-à-vis their U.S. counterparts was to be assessed. Intra-firm and closed user group activities were excluded from the scope of the project.

The study of the Computer Management Service Function in MNEs was to identify trends in the use of information goods and services by companies that operate internationally. Of particular interest were changes taking place in corporate information management systems as a result of evolving computer/communications techniques, and the economic implications of such changes.

The Skilled Manpower Supply and Constraints project was to examine the likelihood of critical skill shortages in Canada; i.e., shortages of workers whose general educational development, specific vocational preparation and job experience are such as to make necessary a long lead time (several years) in which to adjust supply to demand.

The Task Force commissioned a study to review trends in computer/communications technology. The objective was to provide a concise review of the current state of computer and communications technology, and to assess likely technological developments in both hardware and software over the next 5-10 years. The study focusses primarily on North American activities, but also includes discussion of Japanese and European developments. Emphasis is mainly on the present environment (1981), and that envisaged for the next 5-10 years. The results of the study are reported in a background paper (Ref. 6).

Because of time and resource constraints, two aspects were not studied by this working group. The first is the case of imports of computer services by firms operating only in Canada. No reliable estimates exist of the volume of such imports, and because of the wide diversity and sheer number of firms falling into this category, it would be a major undertaking to arrive at a reasonable estimate.

The second area excluded is that of private online data bases. Because of the private nature of these data bases, it would be very difficult to determine the number in existence, their sizes, and uses.

One further use of the computer/communications technology, which does not involve TBDF, by definition, is the in-house use of computer services by firms operating only in Canada. This use has therefore been excluded from this report, but any overall review of the computer industry in Canada would necessarily have to include this use.

1.3 Role of Industry and Briefs Submitted

Cooperation and input from industry was sought from the companies involved and from industry associations. The projects included consultation with the individual firms and the results and findings were made available to members of the Industry Advisory Committee for comments.

Associations and individual firms were encouraged to submit briefs to the TBDF Task Force, as an additional source of input. These were received from the Canadian Independent Computer Services Association (Ref. 9), the Canadian Association of Data Processing Services Organizations (Ref. 10), the Canadian Business Equipment Manufacturers Association (Ref. 11), Bell Canada (Ref. 12)and I.P. Sharp (Ref. 13).

1.4 Outline of the Report

Chapter 2, entitled Computer/Communications and the Emergence of TBDF Issues, describes the growth of computer/communications in Canada and the development of the data networks which have made the growth of these flows possible. It then provides an outline of the specific concerns raised by the emergence of TBDF. Finally, an assessment is made of the prior work related to TBDF that was available to the Working Group.

Chapter 3, TBDF and the Canadian Economy: Major Findings documents the major findings based on projects and other related submissions, briefs, reports and activities. These pertain to international trade in computer/communications services, particularly data processing, packaged software and informaton retrieval, and the use of information goods and services by companies that operate internationally. Because of the significance of MNE activities for TBDF, the Chapter devotes considerable attention to the results as far as the Computer Management Function in MNEs is concerned. Transborder data flows in support of commercial activities are also discussed here to provide a more complete treatment of the subject. This discussion, however, is not based on any special research conducted by the working group but attempts to reflect information on the subject which can be found in the press and the specialized literature.

Chapter 4, Related Computer/Communications Issues is a review of computer/communications policy issues which have a bearing on the ability of the Canadian computer/communications industry to compete effectively in world markets. In particular, policy concerns pertaining to computer equipment costs, and conditions which apply to the use of data communications links, the tax treatment of EDP activities, shortages of critical EDP skills, Government "make or buy" policy, the support for export activities and antidumping legislation are considered.

2. COMPUTER/COMMUNICATIONS AND THE EMERGENCE OF TBDF ISSUES

The growth of international computer-based information flows over the last two decades largely reflects the rapid diffusion of computer/communications technologies throughout much of the non-communist world. This chapter describes the growth of computer/communications services in Canada and the communications links which carry data by electronic means. The thesis advanced here is that TBDF is the international counterpart of domestic information flows in support of commercial transactions, and data flows related to the provision and use of computer/communications services. Their growth can, in turn, be directly related to the growth in the number of computers and terminals in operation, worldwide, and to the development of effective data communications links.

This overview of the Canadian scene will provide the backdrop to a discussion of the specific concerns which have been raised in Canada about the growth in TBDF. These concerns were instrumental in the creation of the Task Force and influenced the work program adopted by the Working Group.

2.1 The Growth of Computer/Communications Services

The rapid growth in computer/communications services in Canada over the past 15-20 years is illustrated by:

(i) the increase in numbers of computers;
(ii) increases in user expenditures on computer/communications; and
(iii) the growth in revenues of the Canadian computer services industry

According to the annual census by the Canadian Information Processing Society (CIPS), the stock of computers renting for more than $1,000 per month increased fivefold during the period 1970-80, from about 2,200 in 1970 to around 10,400 in 1980.

These figures, however, still underestimate the actual increase of computing capacity over this period because:

(i) they do not take into account progress in hardware technology, and
(ii) the CIPS survey does not cover small computers renting for less than $1000 per month.
(iii) the total number of computer users is unknown therefore, full coverage cannot be ensured. Also there is not a 100% response rate to the survey.

This segment includes small business and desktop computers, the fastest growing component of the market. DOC estimates(1) which attempt to include these smaller computers, suggest that the appropriate total may be 4,400 in 1970 and 81,000 in 1980, with almost 60,000 of the latter being small business computers and desktops.

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(1) Appendix I, Table 2.

During the same 10 year period, Canadian user expenditures on all computer/communications services are estimated by DOC(2) to have increased five times, in current dollars from about $1.2 billion in 1970 to about $6 billion in 1980. Despite inflation this increase somewhat underestimates real growth in computer capacity as it does not take into account the rapid decline in the price of computer equipment, and the major improvements in the price/performance of computer hardware.

This growth in the provision and use of computer/communications services has taken place over an expanding field of applications and has spread to all sectors of the economy and to firms of all sizes.

Both the in-house computer/communications activities of firms, and EDP services provided on the open market by Canadian suppliers, experienced major increases over the period 1970-80. Although the latter still represent a small proportion of total Canadian computer/communications activities (an estimated 17 per cent in 1980), the revenues of the computer services industry increased more rapidly than total Canadian user costs for computer/communications services(2). These revenues, which include exports, are estimated to have been about $ 150 million in 1970, $ 400 million in 1975 and over $1 billion in 1980. In-house EDP although still predominant, accounts for a declining share of total user expenditures on computer/communications services.

2.2 The Development of International Data Networks

The growth in computer/communications services is reflected in the rapid increase in data communications traffic. It is estimated, for instance, that international telecommunications traffic originating within the OECD countries is expanding at an average annual rate of 16 per cent (Ref. 7). The data communications component of this traffic, although currently a small proportion of the total, may be increasing at almost twice that rate. This growth in traffic has been made possible by a major increase in the capacity of the infrastructure which is required for effective data transmission, largely due to the development of public data networks and of private networks. The growth in international cable and satellite network capacity has been estimated to be around 21 to 22 per cent annually. The existence of these networks, in turn, is creating a new economic environment, which is likely to have a significant impact on international trade, notably in services.

Although the existing public switched voice networks can be used for data transmission, economic and technical considerations have induced many countries in the 70s to establish additional specialized data networks to meet the growing demand for data communications. Many of these data networks use digital transmission and/or packet switching technology.

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(2) Appendix I, Table 1

In Canada, the TransCanada Telephone System (TCTS) established a digital data network, Dataroute, in 1973 and a packet switched network, Datapac, in 1977. Its competitor, CNCP, inaugurated comparable offerings (Infodat and Infoswitch) in 1973 and 1977 respectively. In the U.S., similar commercial networks were established in the mid 70s by Value Added Carriers. The most successful of these are Telenet and Tymnet, which started operation in 1975 and 1976 respectively; both networks provide domestic and international services, using transmission facilities leased from common carriers. The importance of data networks was also recognized in Europe in the late 70s, with the creation (among others) of Transpac in France in 1978, of EDS (1976) in Germany and EPSS (1979) in the U.K.

