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ABSTRACT

A study was made of the aims governments have with respect to computers and what methods they have at their disposal for achieving these aims. The Canadian experience provided an example. In general, throughout the world, governmental objectives with regard to computers come under three headings: (1) to use computers effectively in governmental operations, (2) to promote an indigenous computer industry, and (3) to direct and regulate computer growth. The methods available for promoting these objectives involve passing legislation and allocating money. In Canada, a redefinition of the powers and a desire to establish a distinctive "Canadian" approach has resulted in a conscious and intense study of information processing and related technologies. However, although it is not difficult to agree on general principles and goals, it is enormously difficult to translate these principles into programs which further national goals. In Canada, the federal government has adopted a decentralized approach of computer services, while at the provincial level, the trend is toward centralization. The general position in Canada is that computer services and software industries are to remain largely unregulated; the problem of whether to participate in a computer network remains unresolved. (WCM)

NATIONAL POLICIES FOR INFORMATION PROCESSING
(with special attention to the Canadian experience)

for presentation at

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Background

There is no need in this forum to make the case for the importance of computers or to describe the growth that has been experienced, almost without pause for over twenty years, in their design, production and use. Computers play vital roles in industry, administration, education and government and in many respects, the ways they used and the ways they are seen by organizations and institutions in those spheres are very much alike in all countries, or at least in all countries which are at approximately the same level of economic and industrial development. But there <u>are</u> national differences in the way computers have penetrated into society and in the responsibilities that governments have acknowledged and undertaken with regard to them. Two facts are sufficient, I believe, to illustrate that the position of computers in the United States is different than it is in other countries. One is that the USA is to all practical purpose, the only country with a substantial computer <u>production</u> industry (as distinct from industry based on computer <u>use</u>), in which even allowing for the dominant role of IBM, there are diverse, and successful competitors. The other fact, and

it may stem from the first, is that the USA is almost the only country sophisticated in the use of computers, which is not engaged in trying to formulate an overall national policy relating to the production and use of computers. Dr. Ruth Davis, Director of the Institute for Computer Sciences and Technology of the National Bureau of Standards, Washington, argues that centralized planning with regard to computers in the United States would be restrictive and stifling, forcing growth and change in narrow directions at a time when there is still a great deal of innovation in the computer technology[1]. The lack of <u>overall</u> policy does not mean, of course, that no policy exists or is sought on special issues such as privacy, networks, standards or acquisition of computers within the government. Nor does it mean that there have been no advocates for more planning; calls for this have been voiced regularly, and there has been at least one book advocating a greater governmental presence in formulating policies for computers[2]. Perhaps the argument that diversity and strength of the US computer industry is such that the industry would be impeded by attempts at overall planning is a valid one, or perhaps it is a rationalization, but it is a fact that in the United States any federal bodies concerned with computers address themselves to special problems in a relatively narrow area over which they have jurisdiction.

In some other countries at least, the situation is different. Many of you are probably familiar with the Japanese plan for intensive long term development of what is known as the "knowledge economy", with particular emphasis on the computer technology in all of its hardware and software aspects[3]. In Canada there has been a continuing series of studies on computers for almost a decade now, many of them, but not all, originating in a department specially created to cope with the problems of new technologies - computers, satellites and cable TV. At the international level the United Nations has issued reports urging developin countries to formulate national policies with regard to computers[4], and OECD, while it has fallen short of advocating this for the industrialized countries which comprise its membership, has nevertheless issued a series of reports on the computer technology and on comparative studies of policy[5]. Moreover, certain countries, notably the United Kingdom and France, have undertaken major support of their computer industries in ways which are quite different than the type of support to be found in the United States. These efforts at policy review and formulation, and large scale financial support, arise out of the concern, voiced in almost every country which has stopped to look at computers, that somehow there is a danger that the country is failing, or will fail, to get a fair share of the action in a crucially important development, and that steps are necessary to see

that national goals are formulated and realized. I have myself been involved, in varying degrees, with governmental studies and actions with regard to computers in Canada, Israel, Denmark, Brasil and Yugoslavia, and through work in the United Nations, with several other countries as well. In what follows, I shall first outline briefly what aims governments have with respect to computers and what methods they have at their disposal for achieving these aims, and then I shall go on to describe some of the Canadian efforts and experiences in these regards.

