



Government of Canada
Department of Communications

Gouvernement du Canada
Ministère des Communications

REVIEW OF OTHER GOVERNMENTS POLICIES
AND PROGRAMS FOR STIMULATING
OFFICE AUTOMATION:
A COMPARATIVE EVALUATION
(DETAILED TECHNICAL REPORT)

Background Study

Etude de base

PROGRAM EVALUATION DIVISION · DE L'ÉVALUATION DES PROGRAMMES

Queen
P
91
C655
P76356
1986

REVIEW OF OTHER GOVERNMENTS POLICIES
AND PROGRAMS FOR STIMULATING
OFFICE AUTOMATION:
A COMPARATIVE EVALUATION
(DETAILED TECHNICAL REPORT)

FEBRUARY, 1986

DOC
PROGRAM EVALUATION SERIES

This is one of seven Background Studies that form part of the evaluation of the Office Communications Systems Program.

The Study was prepared by Wescom Communications Studies and Research Limited for the Program Evaluation Division of the Department of Communications, Canada.

The views expressed herein are those of the author and do not necessarily represent the views or policies of the Department of Communications.

**FOCS PROGRAM EVALUATION
REVIEW OF OTHER GOVERNMENTS POLICIES
AND PROGRAMS FOR STIMULATING
OFFICE AUTOMATION:
A COMPARATIVE EVALUATION**

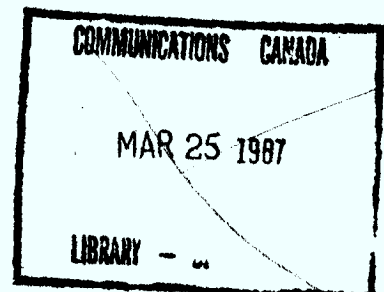
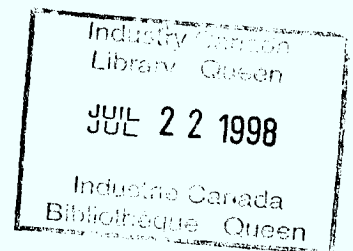
Detailed Technical Report

By

Peter J. Booth

**WESCOM COMMUNICATION STUDIES
AND RESEARCH LIMITED
105 - 853 Richards Street
Vancouver, B.C.
V6B 4K5
Telephone: (604) 669-7175**

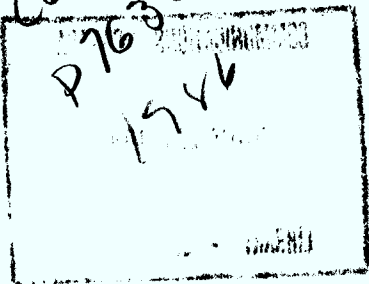
February 1986



P
91
C655

P76356

1986



DD 708 4679
DL 708 4755

TABLE OF CONTENTS

	<u>Page</u>
1.0 STUDY OVERVIEW	1
2.0 PROVINCIAL ACTIVITY IN CANADA	6
2.1 British Columbia	6
2.2 Alberta	9
2.3 Saskatchewan	10
2.4 Manitoba	10
2.5 Ontario	11
2.6 Quebec	15
2.7 Maritime Provinces	28
3.0 SUMMARY CANADA	29
4.0 INTRODUCTION - UNITED STATES	37
5.0 INDUSTRY STIMULATION	39
5.1 General Philosophy	39
5.2 R & D	39
5.3 Department of Commerce	40
6.0 PROCUREMENT	42
6.1 Indications of Market Size and Demand for OA Related Services	42
6.2 Agencies and Legislation Affecting Procurement	42
6.3 The GSA (General Services Administration)	44
6.4 Volume Purchases ("Big Buys")	45
6.5 Standards	45
6.6 OA as a Means to Improve Productivity in Government: PPSSCC (The Grace Commission)	46
6.7 Office of Management and Budget: Reform 88	49
7.0 INCENTIVES FOR PRIVATE INDUSTRY TO USE OA	52
8.0 EVALUATION, ASSESSMENT, SOCIAL IMPACTS	55
8.1 Office of Technology Assessment, Congress of the United States	55
8.2 National Academy of Sciences	55
8.3 National Science Foundation	55
9.0 SUMMARY U.S.	57

TABLE OF CONTENTS (Continued)

		<u>Page</u>
10.0	OFFICE AUTOMATION IN BRITAIN	61
10.1	Introduction - Overview of Strategic Initiatives	61
10.2	Financial Support	62
10.3	Support for Innovation	63
10.4	Government Agencies and High Technology	65
10.5	Methods for Evaluating Office Technology Systems	68
10.6	Office Pilot Trials	77
10.7	Organization of the DTI Pilots	80
10.8	Summary of Office Automation Activities in Britain	84
11.0	SUMMARY: OFFICE AUTOMATION IN THE FEDERAL REPUBLIC OF GERMANY AND HIGH TECHNOLOGY POLICY	86
11.1	Introduction	86
11.2	High Technology Policy	87
11.3	Instruments and Measures for Promoting R & D and Innovation	90
11.4	Office Automation Trials	94
11.5	Summary	96
12.0	OFFICE AUTOMATION ACTIVITY IN FRANCE	98
12.1	Introduction	98
12.2	Government Support to R & D	100
12.3	Information Technology and Office Automation	100
12.4	CESIA	101
12.5	SCRIBE	101
12.6	Project Organization	103
12.7	Summary	105
13.0	REFERENCES - BRITAIN, FEDERAL REPUBLIC OF GERMANY AND FRANCE	106
14.0	INTRODUCTION - JAPAN, KOREA AND SINGAPORE	107
15.0	JAPAN	108
15.1	Temporary Laws Affecting Technology Development	109
15.2	Financial Assistance	112
15.3	R & D Development Measures	113
15.4	Summary - Policies and Programs for New Technologies	114

TABLE OF CONTENTS (Continued)

	<u>Page</u>
15.5 The Japanese Software Industry	115
15.6 The Office Automation Market in Japan	119
15.7 Japan Institute of Office Automation	124
16.0 KOREA	125
17.0 SINGAPORE	128
17.1 Industrial and Export Support	129
17.2 The Capital Assistance Scheme	132
17.3 Summary	133
18.0 REFERENCES - JAPAN	134

APPENDICES

I BIBLIOGRAPHY AND SOURCES

Canada General	135
Quebec	136
United States	137
England	139
The Federal Republic of Germany	141
France	142
Japan	143
Korea	145
Singapore	146

II LIST OF CONTACTS

Canada	147
United States	149

LIST OF EXHIBITS

		<u>Page</u>
1	Les Projets Pilotes	20
2	Government Policies and Programs in Canada which Influence the Stimulation of Office Automation	30
3	Government Policies and Actions which Influence Office Automation in the United States	58
4	Examples of the Setting of a Achievement Criteria from Objectives and the Collection of Relevant Information	70
5	Data Analysis	71
6	Schedule of Typical Trial/Project Costs	75
7	Examples of Possible Benefits from the Use of New Office Technology	76
8	DTI Pilots	79
9	Office Automation and Related Products Production and Exports	121
10	Production and Export Value of Business Machine in 1978 - 1983	121
11	Production Value of Business Machine and Other Office Automation Equipment	122

1.0 STUDY OVERVIEW

This report was prepared in response to a Department of Communications request to conduct a review of Government office automation programs. This review was undertaken to provide information which would enable the Canadian Government's initiatives embodied in the OCS program to be assessed relative to those of other countries. The specific requirement for this study was:

To provide information on the strategies taken by other governments to stimulate the development of office automation.

The assessment was designed to answer two questions:

- a. Why was the particular strategy adopted?
- b. What have been the results of the specific activities?

In many countries government programs developing high technology do not always designate a single component or technology as a basis for development. Rather, policies are set out in terms of broad strategies oriented toward broader based industrial development. Once the strategy is defined, the appropriate technologies are identified which it is hoped will achieve the goal of industrial development. In Korea, Japan and Singapore, for example, the respective governments recognize the importance of different computer-based technologies, including office automation, as part of an overall strategic plan. Such an approach is based on the desire to achieve longer term strategic initiatives rather than responding to short term priorities which are often dictated more by political pressure than sound economic principles.