Once these national public data networks were established, the demand for international data traffic created growing pressures for bilateral connecting agreements between common carriers in various countries. These interconnections, when established, permit the movement of data between domestic networks in different countries. The exit and entry points through which traffic originating in one network must pass to get to another network are usually referred to as "gateways". At the gateway, conversions take place in order to match the internal signalling protocol of one network to those of another if these are different.

The establishment of interconnections in 1978 between the two major U.S. packet switched networks, Telenet and Tymnet, and the Canadian network Datapac has ensured the coverage of virtually the whole North American continent by a system which, to the user, resembles a functionally integrated packet switched network. A similar packet switched international network, Euronet, was established in the EEC countries as a result of connecting agreements reached by the national Post, Telephone and Telegraph agencies (PTTs). These networks have grown rapidly since their inception and are expected to increase futher in the future. It is estimated for instance that the number of network termination points (i.e. points where access to the computer/communications networks is gained) will increase from 393,000 in 1979 to 1,620,000 in 1987 in Western Europe alone (Ref. 22).

The demand for data communications, both domestic and international, has induced many companies to establish private data networks. Some have been established by individual firms, others by closed user groups to meet specialized information exchange and transactional requirements. Indeed the growth in the use of such networks has been more rapid than that of public data networks. The SWIFT network, established by Western European and North American banks is a good example. For these private networks, the circuits are usually leased from telecommunications carriers and the necessary equipment for specialized requirements is added. Lease costs and conditions have a major bearing on the creation of such networks.

The development of satellites has given impetus to the growth of international data communications in recent years because of their advantages over terrestrial facilities, especially for long distances. Their wide transmission bandwidths and capabilities for multi-point distribution have led to the emergence of new data communications services.

Up to now, the bulk of the international satellite communication in the non-communist world has been carried through the facilities of Intelsat, which provides services to its 106 member countries. In recent years, however, an increasing number of countries have made plans for the establishment of regional satellite services or for the use of domestic satellites for international traffic. The recent Canada/U.S. agreement for transborder satellite services is an example. This agreement will enable Telesat, the Canadian national satellite carrier, to negotiate directly with U.S. satellite carriers for the provision of transborder services, opening the door for the establishment of satellite networks at the North American level. A number of U.S. satellite carriers, particularly Satellite Business Systems (SBS) have already demonstrated interest in the development of such satellite networks to serve the growing needs of multinational corporations for international data communications.

A contributing factor to the increase in international data traffic has been the decline in international telecommunications rates. For instance the unit cost of leasing an Intelsat circuit has declined by a factor of four from the late 1960s to 1977 and the trend is continuing. This has significantly improved the cost effectiveness of a number of new international telecommunications applications. An example is the use of satellite communications for teleconferencing. This is a most useful application for large multinational corporations to manage their operations in a communications environment which is virtually distance-insensitive.

The creation of these data networks (both terrestrial and satellite), and their accessability, one to the other, raises a number of important issues at the international level. First, they tend to reduce the economic significance of national borders. This alters the role of nations in shaping functional economic areas (i.e. geographical areas within which the bulk of interrelated economic activities take place) and the effectiveness of various policy levers, as these areas become increasingly influenced by the configuration and reach of networks particularly for the provision of network based services. In these networks, any node can technically play the same role as any other node providing basically the same access to the network. This is particularly true as networks become increasingly distance-insensitive and as the use of packet switching and satellite communication technologies becomes increasingly prevalent. With satellite communications, the functional area covered by the network is no longer fixed and can vary (expand, contract or migrate) depending on the economic forces at play. This mobility of networks further reduces the ability of a country to shape functional economic areas.

While a country can influence the configuration of networks within its own borders it will find it increasingly difficult to influence, either the location of economic activities or the movement of data on these international networks. Using digital transmission and multiplexing techniques there is no simple technical means by which the various types of information flowing across borders can be distinguished. Once converted into digital form and multiplexed, all information (whether it be voice, video, data, etc), "looks" the same, and proposals for monitoring based upon the ability to distinguish between machine-readable data and other information become increasingly less feasible.

International data networks also have significant trade implications. They make possible the provision of services which would otherwise be largely non-traded. Computer based services, which have been the subject of TBDF-related concerns in several countries and which are discussed at length in this report, are one example.

A factor which could influence the location of economic activities on these international networks is the tariff imposed on data communications in the various countries and the conditions which apply to access. Companies which rely on international leased circuits to carry on their worldwide business will become increasingly sensitive to government measures which restrict access to the network, or rules which impose constraints on the use of communications facilities.

Therefore, policy development work affecting regulation of domestic telecommunications services will have to consider the differences between governments and the approaches they take in dealing with international questions. For instance, the definition of value added services, the regulation to be applied to such services, and the distinction between regulated and non-regulated services could have major consequences to trade in these areas.

2.3 The Emergence of Transborder Data Flows Issues

As was pointed out earlier, TBDF arise largely from the information needs of firms in carrying out their international activities and the increased capabilities of data communications networks, both public and private, to handle these data flows with greater reliability and reduced costs.

The TBDF issues which have emerged in connection with this growth in international data flows relate mainly to the international aspects of the decisions made by firms for the provision and procurement of computer/communications services and the geographical location of economic activities. Basic economic concerns pertain to the way these decisions are made, and to the changes in the international allocation of economic activities which take place as a result of these decisions.

With regard to the procurement of computer/communications services firms must typically make two closely related decisions: (a) "Make or Buy" (b) procure from Canadian or foreign sources. In this context, "make" means to provide the required computer/communications services using in-house facilities, and "buy" means to procure them from the computer services industry. TBDF will take place whenever a company "buys" or "makes" computer/communications from abroad. Of course the "make abroad" option is only open to MNEs, since by definition purely domestic firms do not have any operation outside the country.

The distinction between "make abroad" and "buy abroad" (i.e. between provision from in-house facilities of affiliates and open market purchases) is important. In the case of open market transactions, the decision by a Canadian firm to purchase services from a foreign rather than a Canadian vendor is likely to be based largely on price, quality of service and

availability considerations. In the case of in-house flows of services between affiliates, it may be argued that other considerations related to the organization of the MNE, management style and the relationship between headquarters and subsidiaries are also likely to play a major role in influencing the decision.

Consequently, when attempting to assess likely trends in TBDF and underlying factors, it is important to distinguish clearly between these two separate and distinct cases.

This distinction is also important from a policy perspective. In the case of open market activities the main question is to determine what policy action, if any, is required to ensure that the Canadian computer services industry is able to compete effectively and fairly, both in the Canadian and world markets, thereby mitigating concerns related to possible trade deficits in computer/communications services. Such action could include removal of existing disincentives, as well as the possible development of stimulative incentives.

With regard to the in-house activities, a major policy question is to ascertain whether MNEs operating in Canada behave as "good corporate citizens" in their geographical allocation of computer/communications and related activities. This is a part of the much larger question regarding the role of MNEs within the Canadian economy/society.

From a business perspective, the information flow issue may become a key question. The ability to move data across international borders using computer/communications-based information systems has perhaps become an essential requirement for carrying out business at the international level. Companies which rely heavily on international data flows will become increasingly sensitive to goverment measures which they perceive as restricting their ability to move data freely across borders.

2.4 Assessment of Prior Work

This review will focus on Canadian studies of computer/communications and related TBDF issues, Canadian and foreign studies of TBDF in MNEs, and attempts to quantify Canadian TBDF and its economic impacts.

The purpose of the review will be to identify the economic concerns related to transborder flows of non-personal data as clearly as possible, and to examine their factual and conceptual basis. It does not attempt to examine the positions and policies adopted by other countries, or the general work programmes of international agencies such as the Organization for Economic Cooperation and Development (OECD), the Intergovernmental Bureau for Informatics (IBI) and the United Nations Centre for Transnational Corporations (UNCTC).