Governmental Objectives with Regard to Computers

It is not difficult to list the objectives which different governments have sought with regard to computers. They are conveniently summarized under three headings:

I To use computers effectively in its own operations, in particular for administrative, planning and military applications.

II To promote an indigenous computer industry. This is a desired goal for a variety of reasons of which the most important are to:

- ensure effective national use of computers in administration, planning, industry, process control, education, etc. (cf goal I)
- create jobs (since computer based industries are growing exceptionally fast and they make intensive use of people with relatively high levels of

education, an important factor as the number of college graduates increases

- improve the balance of payments (the alternative is higher imports as the number of computers increases).

III To direct and regulate computer growth so that

- detrimental secondary effects are not experienced (e.g. erosion of privacy, large scale unemployment)
- the benefits of the technology are distributed fairly (between public and private sections, employers, and employees, etc.)
- national controls are exercised on ownership of industry, data banks, etc.

The methods available for promoting these objectives are those which governments usually have open to them in pursuing a goal. In general they involve passing legislation and spending money in a variety of ways, which can be summarized as follows:

I Award grants and contracts - e.g. for

- establishing new industries
- setting up cooperative ventures (between gov't/industry, universities/industry, etc.)
- research
- training and education.

II Promote debate and research through

- studies (e.g. policy analysis, marketing)
- conferences
- publications.

III Adopt selective taxation policies, e.g.

- offer incentives to industry and companies which meet specified criteria
- apply tariffs and excess profits taxes to protect indigenous suppliers.

IV Apply purchasing policies

- for its own acquisition
- supported installations (educational, local gov'ts, etc.)

V Set up regulatory agencies applicable to:

- critical aspects of the technology, e.g. communications
- use of personal data
- data banks containing data of national importance (resources, people)

VI Create model operations, e.g. for

- personnel data banks
- service bureaus
- special applications (planning, libraries, etc.)

The Canadian Experience

In using Canadian examples to illustrate how the various instruments and methodologies just listed have been used by governments to achieve the three objectives named earlier, I hope it will be clear that there is no suggestion that in Canada we have had the most concerted or most successful attacks on these problems. Support of the computer industry for example has been much more continuous and important in Great Britain and in Germany, where both countries have sought to keep a national capability for designing, manufacturing and marketing main frames (through ICL in Great Briatain and Siemens in Germany). Nor is there in Canada any organization which conducts research on all aspects, theoretical and practical of software, as is done in France by IRIA, or which concentrates in computer use, applications and markets as does the Computer Usage Development Institute in Japan. However, the occasion of EDUCOM's meeting in Canada seems to be an appropriate one to bring to your attention how we in Canada are attempting to cope with the problems of efficient computer utilization, and especially with the problems relating to networks and computer-communications which have been the subject of so much discussions in EDUCOM for several years now.

As a preliminary, however, it is necessary that I describe some aspects of the current political scene in Canada. For the last ten years or so we have been going through in Canada,

a redefinition of the relative powers of the federal and provincial governments in a kind of struggle which has occurred periodically in the United States, but which is comparatively new for us in Canada. This redefinition was first pressed by Quebec, but it is being pursued with equal vigour now by other provinces - e.g. Ontario and Alberta. The British North American Act, which is the closest approximation to a constitution we have in Canada, allotted certain responsibilities and taxation powers to the provincial governments (e.g. for education, civil law, and the regulation of professions) and others to the federal government (criminal law, defence, interprovincial trade). But in many areas the delineation of responsibilities is far from clear, and both provincial and federal governments are staking out claims. An example is communications channels as used in cable TV and computer networks. Although the federal government, through its specially created Department of Communications has so far been the most dominant here, e.g. by launching satellites or conducting nation-wide studies, the provincial governments have not relinquished their claims to jurisdiction. Quebec, for example, is well on its way with a provincial computer network for education, where it has undisputed rights, and Ontario likewise has a strong educational TV network. These problems will not be settled in Canada until there is agreement on a new constitution in which the provincial and federal powers are renegotiated, an

enormously difficult task which the present government has just indicated that it will tackle again. The result is that many important matters relating to computers cannot be settled yet, but in spite of this there has been a very long series of studies and reports, from which certain goals have emerged and actions initiated.