A recent Science Council* report noted that in Canada, the public sector can provide the infrastructure that industry needs to create its products and services. Today it recognizes that the infrastructure must be updated to accommodate new technologies and the ability to use them. The report supports the notion that broad financial support from government is needed to improve productivity and international competitiveness in Canadian industry, primarily because of insufficient private capital and the need to minimize risk. The information technology sector, combining microelectronics, computers and telecommunications, is considered critical to Canada's long term position in the world economy.

Improving Canadian capabilities in the development, production, marketing and export of office automation products is seen as a major part of an overall high technology strategy. The importance of this sector lies in the fact that at the present time, Canada has an extreme imbalance in trade for high technology products. Studies have shown that in 1983, the world market for office products was about \$100 billion, and for Canada about \$5 million. In 1983, the net deficit for these products was \$3 billion. One of the stated goals of the OCS program was to assist in turning this deficit around through the stimulation of the Canadian industrial efforts.

Related to the previously mentioned goal is the desire of the federal government to learn about and gain experience from the active use of integrated systems. This is an important element since there has been very little experience to date in the use of such systems, particularly when applied to management or so-called knowledge workers.

* Science Council of Canada, Report 37, Canadian Industrial Development, Some Policy Directions, September 1984.

In any program evaluation, consideration for the different goals and objectives and an understanding of the various criteria for measuring the achievement of stated goals is essential. Likewise, it is essential to recognize there may be direct and indirect gains which will, to a large extent, be time dependent. The direct and immediate gains for the OCS program may be seen in the development of a new and innovative product resulting from the efforts of one or another of the chosen vendors. The benefits of this could be measured in the future sales and employment opportunities resulting from such product developments. Indirect and long term gains may emerge as positive effects on Canada's balance of trade for high technology products. Still other more indirect effects may be felt in the learning and understanding of the social and non-economic impacts of office automation. Thus, any assessment of the program should be sensitive to these facts and attempt, where possible, to gather evidence which allows as balanced and fair an appraisal as possible.

The inputs used to appraise the approach taken in Canada must therefore reflect the broadest possible range of experiences and strategies, but at the same time be relevant to the purpose of the evaluation. If it is to set norms for measuring achievements, then assurances must be provided that the norms are realistic and, more importantly, relevant, defensible and reliable.

Where comparative programs are being reviewed, as in this study, it is important to ensure that there is a rationale for including a particular case example in the assessment. It was critical also to know the purpose of related programs and strategies employed by other governments and levels of government. In Canada the OSC program has generally been assumed to be part of an overall high technology policy of the federal government, which includes space, telecommunications and manufacturing. There has, however, been very little indication of the interrelationship of these sectors within that general policy thrust.

In other countries, the desire to stimulate office automation and to conduct research in that sector has been closely tied to a long term strategy for computerization of the national economy and the desire to develop strong export markets in several areas of high technology. In still other examples, this thrust has come from the need to rationalize an inefficient and non-productive work force or to face the realities of the changing nature of work. In some cases, the desire to stimulate a strong export market has been given lower priority than is the case in the Canadian situation.

The investigation of government initiatives for the development of office automation was made for Canada and selected provinces as well as specific foreign countries. Programs have been investigated for:

1. Canada
 - British Columbia
 - Alberta
 - Manitoba
 - Ontario
 - Quebec
2. U.S.
3. Britain
4. France
5. Germany
6. Japan
7. Singapore and Korea

In the cases just listed, direct contacts were made with individuals involved in office automation programs either by telephone, letter or personal interview. In most cases supplementary data in the form of published reports was available to complement the findings of the interview activity.

The information assimilated for each of the government jurisdictions is complemented by an appendix which provides an individual contact name, department affiliation and nature of involvement in a designated industry sector.

The first step in this study was a systematic appraisal of the relevant literature dealing with office automation programs, both domestic and international. The second activity was the selection of relevant contact names and the conduct of interviews with government or industry representatives. A combination of personal and telephone interviews together with mail contacts was employed for the collection of primary data for this study.

The results are presented by government jurisdiction such that provincial activity is reported for Canada, with all other countries described at the national level.

2.0 PROVINCIAL ACTIVITY IN CANADA

2.1 British Columbia

There are no specific programs related directly to office automation being administered by the Ministry of Industry and Small Business. There is, however, some effort being made generally to promote local sourcing and to treat B.C. companies preferentially for office automation equipment and computer services. The Ministry of Finance has a publication called "We Want You On Our Shopping List" for local sourcing which identifies all branches of the government and all required products and services. This is a very recent initiative handled by the B.C. Purchasing Commission and no details of the program were immediately available for incorporation into this study.

The Discovery Enterprise Program (DEP), run by the Ministry of Universities, Science and Communications, offers a pre-venture capital fund for equity financing in high-tech businesses. This year, \$7M was budgeted to be spent as direct investments rather than grants. Business categories of interest are electronics, software, biotechnology, mechanical specialized engineering and aquaculture.

The DEP program is the only one in the province focussed specifically on high technology. In addition, the B.C. Science Council gives R & D grants while B.C. Research gives grants and supports contract research. The B.C. Development Corporation gives loans to high-tech businesses, and the Ministry of Industry and Small Businesses has special programs to aid small start-up firms. (Thus, for example, a software developer might get funds to participate in a show in another country). There is no indication of a special effort to stimulate either software or hardware specifically related to office automation.

BCSC (B.C. Systems Corporation)

1. Role in Government Procurement

B.C. Systems Corporation (BCSC) is a crown corporation that serves the computing needs of the B.C. government. It has also been involved in the procurement of computer systems bought by government ministries. (This activity was delegated to BCSC by the B.C. Purchasing Commission; as of January 1985 procurement responsibilities passed back to the Purchasing Commission). Office automation has been an area of major interest for the B.C. Systems Corporation in the past few years.

In 1980, a list of qualified vendors was established to provide word processors. These consisted of AES, IBM, Wang, and Micom with IBM and Wang now the dominant suppliers to the B.C. government. An underlying goal when specifying suppliers was the need to acquire work stations that could connect with the IBM, SNA network (Standard Systems Network Architecture) since BCSC operates two IBM mainframes.

When purchasing, a government department would usually go to BCSC consultants and develop a "business plan", and either make a purchase from selected vendors or justify an alternative choice. BCSC also assisted in implementation of the system and initial training and start-up activity.

In 1982-83, a similar list of approved vendors was created for minicomputers (IBM, Wang, Hewlett Packard, and Digital Equipment). It was expected that all work stations would interface with these larger computers. There are now 35 minicomputers and 6000 work stations in place. BCSC also supports a specific and generally compatible set of software for each of the mini's.

Regarding software for personal computers, each ministry can purchase what it wishes but BCSC supports only certain material (chosen on the basis of

performance, availability of local support, costs, user-friendliness and other criteria).

Local sources of products have been considered but, especially in the case of hardware, these have generally not been available. Easywriter II, manufactured by Basic Software Corp. in B.C., is an example of a locally-made software product that has been extensively used. More generally, the government of B.C. has policies generated by the Treasury Board that give preference to B.C. based suppliers in any product area, to support local firms and to encourage foreign companies to locate in the province.

Now that procurement responsibilities have passed back to the B.C. Purchasing Commission, BCSC's main role in the procurement process is the provision of technical consulting to ministries making purchases.

2. Encouragement of Local Product Development

In addition to its role in government procurement, BCSC has other impacts on local industry. It contracts with local firms for between \$12M and \$15M annually for actual systems and services in meeting the computing needs of the provincial government. An underlying goal is the encouragement of local firms, especially in the software area where local firms are more likely to be active.

BCSC may play an active role in the development of new products, through outright purchases and through other supportive measures. (For example, a software firm might be given free computer time if it were developing a product for BCSC use). While the criteria for BCSC's support of a new product is that it be useful for the public sector, in many cases a product could subsequently be taken to the open market-place as well.