2.4.1 Canadian Work

The economic significance of computer/communications activities and TBDF has been recognized in Canada perhaps earlier than in most other countries. The Computer/Communications Task Force, in its 1972 report Branching Out (Ref.14), recognized and considered the problems of control over transborder data flows, of access to data banks, and of potential loss of business in Canada. It concluded that, rather than attempting to impose restrictions on TBDF itself, the effectiveness of which would be doubtful, a better solution would consist of positive measures to strengthen the availability and cost-effectiveness of Canadian computer/communications services.

Branching Out was followed in 1973 by the Green Paper Position Statement by the Government of Canada on computer/communications policy (Ref.15). Although none of the 29 policy statements dealt directly with TBDF, it was recognized that among the areas which required further consideration were:

a) the problems involved in exercising Canadian jurisdiction over companies operating in Canada which store and process business data outside the country; and
b) the role of multinational corporations in the computer/communications field.

Following the Green Paper, the Computer/Communications Secretariat (C/CS) was established to conduct further studies in this area. As a part of its work program, the C/CS tried to develop quantitative estimates related to total Canadian user costs of computer/communications activities, and the economic impact of Canada/U.S. TBDF. This work is reported in "The Growth of Computer/Communications in Canada" (Ref.17).

The publication of the C/CS Growth paper stimulated considerable discussion of TBDF issues in Canada. In particular, the Institute for Research on Public Policy (IRPP) organized a seminar in September 1978, entitled "Issues in Canadian/U.S. Transborder Computer Data Flows" (Ref.19). Computer industry participants were far more concerned about the possible negative effects on themselves and on various aspects of the Canadian economy that might come from misguided government regulation, than they were about any trend in job losses (actual or potential). Everyone appeared certain that the problems addressed at the conference were multi-dimensional, and that great care must be taken by governments to ensure that if action was taken in the name of protection against economic losses or privacy, such action should not inhibit the international development of computer/communications technology.

Because of continuing concerns with TBDF after the disbandment of the Computer/Communications Secretariat in 1978, DOC commissioned two further studies in 1979 and 1980. The Maule/Litvak study (Ref.20) examined TBDF in U.S. owned MNEs operating in Canada. A study by Price Waterhouse Associates (Ref.18) was intended to provide an independent assessment of both external studies and internal DOC studies, and a critical review of the C/CS Growth paper. These studies are discussed further under the section on TBDF in MNEs, and quantitative estimates of the economic impacts of Canadian TBDF.

2.4.2 Studies based on Surveys of MNEs

The three studies reviewed and assessed were carried out by Seligman et al (Ref.21) in the U.S. in 1979, Maule and Litvak (Ref.20) in Canada in 1980 and Antonelli (Ref.22) in Italy in 1981. The last two studies were commissioned by the DOC and the OECD/ICCP respectively. All three included in-depth case studies of MNEs.

The McCaffery, Seligman and von Simpson Inc. (MSV) study focussed on 11 major North American companies which conduct a substantial portion of their business outside the U.S. The sample included three consumer products companies, two heavy machinery manufacturers, two metals producers, two chemical companies, an international airline, and a large energy construction firm. Their combined revenues were U.S. $83.5 billion in 1978, and all were among the 200 largest of the Fortune 500 companies.

For the purpose of this study transborder data flows were grouped into seven functional categories, as follows:

a) Systems on "natural persons" (i.e. personnel, individual customers);
b) Systems on "legal persons" (i.e. corporate customers and vendors);
c) Financial systems;
d) Production planning and coordination systems;
e) Engineering systems;
f) Software packages for business applications;
g) Other forms of electronic communications, such as voice traffic, Telex-like messages and facsimile.

The key finding was that the most critical computerized systems which require TBDF are those used for production scheduling, inventory coordination and shipment notifications; TBDF restrictions on production data could not be accomodated without relocating and re-equipping industrial plants and redistributing their labour force.

Financial reporting and aggregation of operating statistics are second in importance; the transmission of such information could be accomplished with less sophisticated technology such as public Telex, facsimile or even mail, but at considerable cost to accuracy and timeliness. Disrupting the electronic transmission of engineering data and computer programs, the next categories in order of importance, would be costly and cause significant temporary dislocations; but the effect would be manageable in the long term.

The study found that natural and legal person systems do not depend on TBDF; restrictions in this area would have very little impact. The exceptions are reservation and credit systems, where the use of computerized systems and TBDF has become almost a condition of doing business for airlines, banks and credit card companies.

In the Maule/Litvak study, five U.S. parent companies with subsidiaries in Canada were interviewed to determine the impact of information technology on the performance of the MNE parent and the Canadian subsidiary. The parent companies ranged in size from sales of $1 billion to $5 billion; their principal lines of business were computers, automotive parts, pharmaceuticals, finance and publishing. Interviews were conducted with senior executives, middle management and operators, in both the parent companies and their Canadian subsidiaries.

The major findings were that the impact of the new information technologies varies by industries; that Management Information Systems (MIS) and the MIS function were in the process of change, moving from being almost entirely involved with operational areas associated with accounting and production to becoming involved with tactical and strategic decision making in areas such as marketing and corporate modelling; and that decisions about the development of MIS and the use of the new information technology in the Canadian subsidiary are made largely in the parent company.

The Antonelli study is based on interviews with 24 international firms and multinational enterprises operating in Italy, together with in-depth case studies of six of these firms. The firms interviewed were Italian affiliates of multinational enterprises, head offices of Italian multinationals and international service firms. The sectors in which they operated include banking, transportation, electronics, engineering, automobiles, chemicals, food and beverage and international engineering services.

The study draws a distinction between flows of data for information processing and flows of data for information retrieval. The first category covers flows whose primary purpose is to access data processing capacity or specialized software located in foreign countries; the second covers flows which serve to transmit information.

The report suggests that flows of data for information processing are probably a minor component of total observed flows, and that their importance may diminish as a result of the gradual shift to distributed data processing and the increasing use of mini and microcomputers.

Regarding flows of data for information retrieval, the report distinguishes between firms operating in the service and manufacturing sectors. Antonelli contends that these flows play a much more direct role in the supply of international services, than they do for manufacturing firms. Efficient and reliable international information networks are indispensible to international banks, credit and insurance companies and transport providers. Restricting the use of these networks would lead to increases in the cost and reduction in the quality of these services. Taken to extremes it could lead some firms to withdraw from the international market.

In manufacturing firms information flows are used to aid control functions, logistic coordination and financial management. The use of TBDF is in many cases associated with substantial changes in the performance and management structure of firms. The separation of service activities from manufacturing activities, and their location in countries where the relative cost of these activities to the MNE is the lowest, is a trend which was observed in some cases.

All these and other studies suggest that the use of computer/communications-based information systems, with their ability to transmit data rapidly and reliably, has resulted in substantial gains for MNEs. These gains have occurred in terms of increased efficiency, improved market performance and better management of financial resources when compared to past performance.

Disagreements exist, however, on the analysis and interpretation of the effects that these systems are having on organizational structures and management style. The specific point at issue is the centralization versus decentralization of decision making. Related issues include the possible centralization of corporate support services, including EDP activities.

2.4.3 Quantitative Estimates of Canadian TBDF

The Computer/Communications Secretariat (C/CS) Growth study (Ref.17) was the first study to present quantitative estimates regarding the economic impact of Canada/U.S. TBDF. It suggested that, in the absence of intervention, Canada would likely experience a significant worsening of its trade balance of computer/communications and related services, with a corresponding major loss of economic activity and jobs.