The second facet of the Canadian political scene which I should mention is the strong nationalism which is apparent in the public attitudes to many issues. It manifests itself as a desire to foster and maintain a distinctive "Canadian" approach in such diverse matters as ownership of industries, resource management, the performing and creative arts, staffing of universities, etc. This is most definitely not anti-Americanism, but since in most of the activities the Canadian way of doing things has to distinguish itself from the way they are practised in the United States, this nationalism is finding expression of itself by a noticeable reluctance to be associated in joint programs. It does not matter that in many of these areas, few persons, if anybody, can say what is different about how they are being done, or should be done in Canada as compared with the United States. There is nevertheless a concern that failure to keep a distinct Canadian operation might in the long run be detrimental to Canadian interests. As an example, I am certain that most Canadians would agree that any inventory of resources such as water or energy should be taken and maintained separately in Canada, so that independent judgements can be made in

negotiations which are eventually bound to be undertaken. But the feeling that data banks ought to be kept separate goes beyond this. Medical data on certain Canadians who have applied for life insurance are kept in a centralized data bank maintained by the Medical Information Bureau, Boston, on behalf of a large group of U.S. and Canadian-based companies. The reason for a shared file is obvious, since the discovery that a high risk applicant has failed to reveal information is of common interest. However, Canadian participation in the data bank has been questioned, at least to that extent that attention was drawn to it in reports on privacy undertaken by the federal government.[6,7] No recommendations were made suggesting that the files be separated, but the general uneasiness was clear.

With this background, I should now like to return to the three main objectives mentioned earlier.

I. Effective Use of Computers in Government Operations

In this area the goals are clearest, the methods for achieving it are best understood, and in the case of the federal government at least there is demonstrable progress along a planned path. The basic document is an EDP master plan, which was issued by the treasury board in 1972 as an overall policy guide. A strongly decentralized approach is adopted and the Central Data Processing Bureau, which for some years has been offering optional services to government

departments, is not even mentioned and will clearly not play an important role. Instead two types of data processing centres are recognized - departmental and functional. Departmental centres in the main serve existing departments (National Revenue, RCMP, Statistics Canada, etc.); functional services, as the name implies. are more concerned with the type of application (revenue collection, trade and transportation, resource-environment). A five year time-table was drawn up for developing new functional services. The range of applications considered is impressive, and the plan shows a full understanding of the multiplicity of ways computers can be brought to bear on governmental operations. By now the plan is well advanced, several of the functional centres have been st up and there are newer publications on how the services are to be administered, both general and detailed[9].

In the provincial government, which have much smaller computer requirements than the federal governments, there has been a trend towards centralizing the service bureau facilities in order to achieve the economies of scale. Saskatchewan operates a centralized facility as does Newfoundland; and there has been a recent consolidation of services in the other Maritime Provinces. In Ontario and Quebec, the largest and most populous provinces, the services are too diverse to permit consolidation into single installations. In Ontario's case there has been criticism

that there is no rationale to different facilities, and little coordination among them, and there are steps under way to correct this.[10]

Before leaving this section on governmental facilities I should briefly like to describe the situation with respect to university computing facilities which are quasi-government in that their support comes wholly from government provided funds. In Canada NRC, the National Research Council of Canada, has played the role that the National Science Foundation undertook with regard to support of computing facilities in the USA. Even though there is no direct support of university education by the federal government in Canada, NRC does support university research, and all through the fifties and sixties there were direct grants to maintain university computing centres. This program was instrumental in ordining about the establishment of university computing centres, and later departments of computer science, throughout the country. At present NRC no longer supports computing centres directly. Instead it allows holders of research grants to pay partial costs of computing, and it has a computer science grants committee which recommends awards for research in the information sciences. Among the provinces Ontario and Quebec were the first to adopt overall program for support of university computing facilities. The Quebec educational computer

network, a star system based on a CDC 6600, is the largest dedicated network in Canada. In Ontario, between 1969 and 1972 there were grants of about five million dollars per year earmarked for computer hardware in universities. Since then these funds have been combined with the regular university allotments in accordance with the principle that universities should make their own priorities on how funds are spent. The identification of computer funds was to have been the initial stage of a rationalization of computing facilities, followed by consolidation of individual centres or co-ordination into networks, but for reasons which are complex, but which are probably well understood by most of you in this audience, these later stages have been slow to materialize. I shall say more about networks later.