BCSC has also worked with the Ministry of Industry and Small Business to attract new firms to the province. The corporation is making efforts to support the

private sector by contracting out work formerly done internally. For example, training programs for using computers are now contracted out to the private sector.

2.2 Alberta

Procurement for OA is carried out through Supply and Services at the Public Works Department of the Government of Alberta. There are no specific policies for sourcing OA equipment locally.

There are, according to the government spokesmen for the Industrial Development Branch, no specific OA development programs. However within the overall science and technology area is a new \$7 million export development program similar to PEMD, the Federal Governments Program for Export Market Development. The Alberta program is not, however, specifically for high technology ventures.

The province of Alberta also has plans for implementing a small product development program which is designed to "fill the gap" in providing early funds for R & D. At the present time, the province operates a \$244 million VentCap (venture capital program) which can be utilized only when a project is near the commercialization stage. There is a recognized need to provide funding at an earlier stage to encourage start-up ventures for new technology in Alberta.

Although there is no activity in the OA area at the moment, the Advanced Technology Department is starting up a new component this year which includes information technology. This is expected to devote a significant although as yet unspecified amount of attention and funding to office automation.

2.3 Saskatchewan

A major effort focussing on office automation is known to be going on in Saskatchewan. The majority of this activity is being co-ordinated through the Systems Division of the Department of Supply and Services. Contact with the department representatives however was not very successful since they only agreed to share information directly with the Federal Government OCS program evaluation branch.

2.4 Manitoba

In Manitoba, the Ministry of Industry, Trade and Technology has an Information Technology program called Infotech which is active in three areas:

- a. educational technology
- b. public information technology
- c. office technology

The intent of their program is to use procurement to stimulate economic development in the province.

Procurement for OA is carried out by individual departments who must seek Treasury Board approval, a process which includes a review by the Ministry of Industry, Trade and Technology. So far, the Ministry has not steered departments towards any particular supplier. It does have industry "partners" in the Infotech program (IBM, Apple Canada, Commodore, Sperry and Burroughs), and Sperry has supplied equipment for the public information and office components of the program. However, Infotech has so far been concerned mainly with education (i.e., microcomputers in schools).

Infotech also utilizes field trials and R & D grants to act as a catalyst when it perceives a promising development. The program will also put together joint

ventures, help a firm acquire other grants, and do independent research into a given market area. However, nothing major has occurred in the area of OA.

Manitoba has also focussed on help for small businesses as a way to develop indigenous industry. Infotech is cooperating with the University of Manitoba in a study-job project in which student MBA's specializing in small business administration will advise small businesses on OA. The students gain job experience and the firms get inexpensive consulting services on the generic capabilities of OA opportunities, problems, and so on.

The Manitoba Government has set up a Workplace Innovation Centre which helps with the adjustment process when a new technology is introduced in the workplace, and this has focussed to a large extent on OA. A program of seminars is being developed for small businesses, to explain the process of adoption, and how to involve management, workers, and unions constructively in the implementation of OA.

It is generally acknowledged that Manitoba has one of the most advanced programs for the use and procurement of OA systems and supplies throughout Canada.

2.5 Ontario

1. The Procurement Process

The Ontario Government has a decentralized purchasing system where each ministry is responsible for purchasing the goods and services it needs. However, an individual Ministry cannot spend too much money without approval from Management Board (similar to a Treasury Board). Also, there are central services for purchasing certain sets of supplies and services. (For example, the Ministry of Government Services handles the acquisition of telephone equipment and services, "directories and database", mailing equipment and services. This

Ministry also has a Computer and Telecommunications Services Division that provides centralized services).

The Ministry of Government Services and the Management Board exercise a certain amount of control over selection in purchasing. For example, no one can buy a mainframe computer without approval, and a unit within Government Services oversees compatibility with existing IBM and VAX mainframes.

Generally, however, regarding office automation equipment (which has mainly meant word processing) individual ministries have significant latitude. Purchases are subject to certain "thou shalt" policies as described below. Also, ministries may want to standardize internally on a certain type of equipment for compatibility purposes. (For example, Industry and Trade has standardized on Phillips Micom word processors, a made-in-Canada system; Micom's can also access the government mainframes). In many cases, however, there has been proliferation of different machines within a single Ministry.

2. Procurement Policies

Ontario has two major procurement policies. The Canadian Preference Policy allows ministries to give special consideration to products with Canadian content. Ten percent of the suppliers stated Canadian content is subtracted from its total bid to arrive at an "evaluation bid". A contract is awarded to the supplier with the lowest evaluation bid.

(The attitude taken is that a "Canadian product" is one which adds value to the Canadian economy. A company need not necessarily be owned by Canadians; it is more important however that the work take place in Canada, creating employment, additional product value and technical expertise. A standard for the "Definition of Canadian Content" was developed by the Ministry and has become nationally accepted).

The Industrial Development Review Policy applies to proposed purchases of \$250,000 or more and is intended to ensure that maximum economic benefits to Canada result from such large purchases. The policy may also apply to smaller purchases if they are identified as significant in terms of industrial development potential.

3. The Office of Procurement Policy

This policy was developed within the Ministry of Industry and Trade to help maximize the Canadian content of purchases made by the Ontario government. In addition to the two major policies described above, it is concerned with increasing industry's awareness of opportunities in doing business with government, and has published "Ontario's Public Sector Market", a purchasing directory (1984/85) with lists of contacts in government responsible for purchasing.

The Ministry of Industry and Trade has produced a major directory of "Computer Systems Sources" to encourage government departments to purchase Canadian hardware, software, and consulting services. Another initiative is a series of "Manufacturing Opportunity Shows" where government (and other) buyers display products imported into Canada that they would prefer to replace with Canadian products.

4. Industrial Development

In the area of industrial development generally, the Ministry of Industry and Trade gives R & D grants and small business development grants. The BILD (Board of Industrial Leadership and Development) program funded a number of "high-tech" projects in recent years, but these are now being phased out. In particular, BILD funded six "high-tech" centres; none, however, is concerned with office automation per se.

5. QWL Centre

The QWL (Quality of Working Life) centre is a centre which participates in projects which examine the impact of technology in the working environment in both the private and public sector. The goal of the approach used at the QWL centre is the democratization of the work place through increasing worker involvement in decision-making. Although worker satisfaction may be a spinoff of democratization, this is not a specific goal of the QWL approach.

The basis for the approach taken at the QWL centre is sociotechnology. As a conceptual strategy, sociotechnology is a method used to identify organizational choices in a given production system. Most formally, sociotechnology can be used to analyse key points of variance within a system (i.e. points where the organization of the system could be varied and options generated). As an example, a given technology can be organized in a number of different ways; depending on our values, we prefer some ways to others. Sociotechnology helps to identify these choices. The QWL centre uses this approach as part of their analysis of a given setting. With a new system, it is preferable to start with the people involved who organize themselves and who identify options. The people are in this way their own researchers.

Essentially, this is the approach used at the QWL centre: In an interview with Wescom, the Director of the centre indicated that the QWL approach does not include evaluation of a project, but rather, works on a consultancy basis with the union and management of an organization who jointly manage their own projects and who decide on evaluation themselves.

QWL is a new organizational paradigm that treats people and groups as open systems, and organizations as purposeful open systems. Old paradigms based on closed systems do not apply. One can argue methodologically that in a dynamic setting, evaluation criteria has to be generated from the specific context itself and like "personal development", evaluation will vary from case to case.

Only one QWL project so far has concerned office automation in a very limited sense (i.e. word processing). The Centre is very interested in the OA area and is seeking an opportunity to participate in an OA project. However, as it works only in unionized settings and as many of the settings for OA - in banking and insurance for example - are non-unionized, their opportunity for participation is reduced. The word processing project was in the Ministry of Consumer and Commercial Relations, and the case study will be written and made public in the near future.