The estimates made by the C/CS were based largely on the expectation that MNEs would tend to increase the centralization of their EDP and related activities (particularly data processing, system development and maintenance) in the years to come. Rapid increases in the import of software were also expected. On the other hand, it was thought that exports of computer/communications services by the Canadian computer services industry from Canadian facilities were not likely to develop to any significant degree, because Canadian suppliers of such services would have a tendency to serve foreign markets (mostly U.S.) by establishing foreign based facilities. In this regard, the Canadian fiscal environment, equipment cost differentials and telecommunication rate structure were singled out as major contributing factors to this southward migration.

These predictions, however, were founded on a rather inadequate information base. No information was (or is) available on the magnitude of computer/communications service imports into Canada, and no systematic survey of Canadian user expenditures for computer/communications activities has ever been carried out.

Assumptions regarding the importation of computer/communications services had to be based on a set of telephone surveys of some 378 firms carried out in 1977. Of these, 35 firms used the computing facilities of a foreign parent or affiliate, and 12 were users of foreign service bureaus.

As a result, some of the assumptions regarding the trends in service imports by users which had to be made in the C/CS analysis were questioned by Price Waterhouse Associates in their study (Ref. 18) which concluded that because of this lack of adequate information, the C/CS estimates could only be considered as a possible scenario of what could happen.

An important task of the EAWG was to attempt to ascertain, subject to the availability of appropriate information, whether a more factually based picture of future trends in TBDF could be established, and to ascertain whether the possible scenario proposed by the Secretariat was indeed a likely one. The main findings of this investigation are discussed in section 3.3.

In conducting this analysis, it was fully realized that even if the C/CS scenario was confirmed this would be cause for concern but a case would still have to be made that government intervention would be useful and required. If action were taken by the government, care would have to be exercised not to reduce the overall efficiency of the Canadian industry nor give our trading partners grounds for retaliation. To the extent that these deficits arise as a result of decisions which are divorced from market forces or result from inadequacies of the Canadian fiscal system there may be scope for government action.

3. TBDF AND THE CANADIAN ECONOMY: MAJOR FINDINGS

The purpose of this chapter is to discuss the likely impact on the Canadian economy of the growing use of international computer/communications links. The findings are based on an assessment of the results contained in the various project reports prepared by members of the Working Group, and on other related submissions, briefs, reports and studies listed in the References (Appendix I).

More specifically, this chapter examines the impact of the increasing use of computer/communications technology on international information flows and on the activities which they support. The activities examined here include EDP-related activities, commercial activities and those related to the internal operations of MNEs.

3.1 International Trade in Computer/Communications Services

In considering trade in computer/communications services, it is important to consider the basic economic factors which determine the very existence of these services in the market place. Theoretically, commercial providers of computer/communications services will be able to compete effectively with in-house supply if they offer to their customers more cost effective services than these customers would be able to provide to themselves. This will usually be the case if the commercial provider enables its customers to share among themselves the fixed cost of providing the service (e.g. cost of running the data centre, cost of software development and maintenance, cost of creation and maintenance of data bases). Their ability to do so will depend on a number of supply and demand factors, including technology, market structures and the demand for specific types of services.

In considering Canada's trade performance in computer/communications services it is important to distinguish between data processing, software services and public online information retrieval services. Because the economics of providing these services are different, their trade trends are likely to be different. The relative magnitudes of these three segments of the computer services industry are also quite different. In 1980, computer service industry revenues were estimated to have exceeded $1 billion (Appendix I, Table 1). This total includes an estimated $600 million for data processing and input preparation, $300 million for software and system services, and $25-50 million for public online information retrieval services.

With regard to commercial data processing activities, information collected by the EAWG suggests that Canadian service bureau operations are not likely to be a major source of trade deficits in the short and medium term, for the following reasons:

(i) The Canadian service bureau industry is dominated by Canadian-owned firms, whose market share has increased steadily during the 1970s and which accounted for over 80 per cent of industry revenues in 1980;

(ii) A number of Canadian firms (e.g. CSG, Datacrown, Sharp) have succesfully penetrated foreign markets;
(iii) Input preparation and batch processing are inherently local activities, while remote data processing requires considerable local technical and marketing support

There are, however, trends towards the creation of very large, international "information utilities", which may modify this situation in the medium to long term. The marriage of very powerful central computers to sophisticated, computer/communications networks which span North America, Western Europe and the Far East has enabled certain timesharing service bureaus (I.P. Sharp Associates, General Electric Information Services Company, Control Data Corporation/Cybernet Services, Computer Sciences Corporation/Infonet Services) to promote remote computing, timesharing, information retrieval and computer/communications-based message communications services on an international basis. Increased use of microcomputers and intelligent workstations by large numbers of managers and professional workers may bring about an increased demand for information retrieval and other value-added services provided by service bureaus and database vendors, which may involve a significant amount of remote data processing activity. Other bureaus could also provide distributed processing services at the customers' premises, using remote processors, to supplement their traditional remote computing services. The recently announced IBM Information Network (IN) may be a step in this direction. Small and medium sized Canadian service bureaus may be unable to compete in this kind of marketplace, unless they can specialize and find appropriate niches.

Programming costs (software development and maintenance) now constitute the largest part of user expenditures on computer/communications services, ahead of equipment and operations costs. As hardware costs continue to decline and computer use increases, the demand for software will continue to grow and software costs are expected to increase as a percentage of total computing costs.

Software can be classified as system software, utility software and applications software. Most system software (operating systems, assemblers, compilers, etc.) has traditionally been supplied (at least initially) by mainframe manufacturers, who generally import the software into Canada along with the hardware. This situation may be changing as manufacturers increasingly "unbundle" their software, i.e., impose a software charge separate from the hardware costs. This is particularly noticeable with the desktop computers. Canadian domestic supply of system software is believed to be small.

Utility software (teleprocessing monitors, database management systems, report generators, sort/merge and other utilities) is supplied by both computer manufacturers and, increasingly, by independent software houses. Canadian firms have generally found it difficult to compete with established foreign firms in this area. The bulk of the utility software used in Canada is, therefore, also imported and will probably continue to be.

The bulk of applications software, especially for mainframe computers is produced in-house, i.e., as custom programs, but the use of off-the-shelf software packages is increasing. Most custom software is still produced and maintained by in-house staff or contract programmers.

In addition to applications software maintenance and development, custom software, which accounts for the largest portion of software expenditures, includes enhancements and maintenance of system software and utility software.

Total software development costs were estimated at $440 million in 1975 and $880 million 1980 (Appendix I, Table 1). Software maintenance costs were estimated at $480 million in 1975 and $1120 million in 1980; maintenance is accounting for an increasing share of custom software costs. Demand has largely outstripped supply in the custom software area, due to skill shortages and other factors, and most EDP departments are faced with large backlogs of applications systems waiting to be developed.

Revenues to Canadian software service suppliers from software development and maintenance are estimated at some $70 million in 1975 and $240 million in 1980, a little over 10 per cent of the total custom programming activity.

The growth in the demand for custom and packaged software is expected to continue. The use of packaged software should increase faster, as firms find it increasingly expensive to develop custom software and, on the other hand, packaged software becomes increasingly more suitable and cost effective. The use of packaged software is likely to be particularly important in the desktop and small business computer segment, where users normally cannot afford to employ professional programmers.

Since most packaged software, including almost all packages for micro computers, is imported into Canada, this raises the prospect of significant deficits in this area. Unless the capacity to meet the demand for software (both packaged and custom) and related services can be developed in Canada, users will turn increasingly to imports.

Canadian suppliers of packaged software are likely to be at a disadvantage when compared to U.S. suppliers, because of the smaller Canadian domestic base, reduced access to venture capital, and the commanding presence of established U.S. firms. On the other hand, a strong Canadian software industry could significantly reduce imports of applications software and find considerable opportunities for exports. This is an area which may require new government initiatives, to promote and stimulate the development of a strong software industry in Canada.

The market for public online information retrieval services is growing at some 30 per cent each year, and this rapid rate of growth is expected to continue at least to 1985. The market is worldwide and international trade is extremely important; estimates indicate that it may account for some 50-60 per cent of the Canadian market. Since certain service bureaus provide both data processing and information retrieval services, and do not break down their revenues by these activity categories, the problem of double counting must be recognized.