II. Computer/Communications

Canada because of its size has a special interest in communications; like other countries it has wanted a strong computing industry, and these two factors were paramount in establishing the federal Department of Communications and of principal concern in the extended series of studies and reports undertaken by that department. The first study, directed by a group largely within the Department of Communications, called the Telecommission, produced Instant World[11], as its main result, supplemented by a series of

conference reports on subjects of topical interest including access to information[12], the wired city[13] and computers and privacy[14]. Instant World presents an exceptionally lucid and well written picture of the telecommunication technology and of its importance to Canada. But it and its supporting studies were regarded as merely setting the stage for the following much larger study, conducted by the Computer/Communications Task Force under the direction of Dr. Hans von Baeyer.

The Task Force divided into many subgroups (to enable it to concentrate on more technical matters, the topic of Privacy was assigned to a special task force which reported separately) and it actively solicited views from industry, universities, consumer groups and other government agencies. After some two years it produced its recommendations in a two-volume report entitled "Branching Out"[15]. Although there were thirty-nine recommendations, most of them were so general, such as requesting that telecommunications be recognized as a key activity, urging collaboration between all interested parties and advocating incentives to develop socially important applications, that there was some disappointment with the results. The report was intended as a policy guideline rather than a detailed set of specific proposals, but perhaps the reasons why detailed proposals were not put forward was that for many important issues, as became clear from the public debates which both preceded

and followed the appearance of the report, either there was no general agreement, or jurisdiction on them lay between the provincial and federal governments, and it was not possible to lay down a line of action. One recommendation which was not taken up was that the government recognize a focal point for activity in computer/communications. The fact of the matter is that there are too many government departments and organizations with strong, almost central, interests in these technologies, to allow any one department to be given a principal mandate for their development.

The difficulties encountered in trying to come up with specific proposals can be illustrated in the problem of determining what form if any, government support of private computer industry should take. The computer field is strewn with the wreckage of large multinational companies who have unsuccessfully tried to compete with IBM in marketing main frame computers, and there is general agreement that it would be suicidal to try this. But then what should be done? There already had been in Canada the experience of large governmental grants to established computer companies. Some years ago the Department of Trade and Industry awarded two large grants, amounting to several million dollars, one to IBM, the other to CDC. The IBM award was to set up an assembly plant in Quebec, to supplement the large assembly and manufacturing plant in Don Mills, adjacen

to the hotel where this meeting is being held. The CDC grant helped establish a plant in Mississauga (outside Toronto) intended, I believe, as a production facility for the Cyber computer which never emerged as a fully developed member of the CDC line. The grant to IBM did lead to a plant which created jobs in a geographical region where it was important to do so, and the CDC grant may have produced comparable benefits, but the awards have been criticized. Being given as they were to large multinational companies, it is difficult to argue that they have helped develop a Canadian-based computer industry, and it is certainly hard to see where they have made use of local design and engineering effort or how they have helped stimulate other kinds of computer effort. What kind of activities would have such effects? One possibility might be to encourage a software industry. Computers are used effectively and widely in Canada, there is a sound infrastructure based on mathematics, engineering and other technologies, and it is not unreasonable to expect that it should be possible to capitalize on these advantages and develop a viable software industry. But many of you will be aware of the difficulties in this regard. For complex reasons, the market for software products has not developed the way experts have felt it would, perhaps because the real market lies in for overall systems rather than for isolated packages.

Also there are many other countries where there is an abundance of skills in the mathematical sciences alon.1 with good experience in using computers - Denmark, the U.K., Japan, even India, and I can say from personal experience that there are hopes for a multinational software industry in everyone of these. The result of all this is that it becomes very difficult to see how a general recommendation favouring support of the computer industry in Canada should be translated into programs.

In this regard the computer technology is not different from other modern technologies. It is also difficult to define national programs for satellites, say, or nuclear power, or transportation systems. There are those who argue that the problems and costs of such general systems demand an international approach - that multinational groupings are necessary to pool resources, share markets and give reasonable hope of success. However, it is necessary to be careful in accepting such arguments without question because they can be equivalent to say that there is no room for small enterprises, whatever the originality and quality of the enterprise.

Coming back to Branching Out there has been since its appearance a slow but steady attempt to make the recommendation more specific, to sharpen the policies and to initiate actions. In April 1973 the Department of Communications published a formal position statement, its so-called Green

Paper outlining policy.[16] After defining the goals, this statement makes 29 policy proposals in five categories (general, data communications, industrial development, new systems, coordination). In certain areas, particularly those concerned with the relations between computer-service firms and the common carriers, some fairly definite principles are enunciated. A general position is taken that the computer services and software industries are to remain largely unregulated. In other areas an open position is maintained particularly with regard to the role that the chartered banks might be allowed to play in the computer service industry. The need to consult with the provinces is emphasized.