2.6 Quebec

Quebec appears to be the province most actively engaged in office automation programs. A number of field trials in various states of planning have been developed which aim to combine procurement with economic development goals. Quebec is also trying to stimulate its electronics industries generally with a primary focus on software. Several new or planned centres also focus on office automation or related areas, and the new federal Canadian Work Place Research Centre is located just outside of Montreal.

1. OA Within The Quebec Government

1.1 Procurement Policies

For OA purchases, there is a consultative committee consisting of: the Bureau Centrale de l'Informatique in the Ministry of Communications, the Ministry of Industry, Commerce and Tourism, the Service des Achats (i.e. purchasing services), and the Ministry of Science and Technology (recently merged with the Ministry of Higher Education).

This committee maintains a list of approved microcomputers - Phillips and three or four other types, all compatible with IBM (and thus compatible with the government's mainframes). Ministries do not negotiate directly with manu-

facturers. For wordprocessing, the approved systems are Phillips and AES but a given department may standardize internally on a particular make (for example, the Ministry of Communications has standardized on Phillips).

In 1983, the Ministry of Communications, the Ministry of Industry, Commerce and Tourism, and the Ministry of Science and Technology made a number of recommendations about office automation which were adopted by the Quebec Conseil des Ministeres. There was a concern that Quebec-made products should be purchased and that needs that could not be met by Quebec products might form the basis of development "projet pilotes" carried out with manufacturers who could offer economic and technological benefits within the province.

In 1983, the Ministry of Communications was given the responsibility to annually examine the OA needs of ministries and government organizations; proposing technological directions; proposing implementation scenarios that took account of human impacts; and coordinating the development of tools and guidelines for implementation.

Also, the Ministry was charged with promoting and coordinating the start-up and evaluation of a set of "projet pilotes" within ministries and government organizations. (Government organizations in Quebec include very large institutions such as the provincial health insurance system).

Subsequently, the Ministry of Communications, the Ministry of Industry, Commerce and Tourism, and the Ministry of Science and Technology have been involved in a major initiative with these field trials. (Although "projets pilotes" translates literally as "pilot projects", the term "field trial" is more appropriate).*

* Source document: Gouvernement du Quebec, Reunion du Conseil des ministeres, Decision No. 83-256, 28 septembre 1983.

1.2 The BCI

Within the Ministry of Communications, the Bureau Central de l'Informatique (BCI) is mainly involved with office automation and field trials. This unit is concerned with computerization throughout the government. Its existence within the Ministry of Communications is unique compared to other Canadian government structures, and allows government use of new technologies to be more easily linked with the ministry's industrial development goals. In the past, the BCI was mainly concerned with large computers. (All government departments use compatible systems, IBM or Amdahl). More recently, the BCI has directed its attention to "la bureautique" - office automation.

In a 1984 study, the BCI examined the diffusion of word processors and microcomputers in the public sector and in government organizations. (Microm and AES dominated in word processing; a variety of microcomputers were in use). This study (La Bureautique: Etat de la Situation et Projection des Besoins jusqu'en 1987, Bureau Central de l'Informatique, Ministère de Communications 1985) found that overall planning for OA was usually lacking, and that attention to organizational impacts, training and links between OA and larger systems was low.

2. The Quebec Provincial Field Trials

The field trial program in Quebec was funded for \$2.5M over three years. Emphasis has been placed on providing a controlled environment to study hypotheses about the improvement of performances within organizations, to yield insights into human and organizational impacts and to test the profitability of new technologies. Objectives include encouraging the development of the Quebec OA industries and the acquisition of exportable products.

The procedure for these projects is that ministries or government organizations submit proposals to the Ministry of Communications (i.e. the BCI) and funds are

made available to finance start-up studies and evaluations. (The Ministry of Communications provides a framework for evaluation and detailed requirements for start-up studies). Funds are also available to develop evaluation tools and to develop a program for evaluation and implementation. Funds do not support actual expenses for staff or equipment in the trials since the participating agencies support these costs. The BCI also supports programs to increase awareness in the government about OA, and supports training as well.

The decision to support a field trial is based on several criteria: impacts on the quality of service to the public; governmental impacts (i.e. the degree of interest the project holds for other ministries and government organizations); impact on Quebec industry; impacts on human resources (i.e. how will these impacts be measured?); impacts on the organization of work; organizational integration (i.e. how will this project contribute to a plan for an integrated implementation of OA in the organization?); technical integration (i.e. how does the project contribute to solutions in integrating technology or in compatibility); originality; technological leadership; and innovation.*

Each of the supported field trials attempts to use different configurations of equipment so that comparisons can be made (for example, centralized vs. decentralized approaches).

The BCI has also produced a document that tells potential applicants for field trials what must be included in the start-up studies.** Considerable attention is therefore given to research and evaluation in each of the trials.

So far, the specific actions taken by the BCI include:

* (Source document: "Modalites de question du fonds de \$2.5M concernant les projets pilotes de bureautique au gouvernement du Quebec, version revisee, juin 1984).

** ("Structure et Contenu des Etudes de Demarrage", Bureau Central de l'Informatique, 3 decembre 1984).

- a document on "orientation technologies", i.e. guidelines for compatibility and "made-in Quebec" criteria (still not formalized).
- a document on scenarios for implementation
- a program of seminars to increase awareness about OA among senior management
- a training program for those responsible for OA
- the start-up of several projects.

The most advanced field trial at present is at the Ministry of Communications. "Communication Quebec" is a service of the Ministry that answers over 1 million calls a year from the public about government services. The project has four functions: word processing, electronic mail, management support, and information retrieval - which is the special part of this trial. Phillips microcomputers have been installed for wordprocessing and electronic mail and the software for information retrieval is being developed at the present time by Becterm.

Most other projects are not as far advanced, although in the case of the Ministère de Revenu a start-up study has been completed. The companies participating so far include Comterm, AES, Philips (Micom), Becterm, Ogivar.

While the funds for the field trials do not support costs for hardware and software (which must be supported by the participating ministry or government organization), the Ministry of Science and Technology does have a \$3.5M fund for R & D in businesses. If a project needs a particular innovation, it is possible that some money may be made available to the participating firm for its development.

EXHIBIT 1

LES PROJETS PILOTES

Gestion Documentaire Avec Outils de Classement/Repérage

- Archives Nationales et RAMQ
Documents Actifs, Semi-actifs et Inactifs
- Conseil Exécutif
Correspondance des Ministres
- Ministère des Transports
Documents Actifs

Suivi des dossiers

- Ministère du Revenu
Dossiers Juridiques
- Ministère des Transports
Dossiers des sous-ministres

Micro-ordinateurs Portatifs avec Logiciel Intégré

- Ministère des Affaires Municipales
Évaluateurs Municipaux
- Ministère de l'Habitation et Protection du Consommateur
Inspecteurs de Bâtiments Publics

EXHIBIT 1 (Continued)

Expérimentation Technologique

- Ministère du Revenu
Traitement de l'Image
- Ministère de l'Éducation
Réseau Local

Fonctions Standard de Bureautique dans toute une unité

- Ministère du Revenu
Service de l'Information

Consultation de l'Agenda des Ministres

- Cabinets Ministériels

Services Décentralisés en Région

- Ministère des Communications (Communication-Québec)
Accès en Région à des Banques d'Information Locales
et Centrales
- Ministère de l'Environnement
Micro-informatique en Région pour le programme d'Assainissement
Agricole
- Ministère de l'Industrie et du Commerce
Accès à une Banque de Données Économiques par les Agents
Informationnels en Région

EXHIBIT 1 (Continued)

Formation Assistée par Ordinateur

- Vérificateur Général du Québec
Utilisation de Didacticiels pour la formation en vérification informatique

Automatisation des Activités Administratives des Bibliothèques

- les Bibliothèques Gouvernementales
Repérage de l'Information, Gestion des Acquisitions et des prêts

Reseaux de Communications et Automatisation des Taches

- Ministère des Communications
Réseau de Communications entre les Cadres du Ministère;
Automatisation des Fonctions de Gestion
- Contrôleur des Finances
Réseau Reliant les Directions de Compatibilité; Préparation et
Transmission des Rapports Financiers

In the future, BCI is considering putting money into field trials to support more than evaluation and at the same time is also considering reducing the number of projects which it supports.