Canadian database vendors are holding their domestic market position in the numeric database sub-sector, which currently accounts for 75-80 per cent of total information retrieval revenues. In this sub-sector there might even be a small favourable balance of trade due to the activities of I.P. Sharp Associates, the one Canadian world class database vendor and timesharing service bureau. The reference database sub-sector is increasingly dominated by U.S. vendors; here imports account for some 80 per cent of the Canadian market, and exports are very small.

Deficits can be expected to continue in this market. Because of the high fixed cost of data base creation and maintenance, as compared to retrieval costs at the margin, information retrieval services are characterized by major economies of scale. With the establishment of cost effective, international data communications networks, the provision of services can be made on a world scale from a single centralized location or from a single node in each major geographic sub-market, in order to fully exploit these scale economies. For a North American database vendor, this single location is likely to be in the largest market for such services (i.e. the U.S.). Although the overall deficit compared to the size of this market may become important in relative terms, it is likely to remain small in absolute terms. However, it is important to recognize that this is an area where economic imperatives may be on a collision course with sovereignty, privacy and cultural ones. This point will be discussed further in the Sovereignty Working Group report.

In conclusion, the work of the EAWG regarding the "open" component of the computer/communications services market suggests that in the absence of a strong industrial development focus, significant deficits may emerge in some segments of the computer services market, such as software packages and information retrieval services. On the other hand, positive stimulative measures could both reduce potential deficits and create significant export opportunities.

3.2 Information Flows in Support of Commercial Activities

Information has always been an essential element of commercial activity. Buyers need to know what can be purchased, at what prices and under what conditions. Sellers need information on the demand for their products, and the requirements of the buyers.

To carry out market transactions, a number of procedures or activities are necessary, such as ordering, inventory control, invoicing, financial transactions related to payments, delivery of goods and services, etc. To support these activities, information flows are required both within a firm (in-house), and between firms, their suppliers and consumers.

The vast expansion in domestic commercial activities and international trade brought about by the industrial revolution has been accompanied by a corresponding increase in information flows required to support these activities. The speed and capacity of information links has been progressively improved over the last 150 years, using advances in physical transportation and

telecommunications (railways, steamships, aircraft, telegraphy, telephony), to handle the increased volumes of national and international information flows. Thus transborder information flows predate the use of computer/ communications systems to handle such flows.

The advent of electronic telecommunications networks and computer/ communications-based information systems has made significant changes in the way information can be exchanged and hence the way in which commercial transactions can be carried out. In many firms, large portions of the internal systems supporting commercial transactions, such as ordering, inventory control, invoicing and general accounting are now computerized. The same is true of the banking industry. Computer/communications is used both to provide online banking services to customers, and to support inter-bank transactions such as clearing house and funds transfer operations. The electronic cash registers and point-of-sale terminals allow retail transactions to be captured directly in electronic form. With the computerization of word processing and typesetting, an increasing amount of information is now being created in electronic, machine-readable form.

Over the last 30 years, national economies have become increasingly interdependent and interwoven. This development, encouraged by increasingly freer trade, has led to the emergence of the "World Product" as an important concept, and the Global Market Share (GMS) as an important goal. The main agents for these dramatic changes are the integrators of the world economy - the multinational enterprises, trading units and banks. Estimates indicated that in 1980, multinational corporations contributed to some 25 per cent of the gross world product. Of the top 100 economic units in the world, 60 are currently countries and 40 are multinational corporations; the ratio may reverse by 1990 (Ref.25).

The operations of multinational corporations, trading units and the international financial system necessarily involve the flows of large volumes of information across national borders. Since speed and reliability are at a premium in such information flows, computer/ communications-based systems are increasingly being deployed for this purpose. This type of TBDF can only be expected to increase rapidly during the 1980s, as international operations and commercial transactions increase in volume.

On the manufacturing side the application of CAD/CAM technology is changing the nature of information flows between prime manufacturers and subcontractors. With the rapid diffusion of this technology, component design and specification information is increasingly created, maintained and transmitted electronically. This implies closer relationships between prime manufacturers and subcontractors as subcontractors can be involved earlier in the design stage. This also implies greater scope for prime manufacturers to subcontract abroad as the increased use of electronic communications, which is inherent to the application of CAD/CAM technology, reduces distance as a criterion in subcontractor selection. This close association of prime manufacturers and subcontractors located in different countries may give rise to the creation of multinational industrial complexes which may have many of the characteristics of multinational corporations.

Rapid progress in computer/communications technology and network based services means that they will have an even greater impact on information flows in the future. A whole group of information retrieval and transaction processing services is expected to reach widespread operational use by 1990; these include Electronic Funds Transfer Systems (EFTS), Teleshopping, Electronic Mail and Messaging Systems (EMMS) and Teleconferencing/ Videoconferencing. The emerging "Office of the Future" will be largely automated; electronic products and sophisticated multifunctional workstations will be used by an increasing proportion of office workers.

The increasing use of Teleshopping, EFTS and EMMS for purchasing, financial payments and information exchange transactions may lead to greater TBDF. The physical distance between a service requesting point and a service providing point in a computer/communications network does not, in most cases, affect the quality of the service that can be provided. Unlike the physical transportation of tangible goods, the cost of information based services is becoming increasingly distance insensitive.

3.3 Information Flows in Multinational Enterprises

Most concerns with regard to the unfavourable economic impacts of TBDF have been raised with respect to the Canadian operations of foreign MNEs.

These concerns largely reflect Canada's uneasiness with regard to the high degree of foreign control in the economy (29 per cent of asset value in the country's non-financial industries) and the role of MNEs in Canada. Canadians usually tend to welcome foreign capital and foreign expertise as a source of wealth creation. However there is concern that related activities may be subject to foreign political influence, or, for other reasons be inconsistent with Canada's national interest.

One of the main concerns raised with regard to the use of TBDF by MNEs pertains to the fear that these companies will centralize EDP and related activities at foreign headquarters, thus precluding the creation of EDP related jobs and expertise in Canada and foreclosing a significant segment of the Canadian computer/communications services market to Canadian providers. At the same time, it is feared that this centralization would result in major resource transfers from Canadian subsidiaries to foreign headquarters for the procurement of these EDP and related services, thus adversely affecting our balance of trade in services.

These concerns were reflected in the forecast made by the Computer/ Communications Secretariat referred to earlier, which predicted that imports of computer/communications services by Canadian users would increase from some $150 million in 1975 to $550 million in 1980 and $1.5 billion 1985. However, as was also pointed out earlier, these predictions are based on a rather inadequate information base, whose limitations are becoming increasingly recognized.

Conflicting evidence on this question was also available from a limited number of case studies conducted in other countries such as the U.S. and Italy. There were serious questions, however, with regard to whether general conclusions could be inferred from these case studies and whether these results were applicable to the Canadian situation.

In order to clarify some of these issues, an in-depth survey of 12 large MNEs operating in Canada was undertaken, to understand the nature and reasons for TBDF in MNEs, the role of computer/communications in the process, the implications for the domestic computer services industry, and the implications for the Canadian economy.

Seven of the firms studied were Canadian controlled MNEs, and five were subsidiaries of foreign controlled MNEs. They were chosen from the financial, mining and mineral processing, manufacturing, chemicals and retail sectors.