The present position seems to be that the federal government is slowly feeling its way towards sharpening and implementing proposals. Dr. von Baeyer has remained in the government in charge of a multi-department force charged with the task of coordinating the activities on computer/communications throughout the federal government, and there is evidence of a quiet effectiveness in the work there. Studies on which segments of computer industry might receive support are still proceeding. Some of these have been at the same time broadly based and of considerable depth, such as one recently carried out on the future of terminals. But specific programs have not yet been announced, and those of us not directly in the government can only hope that there will be positive results to show for the enormous amount of investigation which has gone on in this country.

III. Networks

As a final example of the difficulties governments can experience in trying to arrive at constructive programs even after much study, I would like to say something about computer networks, although some of the points I wish to raise have just been made by the previous two speakers. In Canada, perhaps even more than in the United States, the two railroads have played a dominant role in the development of the country and in maintaining communications along the twenty-five-hundred-mile long and hundred-mile-wide strip which embraces most of the populated centres. For this reason among others there has been a readiness to accept that computer networks could play an equally important role in making the computer/communications technology a productive force in the country. In 1971 the Science Council of Canada issued a report entitled "A Trans-Canada Computer Communications Network"[17] in which it urged the establishment of a "national spine". This was to be a computer network which would offer cheap service along the length of the country, and hence provide an alternative to the establishment of a multiplicity of north-south links, between the densily populated centres of Canada and United States, which would otherwise be the natural mode of development. The Telecommission and the Computer/Communications Task Force likewise seemed to favour a Canadian network development, but no specific network proposals emerged from its work. For two years it supported a major study of a proposed network, called CANUNET[18], which was to link

universitics, but no funds for this were ever allocated. The reason for the failure of CANUNET, and of a related program which was Ontario-based, called METANET, to get off the ground are complex. A major factor, certainly, was the difficulty in proving that the networks were needed and would be used. The question arises whether many university computer users really need computing facilities not provided locally, and whether there is any mechanism by which those who do want to use computer elsewhere have funds which are not locked in to their own centres. In this regard the slow rate of increase in ARPA traffic, which has been carefully watched, has suggested caution. There are those in government circles and elsewhere who have argued that universities should not commit large funds to in-house facilities, either singly or collectively, and that it is time they looked to commercial services if they want non-local access. In any case, it is suggested that if networks have all the advantages claimed for them, the universities themselves should be willing to make the necessary investment to realize them. Especially important in Canada has been the position of the common carriers, particularly Bell Telephone of Canada, that computer networks is not a suitable area for government intervention. They argue that networks are best allowed to grow in a competitive environment as the market develops real applications, and you have heard

at this conference some of the impressive evidence that they are in fact, developing the right kinds of service at the right pace. Whatever the reasons, the arguments in favour of government supported computer networks have not prevailed to the point where any government supported network has been launched. Many, myself included, believe that university computing centres in Canada are too narrowly based, that the real costs of their service are not measured, and that establishment of university networks would prove beneficial. Funds are still being sought, if not for setting up full networks, at least for promoting interuniversity communication. It is noteworthy that no Canadian university is a member of ARPA, but I am hesitant to say whether this is due to a reluctance to join in activities with the USA as pointed out earlier, to a belief that a Canadian network will eventually emerge, or simply doe to a lack of need or funds for the services available through ARPA. In any case, the problem of whether to promote and participate in networks, either commercially based or university-based, has not been resolved by Canadian government.*

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* An exception to this is the special-purpose star system educational network in Quebec, mentioned earlier.

Conclusion

In spite of the lengthiness of this paper, by no means have all the activities of even the federal government with regard to computers in Canada been mentioned, to say nothing of provincial undertakings. For example I have said nothing about the studies which have been carried out on Information and Library Services, and I have only alluded to the Report of the Privacy Task Force and to other studies on social implications of computers even though this is an area in which I myself have been involved extensively. I hope that what I have said is enough to justify the following three points which I offer as summary:

1. Throughout the world the computer technology has been the focus of governmental interest; for good reasons studies and programs for its growth and development are widespread.

2. Few countries have embarked on a more conscious and intense study of computer/communications and related technologies than has Canada.

3. Although it is not difficult to agree on general principles and goals, it is enormously difficult to translate these principles into programs which have reasonable expectation of furthering national goals.

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