3. Industrial Development for the Electronics Industries Generally

"Le Virage Technologies":

Programs for high technology are undertaken by the Quebec government within the context of an overall examination of the Quebec economy called "Le Virage Technique, Batir le Quebec - Phase 2, Programme d'action economique 1982-1986".

In the area of electronic technologies, special emphasis is placed on the development of software (where international competition is considered less intense and where development costs are lower than with hardware manufacturing). The Society for Industrial Development (SDI) is responsible for encouraging the software industry.

The SDI (Societe de Developement Industrielle de Quebec) is a government agency that promotes industrial development through financial incentives, and administers the "Assistance Program for the Electronics Industry".

This program provides financial aid through grants, interest-free loans, and the acquisition of non-voting shares. In order to qualify, companies must satisfy certain criteria to show that aid will benefit the Quebec economy. (A firm might be eligible, for example, if 50% of its total sales were derived from the manufacturing of software and package programs in Quebec). The Electronics program is approximately two years old, and office automation is considered an important area for support.

The Ministry of Industry, Commerce and Tourism is involved in the SDI programs, which also includes an Assistance Program for R & D and a "Program for Exports". The R & D program is intended to be complementary to federal programs although companies can apply to both sources.

The Ministry also encourages foreign companies to locate in Quebec (through a division called "Service de la Promotion Industrielle"). This encouragement may be linked to procurement - i.e., the company can sell to government if certain conditions are met.

The Ministry of Industry also has an associated Centre de Recherches Industrielle du Quebec (CRIQ) that provides non-grant types of help, especially for small companies, to get to market. For example, it will help a small firm to organize an agreement for a technology transfer. It gives help to inventors - evaluation of the invention, estimation of commercial potential, advice on protection, etc. It also has technical lab services, and in-house engineers who will work with external companies on a fee basis. This is a para-governmental organization, and is meant to be self-supporting.

In addition, the Ministere de Commerce Exterieur has programs to help Quebec companies export (such as supporting marketing missions for groups of related businesses).

The Ministry of Science and Technology has established a program (AGVIR-Agence Quebecoise de Valorisation Industrielle de la Recherche) which provides grants, local guarantees and equity capital to "high risk" companies (including "high-tech").

The Societe de Microelectronic Industrielle de Sherbrooke Inc. (SMIS) offers design facilities for microelectronic circuits and components, and is funded both federally and provincially. (The federal funds are part of a project creating a set of microelectronics centres across Canada).

The Ministry of Communications also has a new program for information technologies, funded at approximately \$3M for applied research (some 75% of which will be allocated to software). This Ministry also has a program to aid the "informatization" of management, production and distribution within communications firms. (Aide a l'Informatisation des Entreprises Communications).

In total, approximately \$230M was invested in high technology by the Quebec government in 1982-83 (Le Devoir, 22 March 1985).

4. Conference sur l'Electronique et l'Informatique

Another aspect to overall high-technology development in Quebec is the Conference sur l'Electronique et l'Informatique. This "conference" is an ongoing examination of the electronics and informatics section that culminated in a final session during April 1985. Several committees produced a set of reports:

1. L'industrie de l'electronique et du logiciel au Quebec: creer ensemble un climat favorable a son developpement
2. L'informatisation des entreprises et des administrations publiques
3. L'informatisation, l'emploi et le travail
4. L'integration de l'informatique a la culture

The first report was written by the "Commission sur l'expansion de l'industrie de l'electronique et du logiciel au Quebec" (i.e. expansion of the electronics and software industry) headed by Pierre Ducros. According to this report, the principal objective in Quebec should be the creation of a strong and competitive industry by encouraging a climate of entrepreneurship. Development should rely more on private initiative, leadership, and innovation, rather than waiting for government to nurture privileged development. Quebec, it was argued, should

encourage risk-capital "societes" and establish fiscal policies that encourage new products and innovation. It is also recommended that economic barriers be diminished that discourage foreign participation in Quebec development. Reciprocally, Quebec companies should be enabled to expand in other countries.

These approaches, with their emphasis on fiscal incentives, are particularly significant given that most stimulation of OA has concentrated on procurement (for example, procurement is the only lever of development available to the BCI), and that broader industrial development programs have usually focussed on different forms of grants.

Tax incentives to encourage risk capital are one possible form of fiscal policy. There are at present very low levels of risk capital in the province (a topic studied by a Commission Quebecoise sur la Capitalisation des Entreprises). At present, however, such fiscal policies are not being utilized; and any changes in this area would have to arise from the Ministry of Finance.

5. Other Centres Working in Related Areas

For some time, the Quebec government has planned a research centre for "bureautique et ressources humaines", one of a set of six research centres (including centres for computer-aided-learning and telematics). A committee for the implementation of this centre has been established, and some research has begun, but only on the human resources side (e.g., employment impacts).

There is also a new Centre de Recherche en Informatique de Montreal (CRIM) set up by four universities to focus on four themes, one of which concerns office automation. (Federal money for this centre has been given by the Secretary of State). Establishing and maintaining relations with industry are important goals of this Centre.

6. Canadian Workplace Automation Research Centre
(Le Centre Canadien de Recherche sur l'Informatisation du Travail)

Situated in Quebec is the new Canadian Workplace Automation Research Centre affiliated with the federal Department of Communications. This centre is located in Laval (outside of Montreal) and was funded by the federal government: \$5M for construction and \$6M for the purchase of data processing and communication hardware.

The Centre is intended to act as a catalyst for technological development in office automation, by "assisting business to play a greater role in the design, manufacture and marketing of office communications products". It will bring together governments, private companies and universities involved in office communication research. Its mandate includes:

- research in office systems (hardware and software), and in organizational and social impacts of OA;
- developing knowledge and skills needed to produce OA products;
- becoming a focal point for cooperation with Canadian and international laboratories and the private sector;
- strengthening Canada's position in the research field and acting as a catalyst for technological developments;
- establishing close relations with Canadian industry and educational institutions.

Specific areas of activity include:

1. R & D associated with integrated systems. (Interconnection between different types of equipment; integrated OA systems; local area networks; interfaces between networks and the interconnection of OA systems both locally and over distances).

2. R & D associated with advanced OA technologies. (Expert systems; voice interfaces; automatic translation; database management).
3. Organizational research. (Study of the decision making process; effects of OA on organizational structures; productivity research; and research on user interfaces).
4. Sharing scientific knowledge. (Developing an information network and maintenance of a database on projects, organizations and publications related to OA; public awareness; exchange program with industry).

2.7 Maritime Provinces

While some programs are known to be underway in this region, the time and budget constraints of this project did not allow an indepth appraisal of these activities.

3.0 SUMMARY CANADA

The activities reviewed for the various provinces in Canada show a diversity of approaches to the stimulation of office automation activities. In most provinces reviewed, the approach is usually one of incorporating OA into a broader policy perspective and to not separate out one area per se. The most common feature at the provincial levels is the attempt to structure both direct and indirect impacts on high technology in the form of fiscal policies such as tax incentives or in the form of procurement policies which assist Canadian suppliers. In most cases, the latter effect has taken the form of some type of Canadian content rule or policy for purchasing locally, i.e. on a provincial basis.

Only the provinces of Quebec and Manitoba seem to have programs in place which parallel the efforts of the federal government. In the area of field trials and evaluation, very limited activity has taken place to date and no definitive or final reports indicating the nature of results have emerged at this time.

Most provincial authorities clearly appreciate the importance of the office automation area but few have taken steps to give it a dominant position within an overall industrial strategy. Rather, what efforts have been made tend to address the use of OA within government and to the ways productivity gains may be achieved through the use of OA. Concern has also been raised about the impacts of OA but there has been very limited formal investigation of the issues arising from the implementation of OA systems in government. Furthermore, no formal criteria to assess the impact of a given program seems to have been developed for any of the provincial programs reviewed in this section.