The results of the survey lead to the following findings with regard to the use of TBDF by MNEs:

- Electronic data flows are still a small component of total observed information flows in most companies surveyed.
- Companies heavily involved in the provision of services, such as financial institutions, insurance companies, airlines and manufacturers with a large service function, use computer/communications most extensively and generate the most TBDF.
- Practically all electronic TBDF currently moves across borders within the framework of basic management information systems, to support two types of corporate activity: operational activities and corporate planning/financial control functions.
- The major portion of electronic data crossing borders supports routine operational activities; substantially lower volumes of data are transmitted for the purposes of corporate planning and financial management.
- New developments in computer/communications technology are enabling various operational and planning functions to become integrated into a single, comprehensive corporate production and marketing control network, involving the transmission of numerous pieces of data through a complex web of computer/communications links.
- Most firms surveyed expected that business will become more information-intensive in the future; more information will flow and the portion flowing electronically will increase.
- Most companies predicted that within 10 years a minimum of 50 per cent of information flows would be in electronic form.
- The major increases in TBDF will result from person-to-person transfers of data via communicating word processors, for a variety of reasons and on an as-required basis, rather than from increased flows of data within formal automated management information systems.
- Practically all data within formal corporate management information systems will become part of a large, integrated information base; flows of data for routine operational purposes will tend to become indistinguishable from information flows supporting the corporate planning and control functions.
- Technological innovations will likely provide corporations with greater flexibility and choice with respect to organizing their systems operations.

With regard to the economic impact of TBDF on the performance and operation of MNEs, the following conclusions were reached:

- TBDF and use of new information technologies have resulted in substantial gains in the production and market performance of MNEs, through reduced costs, increased productivity, better decision-making and the provision of new and improved services to customers on a worldwide basis.
- Theoretically, TBDF and the use of computer/communications can lead to increasing specialization of functional activities among corporate affiliates and across national boundaries. However, this analysis has concluded that TBDF has allowed firms to improve existing operations and expand into new activities, but it has not impacted significantly on the essential structure and organization of the companies interviewed.
- Over time, the cumulative effect of continuous, incremental upgrading and adjustments in information systems and use of new technologies has changed the manner in which businesses conduct many of their activities. However, the link between the technologies and deliberate corporate restructuring decisions is less clear. Decisions about corporate organization are taken with full knowledge of what is technologically possible, but other factors appear to play a much more strategically important role in decisions to change the organization of production and marketing activity.

With regard to the provision of central services, R&D and EDP activities, the following findings were made:

- Because information technology improves communications networks in MNEs, it provides opportunities for greater centralization of control in certain areas of administration and co-ordination such as financial management, currency and tax planning, purchasing, inventory control, and marketing. However, with the exception of financial co-ordination, centralization of services appears to be taking place at the national rather than international level.
- The increasing importance of the computer and information systems' function at the centre of the organization is reflected by a rise in status of the manager of information and systems to vice presidential level within the hierarchy of some organizations. Functionally, all other information systems managers in the corporation may report to this VP, although their line responsibility is within their own subsidiary company.
- Although systems planning is becoming increasingly centralized, there is great diversity in the way corporations organize their EDP activities. This is largely due to the manner in which the information intensity of particular corporate activities interacts with the nature of particular information needs.
- Currently, most of the MNEs surveyed have over 80% of their EDP and related service requirements provided from within Canada.
- Imported EDP services generally involve intrafirm transactions. Offshore expenditures on the open market purchase of data processing services is insignificant in the companies surveyed.

- Most companies stated that they were gradually meeting more of their domestic EDP needs in Canada and expected this trend to continue.
- A slightly different pattern of activity is reflected in software and systems development. The majority of companies surveyed now meet the bulk of their Canadian operating requirements for systems development and software applications in Canada. Software packages, when required, are usually purchased offshore; there is a general desire on the part of MNEs to buy "off the shelf" whenever possible.
- The limited Canadian capability in pre-packaged applications suggests that MNEs may become a growing source of imported software in the future, unless the Canadian software industry can develop to meet this growing area of demand.

On the basis of these findings the following conclusions can be drawn from the 12 companies surveyed:

- Incremental adjustment to the use of computer/communications technologies has altered the way in which business is conducted. Many companies, or activities within companies, would not exist in the current market environment without them.
- The main impact of these technologies has been on operational efficiency. They have facilitated the centralization of common services, but generally on a national, rather than international basis. As expected, an exception tends to be centralized financial management by the MNE parent of cash reserves, short term investments and borrowings.
- EDP systems planning tends to be centralized, to the level of the MNE parent. The actual development of systems and implementation is generally decentralized.
- With respect to planning and control, head office and subsidiaries are becoming more interdependent, but it is not clear that control by the centre is increasing.
- There is little evidence to support the notion that these technologies are leading to the international rationalization of business activity, although they clearly contribute to the rationalization which does occur.
- The economic benefits of computer/communications technologies for the MNEs surveyed are overwhelmingly positive.
- The one area of possible economic loss is in the computer services and software sector. Thus calculations of the net benefits of TBDF to the Canadian economy must balance general economic gains to the MNEs' total Canadian operations, against the possible consequences for the EDP sector when looked at in isolation.
- The use of these technologies will become even more important in the future, for the profitable participation of Canadian industry in the mainstream of international commerce.

If these results could be extended to all MNEs, they would alleviate at least some of the concerns raised in previous studies.

Caution, therefore, needs to be exercised in interpreting these results for the following reasons:

(i) they are at variance with the findings from some of the other studies (e.g. Antonelli);
(ii) They only apply, strictly speaking, to 12 large MNEs, although an attempt was made to survey a cross-section of such companies. It is not clear to what extent they can be extended to the whole MNE community.

Further studies of a more systematic nature would be required to establish a clearer picture. Of particular interest here would be to ascertain whether the size of subsidiaries may be an important factor in influencing use of TBDF by MNEs.

3.4 Computer Related Employment and Skill Shortages

Together with other industrialized countries, Canada has been suffering from shortages of skilled computer professionals such as programmers, systems analysts, consultants and data processing managers. Estimates indicate in the medium to long term that demand for these categories is likely to grow more rapidly than total EDP employment, and that 70,000 new EDP professional and managerial workers will be needed by 1990, without allowing for departures. Shortages of critical skills may already have begun to cause large backlogs in the development of computer applications. Due to the current recession the shortage of entry level personnel seems to have eased substantially in recent months.

At the moment, the international trade effect of these critical skill shortages is neutral, since other competing countries like the U.S. are faced with equal if not greater shortages of highly qualified computer personnel. Skill shortages, though real, have not been the major motivating factor for locating EDP facilities abroad rather than in Canada, or repatriating EDP activities out of Canada.

There are, however, reasons for future concern. Certain foreign governments, notably those of Japan and France, appear to be initiating long-term computer literacy and training programs which could give these countries an important advantage in this field by 1990. Widespread computer literacy, and the ability of an increasing number of end users (especially professionals) to do their own problem solving, is seen by some as a lasting solution to the shortage of skilled computer professionals.

In Canada, training related to critical skills is not growing fast enough in educational institutions; also, more on-the-job training of entry-level and junior personnel is required, to meet skill needs in the required categories.

Finally, U.S. firms may begin to raid the Canadian pool of trained EDP manpower possessing the critical skills, if skill shortages in the U.S. become relatively worse than in Canada.

Joint action programs, based on cooperation between the federal and provincial governments, educational institutions and the Canadian computer industry will be needed to ensure that the supply of skilled EDP manpower in Canada remains competitive compared to other industrialized countries, and that professional end users are given the computer skills which will enable them to shoulder an increasing burden of computer use for their own problem solving. The development of "user-friendly" software should also contribute to alleviate some of the shortage, by reducing the time required to reach an adequate level of computer proficiency.

3.5 Information Gaps

An area of great concern to the Working Group is the lack of an adequate computer/communications related information base for policy development purposes. Major information gaps remain to be filled before a more complete picture can be established. These are discussed at greater length in the background paper entitled "An Evaluation of Available Computer/Communications Information and Information Gaps".