EXHIBIT 2

**Government Policies and Programs in Canada which
Influence the Stimulation of Office Automation**

	<u>Programs Specifically Related to OA</u>	<u>Programs Which Indirectly Influence OA</u>	<u>Nature of Support</u>	<u>Rational</u>	<u>Results</u>
B.C.	None	B.C. purchasing commission's local sourcing	Local sourcing	Promote local business through preferential treatment	N/A
		The discovery enterprise program	Pre-venture capital fund for equity financing in high-tech businesses		
		B.C. Science Council	R & D Grants		
		B.C. Research	Grants and support of contract research		
		B.C. Development Corp.	Loans to high-tech businesses		
		Ministry of Industry and Small Business	Special programs for small firm development		
		B.C. Systems Corporation	Procurement to serve the computer needs of the B.C. government	Support local business development and encourage foreign companies to locate in B.C.	N/A
		B.C. Purchasing Commission	Technical consulting services to help in the development of business plans		
		B.C. Systems Corporation	Contracts with local firms for actual systems and services	Encouragement of local product development - most particularly software development	N/A

EXHIBIT 2 (Continued)
Government Policies and Programs in Canada which
Influence the Stimulation of Office Automation

	<u>Programs Specifically Related to OA</u>	<u>Programs Which Indirectly Influence OA</u>	<u>Nature of Support</u>	<u>Rational</u>	<u>Results</u>
Alberta	No industry development programs for OA specifically	Supply and Services (Public Works Department) Venture Capital Program Export Development Program Advanced Technology Department	Procurement Venture Capital		
Saskatchewan					
Manitoba	Ministry of Industry, Trade and Technology - Infotech Program	University of Manitoba	Procurement, Field Trials, R&D Grants, Joint Ventures, Independent Research Consulting Services	Stimulate economic development in the province Provide job experience for students. Provide inexpensive consulting services on the general capabilities, opportunities, and problems associated with OA	To date, no major developments have occurred in the area of OA
		The Work Place Innovation Centre	Seminars and Consultative Services	Educate and help companies through periods of an adjustment	
		DRIE			

EXHIBIT 2 (Continued)
Government Policies and Programs in Canada which
Influence the Stimulation of Office Automation

	<u>Programs Specifically Related to OA</u>	<u>Programs Which Indirectly Influence OA</u>	<u>Nature of Support</u>	<u>Rational</u>	<u>Results</u>
Ontario	Ministry of Industry and Trade		Decentralized procurement system of goods and services (approval of the management board required for large purchases)		N/A
	* Ministry of Government and Services, and Management Board		Acquisition of telephone equipment and services, directions and databases, mailing equipment and services.		
		The Canadian Preference Policy	Special consideration given to Canadian products.	Support of Canadian products adds value to the Canadian economy (i.e. stimulated employment)	N/A
		Industry Development Review Policy	Identify significant industry development opportunities and ensure economic benefits accrue to Canada from large purchases.		
	The Office of Procurement Policy (Ministry of Industry and Trade)	Educational Services Consulting Services	Maximize the Canadian content of purchases made by the Ontario government. Attempt to increase industry's awareness of opportunities incurred by doing business with the government.		N/A

* The board exercises some control in that it oversees all activities to ensure compatibility, but in general the individual ministries are quite autonomous.

EXHIBIT 2 (Continued)
Government Policies and Programs in Canada which
Influence the Stimulation of Office Automation

	<u>Programs Specifically Related to OA</u>	<u>Programs Which Indirectly Influence OA</u>	<u>Nature of Support</u>	<u>Rational</u>	<u>Results</u>
Ontario (Cont)		Manufacturing Opportunity Shows	R & D Grants Small business Development Grants	Democratizing of the work place and aid in periods on technology transition (i.e. the organizational implications).	Has funded a number of high-tech projects over the years but is now being phased out.
		Ministry of Industry and Trade (Board of Industrial Leadership and Development)	Consulting in both private and public sectors, project evaluation services	Democratizing of the work place and aid in periods on technology transition (i.e. the organizational implications).	Only one project to date has been directly related to OA.
		QWL Centre	Finance start-up studies and evaluation. Funds to develop evaluation tools and to develop a program for evaluation and implementation. Funds available for increasing awareness in the government about OA. Supports training Funds for field trials "Informatization" of management, production and distribution within the communications firms.	"Informatization of management, production and distribution within the communications firms.	N/A
Quebec	Government du Quebec: Ministry of Communications		Advises on the OA configuration to be throughout the government. Carries out studies.		
	Bureau Centrale de L'Informatique (BCI) of the Ministry of Communications				

EXHIBIT 2 (Continued)
Government Policies and Programs in Canada which
Influence the Stimulation of Office Automation

	<u>Programs Specifically Related to OA</u>	<u>Programs Which Indirectly Influence OA</u>	<u>Nature of Support</u>	<u>Rational</u>	<u>Results</u>
Quebec (Cont)	Ministry of Industry, Commerce and Tourism		R & D Export Promotion Encourages foreign companies to locate in Quebec Procurement Field Trials		N/A
	SDI Program (assistance program for R & D and a program for exports)				
	Service de la Promotion Industrielle		Procurement		
	Centre de Recherches Industrielle du Quebec (CRIQ)		Non-grant type help to aid small companies to get into markets. Help to inventors (evaluation of the invention, estimation of commercial potential technical lab services).		N/A
	Service Des Achats				
	Ministry of Science and Technology		Field Trials R & D Funding		
	Still under Government du Quebec				
	Ministere de Commerce Exterieur			Stimulate export markets	

EXHIBIT 2 (Continued)
Government Policies and Programs in Canada which
Influence the Stimulation of Office Automation

	<u>Programs Specifically Related to OA</u>	<u>Programs Which Indirectly Influence OA</u>	<u>Nature of Support</u>	<u>Rational</u>	<u>Results</u>
Quebec (Cont)	Ministry of Science and Technology (establish the AGVIR-Agence Quebecoise de Valorisation Industrielle de la Recherche.		Grants Local Guarantees Equity Capital For High Tech Companies		
	Societe de Micro-electronic Industrielle de Sherbrooke Inc. (SMIS)		Offer design facilities for microelectronic circuits and components.		
	Conference Sur l'Electronique et l'Informatique		Educational Service	Help stimulate the strong and competitive industry by encouraging a climate of entrepreneurship	N/A
	Centre de Recherche En Informatique de Montreal (CRIM)			Encourage relations with industry.	
	Canadian Work Place Automation Research Centre		Research in office systems and in organizational and social impacts of OA. Develop knowledge and skills needed to produce OA products. Coordinating body between government business and academic. R & D associated with integrated systems. R & D associated with advanced OA technologies. Organizational research education.	Catalyst for technological development. Stimulate local purchases in the context of the broader development goals.	N/A

EXHIBIT 2 (Continued)
Government Policies and Programs in Canada which
Influence the Stimulation of Office Automation

	<u>Programs Specifically Related to OA</u>	<u>Programs Which Indirectly influence OA</u>	<u>Nature of Support</u>	<u>Rational</u>	<u>Results</u>
Quebec (Cont)		Le Virage Technologies		Encourage development of the software industry.	N/A
		Society for Industrial Development (SDI)	Financial Incentives. Administering the assistance program for the electronics industry. Grants Interest Free Loans	Encourage overall indigenous economy.	N/A
Maritime Provinces	No major programs to date				

4.0 INTRODUCTION - UNITED STATES

The U.S. federal* government's approach to office automation falls into 4 categories.

1. Industry Stimulation

- grants
- marketing assistance
- taxation policies
- field trials

Initiatives may be specific to OA, or may affect OA as part of the larger computer hardware or software industries.

2. Procurement: The Effects of Government as a User of OA

- standards
- procurement guidelines, schedules and other influences on the choice of equipment
- "catalyst user", test sites, showcase user, "big buys"

3. Incentives for the Private Sector to Use OA

4. Evaluations and Assessments of the Effectiveness and Implications of OA

Unlike Canada, the U.S. does not have specific government programs in place designed to directly stimulate the office automation industry. Rather, the approach taken is "free enterprise" with the present administration espousing a "laissez-faire" philosophy. In addition, because the U.S. Office Automation (OA) industry is burgeoning and is a dominant competitor worldwide, there is not the same perceived need to nurture domestic industry as that found in Canada.

* Our investigations have been limited to the federal government initiatives.

One result of this situation is that there is no focal program or distinct section within the U.S. federal government where information on office automation is centralized. Apart from a few initiatives in the Department of Commerce that might affect OA, most of the impact of the U.S. government on OA occurs through the use of the technology for its own internal operations.

In the sixties and early seventies, the federal government was an influential force in the development of computer technology. However, our discussions with various government officials suggest that role has diminished somewhat with respect to office automation (OA). The government is generally perceived as lagging behind in OA development with a tendency to rely on older and somewhat outdated equipment. When large purchases are made reliance is placed, in most cases, on using "off the shelf technology" rather than becoming involved in innovative product development.

5.0 INDUSTRY STIMULATION

5.1 General Philosophy

The attitude of the U.S. government is generally "hands-off" and non-interventionist with respect to direct industry involvement and stimulation. Non-interference, for example, has included the failure to intervene from an anti-trust perspective in the activities of a consortium of high-tech firms organized for joint research in artificial intelligence and other areas (an initiative heralded as the U.S.'s private sector response to Japan's Fifth Generation Project). Ordinarily, the U.S. Department of Justice (DOJ) enforces anti-trust laws that prohibit competitors from joining together to develop products. In this case, the firms say they are not developing products, but rather are undertaking more basic research into technologies that can be incorporated into products by individual firms at a later stage. (The Department of Justice has chosen not to hinder the consortium's work).

5.2 R & D

While not engaged in "industrial strategies" per se, the U.S. government is nonetheless a major supporter of one of the most popular tools in industrial development, R & D. Of total spending on R & D in 1982 (\$77.3B), the federal government's share was \$36.1B or 47%. Five agencies including the Department of Defense, NASA and the National Science Foundation account for over 90% of the \$36.1B.

The U.S. does not have a department comparable to the Department of Regional Industrial Expansion (DRIE) in Canada, which funds R & D from the viewpoint of industrial development. Rather, R & D is carried out to meet operational needs. For example, an agency might develop a prototype for a product or system it will eventually use.

Until a few years ago the U.S. government played a very influential role in R & D for the computing industry. More recently, however, the influence of government in R & D for high technology has dwindled to the point where in 1983, the Grace Commission criticized the government for backwardness in the area of data processing and office automation.

Nonetheless, there are a few examples of major developments in OA spurred by government developing products for its own use:

- the Internal Revenue System has been a driving force in optical character reading, for the purpose of automatically processing tax returns.
- the Library of Congress has done advanced work in terminal graphics and optical discs.
- the U.S. Navy developed a sophisticated model of its worldwide operations that underwrote basic research in database design.

5.3 Department of Commerce

The Department of Commerce has various types of activities to stimulate industry, but does not fund targeted industrial development in the same manner as Canada's DRIE. A furor arose some years ago when there was discussion about picking winners and losers in similar fashion to the ideas of Canada's Science Council. This concept was not considered an acceptable approach for the U.S. government to follow and even the high-tech sector is not singled out for special treatment.

Another part of the Department of Commerce carries out "Country Market Surveys" that study ten or twelve countries for a particular industry (electronic components, for example).

The Office of Microelectronics and Instrumentation prepares information about the electronic components and medical instruments industries, and recently completed an overview, "U.S. Industrial Outlook for Electrical Components". They have also done "competitive assessment studies", analysing U.S. competitiveness in semiconductor manufacturing, for instance.

There is no target industry policy in the U.S., and furthermore, there are also no export subsidies for U.S. firms. The Trade Adjustment Assistance Department deals with firms having difficulty due to foreign trade competition. There is, however, some trade promotion on an industry-specific basis. For example, firms pay a fee for the services of the International Trade Association (ITA): The ITA recruits contacts abroad through its Foreign and Commercial Services for private companies wishing to do business overseas.

Another part of the Department operates TOPS - Trade Opportunities System, whereby names of U.S. firms are kept in a database used when Foreign and Commercial Services get requests abroad.

6.0 PROCUREMENT

6.1 Indications of Market Size and Demand for OA Related Services

The importance of the federal government procurement practices is emphasized by the fact that 5% of the \$3 trillion GNP in 1984* was derived from government expenditures. Also, the General Services Administration (GSA)** has predicted that the number of computers of all types in government agencies would grow from 18,000 to 1 million by the end of this decade. The 1986 federal budget requests were in excess of \$14 billion*** to acquire and support general purpose information technology. Already the U.S. government is the single largest user of information technology in the world and this is predicted to expand significantly in the next few years. Overall expenditures on OA type services are also predicted to rise quite dramatically from a 1983 acquisitions level of \$240 million to a 1987 level of \$573 million.

6.2 Agencies and Legislation Affecting Procurement

There is a certain fragmentation of responsibility for procurement in the U.S. federal government with the OMB (Office of Management and Budget), the GSA (General Services Administration) and the Department of Commerce all having government-wide policy-making responsibility for automated data processing equipment and services (which generally includes OA).

The Brooks Act (Public Law 89306) was enacted in 1965 to manage the growth of computers in government and to encourage a competitive environment for computer manufacturers. Procurement authority for data processing was taken away in 1965 from individual agencies and assigned to the GSA. Related fiscal and policy control was assigned to the Office of Management and Budget (OMB).

* Harvard Business Review, Oct/Nov. 1984

** Mini-Micro Systems Oct. 1983, p. 176.

*** Management of the U.S. Government, P. 47.

The Brooks Act focussed on coordinating and effectively procuring hardware. OMB was to set overall policy; GSA was to oversee acquisition; and the National Bureau of Standards within the Department of Commerce was to set standards. The Brooks Act also set forth the philosophy that procurement for data processing be efficient, effective, and economical.

The Paperwork Reduction Act (Public Law 96511) enacted in 1980 urged greater productivity within government agencies. This act introduced the notion of information resource management instead of data processing and thus included office automation. This act also established an Information Resource Manager within each agency to manage information-related activities, and strengthened the role of the OMB in information policy.

The Federal Information Resources Management Regulations that govern the purchase of information technology (including OA) are based on the objectives that equipment should be effective, efficient, and economical. (i.e., the aim is not simply to favour domestic industry).

Another act affecting procurement is the Buy-American Act implemented by Section 25 of the Federal Acquisitions Regulations. It applies to purchases below \$169,000 (a negotiated sum subject to change). Above that sum, purchases are governed by the U.S. Trade Act Agreement with member nations. Under this Act, at least 50% of the equipment purchased must consist of American components unless a foreign bid is either 6% or 12% lower. (The 12% applies if the manufacturing industry concerned is a "labour surplus" area - i.e. if that industry has high unemployment). In practice, the purchase of American office automation products results from this legislation because foreign suppliers find it very difficult to meet these conditions.

The Competition and Contracting Act has been in place only a few months. Its purpose is to facilitate better prices for government through increased competition in procurement. This act may counteract a tendency for agencies to

become locked into a specific brand of technology or sole-sourcing procurement as add-ons to existing equipment. The Act also gives unsuccessful bidders more means to protest the awarding of contracts. There are no indications, however, of the impact of this Act at the present time.

6.3 The GSA (General Services Administration)

Within the GSA, procurement for information technology resides in the Office of the Information Resources Management (OIRM). OIRM is also responsible for providing technical assistance to agencies on telecommunications, software, office automation, and other topics.