It is worth pointing out in this regard that:

i) The current Statistics Canada Computer Services Industry survey (Ref.27), the principal source of information regarding the industry, only collects data related to:

   a) revenues and expenditures of firms classified as computer service suppliers,
   b) sale/rental/lease of computer hardware by large, established computer manufacturing firms.

ii) In general, no data are collected or are available regarding imports of computer services and software, either by service suppliers or by Canadian users. This makes any attempt at a balance of trade analysis for computer/communications services difficult.

iii) No reliable information is available regarding the sales of:

   a) Desktop and small business computers, the fastest growing segment of the computer hardware market;
   b) Packaged software, which may become a very important component of the software market, especially for small business computers and desktops.

iv) No Canadian demand or supply information related to information retrieval services is currently available, precluding a reliable balance of trade analysis in this fast growing area.

v) No comprehensive quantitative information base is available with regard to intra-corporate computer/communications flows between MNE parents and their subsidiaries, thus rendering very difficult any reliable quantitative estimates regarding the magnitude and trend of service imports in this area, and a balance of trade analysis.

vi) No systematic survey of Canadian user expenditure for computer/communications activities has ever been carried out; this would be a large undertaking requiring extensive planning and considerable resources.

These questions need to be addressed on an urgent basis to assist policy development in this vital and growing sector of the economy.

4. RELATED COMPUTER/COMMUNICATIONS ISSUES

4.1 Introduction

Although major information gaps remain, a number of areas in need of policy review can already be identified at this time. In addition to these areas identified by industry as of concern to TBDF there exists a range of government policies and programs whether in the form of foreign investment legislation, funded programs or equipment standards, which can be called upon to complement the development of a more vital trade in services and goods that depend on or generate TBDF. Strictly speaking, many areas suggested for policy review are more related to computer/communications policy considerations and their industrial implications than to TBDF per se. They have nevertheless a major bearing on TBDF issues as is contended in many submissions received by the Task Force from industry. This is a reflection of the fact that TBDF is merely the international manifestation of the use of computer/communications activities and will therefore be affected by any policy initiative which has a bearing on computer/communications activities in Canada. From a TBDF perspective, such a review of computer/communications policy has to be undertaken with a view to improving the ability of Canada-based users and providers of computer/communications services to make effective use of the technology to foster their competitive position in the domestic and foreign markets. It is with this consideration in mind that several of the proposals received by the Task Force in the form of briefs submitted by industry have been reviewed by the EAWG and are discussed in this chapter. The intent of this review is not to reach any specific conclusions with regard to policy initiatives which the government may undertake but rather to identify they scope of the policy areas which would need to be addressed in such a review, in the light of the submissions received by the Task Force.

Submissions were received from The Canadian Association of Data Processing Service Organizations (CADAPSO), The Canadian Independent Computer Services Association (CICSA), The Canadian Business Equipment Manufacturers Association (CBEMA), and The Computer Communications Group, Bell Canada and I.P. Sharp Ltd. The CICSA position differs from the others on the fundamental question of the desirability of restrictions on data flows across international borders. Four submissions, while differing in many respects, agree that Canadian companies should have generally free access to the world market for computer/communications services, and that foreign companies should therefore have reciprocal rights in Canada. CICSA strongly disagrees with this position, and urges that the government require Canadian firms to process all their data in Canada. CICSA is also concerned with the possible migration of head offices and the consequent loss of head office jobs and services in Canada.

Overshadowing this review, however, is the realization that the growing importance of services in Canada's output of goods and services and their dramatically increased marketability among trading nations of the world are combining to generate a climate of urgency for the re-assessment of our public policies as compared to those of our trading partners. This review

has identified sectors that are particularly vulnerable to foreign competition (such as software development and information retrieval) and consideration should be given to whether the Canadian policy environment is particularly harsh relative to that of other countries. In an age where comparative advantage may lie increasingly in the provision of certain services such as computer/communications, it is essential that the realities of the international marketplace be recognized and dealt with effectively, including the fiscal incentives used by our trading partners to promote the world competitiveness of the services produced by their nationals.

In this context, any government measure (policy, regulation, program, law) which tends to distort the cost of providing and/or using computer/communications services in Canada, which reduces the revenues which can be generated from such activities or which reduce ready access to venture capital can potentially put Canadian industry at a disadvantage vis-à-vis its foreign competitors and may contribute significantly to an erosion of our trade balance in computer/communications services and to the migration of EDP and related activities and manpower out of the country.

Of particular relevance on the cost side, are any unfavorable conditions which apply to the cost of computer equipment, the price and use of data communications links, the tax treatment of R&D activities and EDP-related assets, the availability of skilled labour, and the cost of capital, including the availability of government financial assistance to industry.

Of particular relevance on the revenue side, are any specific unfavorable conditions or policy pertaining to:

(i) the protection of property rights,
(ii) government make or buy policy for EDP services,
(iii) tax treatment of computer services,
(iv) support for marketing activities.

4.2 Cost and Supply Considerations

4.2.1 Equipment costs

Suggestions have been made that consideration be given to the removal of the federal customs duties and sales tax applicable to main frame computer equipment. Canada's custom duty applicable to main frames has been reduced from 10 per cent to 6.3 per cent (1982) and is scheduled to drop to 3.9 per cent by 1984. Further reductions in this tariff may still be desirable but they would need to be considered in light of Canada's overall trade policy and the concessions that could be obtained from our trading partners.

With regard to the 9 per cent federal sales tax, some entrepreneurs have complained that it is anomalous that this tax is imposed on computer/communications equipment used in the production of services, while the tax is not imposed where such equipment is used to produce goods. This difference in application has arisen largely because the federal government does not have a sales tax on services and therefore taxes inputs into the service industry. Consideration could be given to removing this tax but factors relating to general tax policy considerations would need to be reviewed in addition to the concerns of the computer services industry.

In general, it was concluded that the fiscal environment for the domestic computer/communications industry facing international competition should not be out of line with that of our competitors. This, however, is a complicated issue and extends far beyond the question of tariffs and taxes on computer equipment.

4.2.2 Price and conditions which apply to the use of data communications links in Canada

This issue is of great concern to industry. The significant cost differential between Canadian and U.S. rates for data communications weakens to some extent the competitive position of Canadian service bureaus and creates incentives for the establishment of data centres outside Canada to serve the Canadian market. This situation arises from a number of factors including: the cross-subsidy which currently prevails in Canada between local and long-distance rates and between residential and business rates and the institution of relatively large extended area servic boundaries in major Canadian metropolitan areas. The situation is likely to worsen as U.S. deregulation of telecommunications becomes fully effective. The lack of harmonization among Canadian regulatory jurisdictions of regulations pertaining to the use of communications links (particularly terminal attachment provisions) has also contributed toward impeding computer/communications activities conducted across jurisdictions and encouraged the migration of such activities out of the country.

4.2.3 Tax treatment of software

Submissions from the private sector have recommended that the tax treatment of software in Canada be brought in line with that afforded to similar products in the United States, Japan and other foreign jurisdictions. In particular, it has been suggested that the 150 per cent incentive deduction available for R&D activities be extended to software development. Further consideration needs to be given to the exact nature of the problems facing the software industry (inadequate access to capital, marketing problems, heavy taxation) and the desirability of various instruments (special tax treatment of custom software expenditures, direct grants, marketing assistance, etc.) to overcome the problems.

4.2.4 Shortage of critical skills

The shortage of EDP critical skills is also an area of great concern to both producers and users of computer/communications services. Because of the importance to Canada of critical skill shortages in this field, a special study was undertaken. The results of this study indicate that the supply of labour has responded well to the tremendous growth in demand for EDP personnel over the last decade (the average annual rate of growth of EDP employment between 1970 and 1980 was around eight per cent, about four times the rate for total employment in Canada over the same period). Despite this impressive performance, there is evidence that growing shortages are being experienced for certain categories of EDP personnel (experienced programmers and systems analysts). In order to assess fully the significance of this

situation, it is important to realize that, as skill shortage in this field is an international phenomenon, immigration cannot be expected to offset the Canadian shortage situation to any substantial degree.

A number of proposals have been made by industry to alleviate skill shortages. The formulation of a national plan by CEIC, in cooperation with provincial governments and industry, to alleviate shortages has been suggested by some industry representatives. Among the suggestions made to the Task Force was that post-secondary institutions should carry out an assessment of their resource requirements to meet prospective demands for training in computer science and data processing. Educational institutions may wish to explore the possibility of exchange programs with industry in order to attract industry experts to teaching assignments and to help teachers to keep up to date with technological changes in this rapidly evolving industry. Both service bureaus and multi-national enterprises have had high praise for the graduates of cooperative programs where students alternate periods of work with periods of academic study, which suggests that cooperative education in the computer field should be expanded. "The implementation of the National Training Act is making a significant contribution to the expansion of the supply of persons with critical computer skills and also aiding those already in the field to upgrade their skills. The Act provides for a National Occupational Growth and Adjustment Fund, the primary purpose of which is to provide capital for training facilities to be established, expanded or modernized, to increase incentives for industry to undertake on-the-job training and to increase the purchase of seats in non-apprenticeale occupational areas such as computer programming".

Crucial to the success of any program to increase this supply of computer science and data processing graduates is the conduct of a review of the shortage of computer science and data processing instructors to determine what pay scales and conditions of work will be required to enable educational institutions to compete successfully with industry and government in recruiting and retaining sufficient numbers of good teachers.

4.2.5 **Cost and Availability of Venture Capital**

Venture capital is available to Canadian business firms, big or small, through a variety of mechanisms and institutional arrangements. Indeed the recently completed Small Business Review could find no evidence that there were gaps in this area in Canada. With regard to cost of capital, long established firms with good track records have traditionnally enjoyed an edge but the recently announced Small Business Investment Grant should help reduce borrowing costs for the acquisition of new assets or for financing R&D by small firms. Notwithstanding these various provisions, however, firms specializing in the production and sales of services as opposed to goods appear to have more difficulty in convincing would-be lenders of the viability of their proposals and, on this account, find that their access to venture capital is more difficult and often more costly. The situation deserves to be studied and the facts brought out to determine whether there

are real problems to be overcome in this area. Government and government enterprise programs that provide industrial assistance to business could also be assessed with the same considerations in mind. Reviews of the fate of service applications to the STEP (Support for Technology Enhanced Productivity), EDP (Enterprise Development Program), IDB (Industrial Development Bank) and EDC (Export Development Corporation) would be useful in this regard.

4.3 Demand and Revenue Considerations

A number of factors also tend to affect the ability of Canadian providers of computer/communications services to generate revenues from their activities. Of growing significance is the absence of adequate legal protection (such as copyright) of digitized information and software. Without it, fair returns cannot be guaranteed to the capital invested by information producers, data base vendors and software developers. It may, in part, be a cause of problems in obtaining venture capital. This shortcoming is detrimental to the development of a strong Canadian industry which is able to compete effectively in the domestic and world markets particularly the area of packaged software and data bases. Similar concern has been voiced by the software industries in other countries.

4.3.1 Government Support to Export Activities

Because of the international nature of EDP activities, the ability of Canadian suppliers to penetrate foreign markets, especially that of the U.S., is of critical importance. The Canadian industry is relatively well positioned in this regard given its skill in the use of computer/communications technology, the similarity of markets and business practices between the two countries, the close integration of the two economies and the use of a common language. There is need to review support to export activities such as trade missions and international marketing assistance in order to determine the optimal means of assisting the industry in fully exploiting these opportunities. This should include a review of the legal and regulatory roadblocks to exports (e.g. tax treatment of foreign income).

4.3.2 Government Make or Buy Policy for EDP Services

The percentage of expenditures on imports of EDP software and services is probably too small to have a major impact on TBDF. Moreover present government make or buy guidelines appear adequate to protect legitimate Canadian interests in the provision of EDP services. Still, economic benefits could be further enhanced if government agencies were encouraged to contract out their complete software and systems requirements, instead of merely subsets of their needs. Such initiatives could prove particularly useful in the development of competitive Canadian software packages.

4.3.3 Anti-Dumping Legislation

The use of anti-dumping legislation to protect Canadian suppliers of EDP services from unfair competition from foreign suppliers has been advocated in some of the submissions received by the Task Force. While this is not possible at this time since the existing legislation applies only to goods and has no provision with regard to "unfairly" traded services, the proposal has been the subject of study and merits further examination. A discussion paper on Import Policy Proposals released by the Department of Finance in July 1980 suggested the authorization of the Anti-Dumping Tribunal upon reference from the Governor-in-Council to investigate particular problems related to service imports. Further study is required with regard to the possible imposition of anti-dumping duties on services and the methods of determining "normal values" for services. This is required in anti-dumping procedures. In the absence of progress on this front, problems may arise in the future in the EDP field especially with regard to software developed in the U.S. which can then be sold at marginal cost on the Canadian market. Clearly this is an area deserving of further attention.

APPENDIX I

References and Statistical Data

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10. Brief submitted by the Canadian Association of Data Processing Services Organizations (CADAPSO), November 1981.

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C. Other Related Work

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26. Gotlieb, C.C. and Zeman, Z., Towards a National Computer and Communications Policy: Seven National Approaches, Report prepared for DOC, May 1980.

27. Statistic Canada Catalogue 63-222 Annual, Computer Service Industry Annual Reports, 1972-80.

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29. Mid-Year Review of the Canadian Computer Industry, Computer Data, Vol.7, No. 5, May 1982.

Table 1:

Preliminary Estimates for Canadian User Costs and Computer Services Industry Revenues, 1970-1980
(Millions of Current Dollars)

Item	Category	Costs/Revenues ($m)		
		1970	1975	1980
1. User Costs for C/C Services	Total	1,185	2,660	6,090
	In-house	985	2,170	4,615
2. Software Costs (User and Service Suppliers)	Development		440	880
	Maintenance		480	1,120
	Other Software (Packages, etc.)		15	40
3. Computer Services Industry Revenues	Total	150	400	1,030
	Machine-Based(1)		305	655
	Person-Based(2)		95	375

Sources:
- The Growth of Computer/Communications in Canada, March 1978 and Revised DOC estimates, February 1982.
- Report on Software Related Issues
- Statistics Canada Catalogue 63/222: Computer Services Industry (1972-80)

Notes:
(1) Machine-based includes revenues from data processing, input preparation and the computer usage component of software development and information retrieval services.

(2) Person-based includes all costs of programmers, systems analysts, consultants, etc for other services.

Table 2:

Estimates of Canadian Computer Population and
Annual Rental Value ($m) of Installed Computers, 1970-1990

Item	Category	Years				
		1970	1975	1980	1985	1990
1. Computer Population	Total (Rounded)	4,400	14,600	81,000	285,000	752,000
	Large (1)	91	244	433	553	641
	Medium (1)	1,330	1,779	3,191	4,073	4,722
	Small (1)	1,701	6,077	17,605	35,410	57,028
	Very Small	1,300	6,300	18,700	44,600	89,700
	Desktop	-	200	41,000	200,000	600,000
2. Annual Rental Value of Installed Computers ($m)	Total	396	796	1,717	2,873	4,375
	Large	77	236	498	755	1,040
	Medium	251	344	589	733	850
	Small	57	178	491	974	1,568
	Very Small	11	37	90	201	377
	Desktop	-	1	49	210	540
3. Percentage of Total Annual Rental Value (%)	Total	100.0	100.0	100.0	100.0	100.0
	Large	19.6	29.6	29.0	26.3	23.8
	Medium	63.3	43.3	34.3	25.5	19.4
	Small	14.3	22.3	28.6	33.9	35.8
	Very Small	2.8	4.7	5.2	7.0	8.6
	Desktop	-	0.1	2.9	7.3	12.4

Sources: ° CIPS Annual Computer Census, 1965-80
° Revised DOC Estimates, February 1982
° Report on Software Related Issues

Notes: (1) CIPS Census Sizes include Large, Medium and Small (Monthly Rental of $1000 and over).

BACKGROUND PAPERS