While the GSA is the central procurement agency for the federal government, purchasing authority for DP acquisitions of less than \$500,000 can be delegated to individual agencies. Purchases of greater amounts may also be delegated if the OIRM approves. As most OA purchases are for relatively small sums, in most cases agencies have acted independently in their procurement of OA products and services. An agency's decision may be influenced by procurement schedules prepared by the GSA. These schedules contain information for pre-negotiated terms and conditions with discount prices arranged with certain manufacturers.

The GSA also has established (one or more) commercially-operated computer store(s). The first was in Washington at a government facility; a dozen more are planned. The stores were set up on the basis of a bidding process among commercial firms. Those now in operation are not dedicated to a sole supplier with a number of brands of computers and office automation equipment being stocked.

6.4 Volume Purchases ("Big Buys")

"Big Buys" can allow an agency to specify to a vendor exactly what features it wants in a particular product and also offer the opportunity for volume discounts. In 1983, over 50% of all federal agencies were planning large office systems buys, and almost 30% were planning large microcomputer buys.* In 1984, for example, the U.S. Navy and Armed Forces jointly purchased over 10,000 Zenith IBM-compatible personal computers.

Many agencies are following the pattern of large, centrally-controlled purchases, to avoid interconnection problems by standardizing on either a single vendor, or multiple vendors who meet very specific communications protocols.

6.5 Standards

The National Bureau of Standards (NBS) is a software group that provides guidance on the use and maintenance of software. It has very little concern for purchasing. (The GSA has guidelines for procurement). NBS produces guidelines on documentation, software tools (i.e. aids to reduce development and maintenance time); software maintenance and other topics. While the guidelines are not formally enforced, they do tend to be used.

NBS publishes a set of standards to which any computer system produced by the federal government must conform. The objectives of these standards are: (1) to promote interchangeability of disc and tape subsystems between different manufacturers; and (2) to increase competition so that lower prices result. (An example of a subsystem is "a disc controller and its supported devices").

* Computerworld, November 19, 1984

The NBS produces both guidelines and standards, and some standards are mandatory (as is the example above). Mandatory standards are published by the NBS, and GSA "promulgates" them, i.e. puts them into regulations. Any disputes with respect to the feasibility of standards or their relevance is arbitrated by the General Accounting Office.

6.6 OA as a Means to Improve Productivity in Government: PPSSCC (The Grace Commission)

Productivity in government was the topic of a recently conducted U.S. commission. The Presidential Private Sector Survey on Cost Control (commonly referred to as the Grace Commission), was completed in 1983 and made recommendations for cost-cutting in areas that included data processing and OA. Thirty-six Task Forces chaired by 161 executives examined government agencies and made recommendations calculated to save \$42B in three years. One task force addressed data processing and office automation specifically.

6.6.1 General Report

Overall, the Grace Commission report was highly critical of government inefficiencies, stating that "one-third of all taxes are consumed by waste and inefficiency in the federal government". The report criticizes: deficiencies from managerial and operating perspectives; excessive interventions by Congress in governmental management; lack of centralized management; availability of government-wide information; and continuity in key management posts. Major recommendations were made regarding financial management, administration, procurement, and human resources management with specific actions recommended for individual agencies.

6.6.2 Data Processing and Office Automation

In general, the status of automated data processing was considered to be disorganized and inefficient, falling far short of the potential for productivity

improvements. Over half of all federal ADP systems were considered obsolete, with an average age about twice that in private sector.

Other specific problems which were identified included lack of co-ordination and planning leading to a high degree of incompatibility between systems and sub-components. A further problem was the high incidence of turnover among qualified personnel.

One major recommendation was the establishment of a Federal Information Resources Manager (a FIRM) to direct government-wide efforts to upgrade and replace existing systems. The FIRM was considered a facilitator and coordinator that could also deny funds for systems that are incompatible or not cost justified. The report also included many specific recommendations for individual agencies such as the Army and the Education Department.

The Commission estimated that office automation, if effectively implemented, could mean savings of \$6.537B within three years and the three year total savings for DP and OA together could reach \$22.633B.

The ADP-OA Task Force focussed on six areas:

i. ADP Management

The report identified a void in ADP management as a major problem, and criticized Office of Management and Budget (OMB) for failing to exercise managerial (as opposed to budgetary) control over information technology. Three main recommendations are made:

- a. a FIRM should be established to oversee ADP/OA throughout the government.

- b. Within agencies, a full-time senior professional should oversee ADP/OA management. In the past, in most agencies the responsibilities of the Information Resource Manager (required by the Paperwork Reduction Act) were added on to an existing position.
- c. The GSA (Government Services Agency) should grant agencies more procurement authority and enhance the technical assistance it gives.

ii. OA Recommendations

The commission report supported the need to emphasize OA for managerial/professional personnel. To date, most OA has focussed on clerical productivity (i.e. word processing), although 75% of government labour costs are for managerial and professional staff.

Common OA problems indentified were: duplicate or incompatible equipment, underused equipment, fragmented planning, and lack of expertise to ensure efficient use. There was also no inventory of existing equipment.

Recommendations included:

- the FIRM should require each agency to submit an annual OA plan and status report
- the FIRM and GSA should provide guidance for OA plans
- agencies should review OA systematically
- the FIRM and GSA should make available a variety of planning and technical tools and concepts for agency use and the GSA should provide technical assistance to agencies
- GSA should publish an acquisition guidebook that interprets relevant regulations and provides guidance in cost/benefit analysis, evaluation criteria, etc.

More technical recommendations included:

- upgrading or replacing a large number of systems - installing common applications software. (For example, there are over 350 different accounting systems in use, each of which requires maintenance and enhancements).
- consolidation of hardware and support resources, within and eventually among, agencies.
- centralized technical support
- standardization.

Though the Grace Commission's recommendations have not been adopted per se, (and no FIRM has yet been established), they have been influential in the recent actions of the OMB and the GSA.

6.7 Office of Management and Budget: Reform 88

The Grace Commission recommendations were influential in affecting the initiatives of the OMB through Reform 88.

Reform 88 is the President's Management Improvement Program established in 1981-1982 to improve the management processes within the federal government. In general, it was the opinion of the commission that government was not being administered with the minimum efficiency that any private sector entity would consider essential for survival.

Regarding information technology, the Administration adopted a three-point strategy: (1) to develop and issue effective Government-wide policies, procedures and guidelines; (2) ensure implementation through OMB involvement in the planning processes by making significant investments in information technology; and (3) to "develop results-oriented measures of performance to ensure maximum return on the Government's investment in information technology". To help achieve this objective:

- agencies will be required to document at least a 10% return on their information technology investments;
- agencies will be required to implement standards that foster open systems of communications and permit the exchange of information among systems;
- greater reliance will be placed on the acquisition of commercially available software to reduce the Government's dependence upon locally-developed, customized software.

In the Telecommunications area other relevant recommendations were made:

Prior to the deregulation and divestiture of the Bell system, the government relied almost exclusively on Bell for both voice and data communications. For voice services, the GSA secured low-cost communications repackaged to civilian agencies through the Federal Telecommunications System (FTS). The Department of Defense received services in a similar way.

Since divestiture and deregulation, agencies have begun projects to construct and/or operate their own local and long-distance networks, or to use existing public data networks. With the advent of competition, the Government has an unprecedented opportunity to reduce voice telecommunications costs by capitalizing on increased competition and technological progress. However, agencies can no longer rely on traditional methods and sources of support. Therefore, guidelines, policies, and analytical methods are being developed to aid agencies in choosing voice services, both individually and from a Government-wide perspective.

Another major problem has been the difficulty in exchanging information between different kinds of computers. The International Standards Organization has been working to establish standards the adoption of which would help move

information more easily within the government. In the future, OMB will undertake a project to determine whether 150 different standards should be adopted by the federal government.

While hardware costs are dropping, software costs have continued to rise in federal agencies because development and maintenance of software is labour-intensive. For example, in 1985, software costs amounted to less than 20% of federal computer expenditures; today, they represent 60%. The federal government continues to custom develop more than 90% of its software which is a rather expensive approach.

A "software management initiative" is intended to ensure that federal agencies reduce the annual cost of software maintenance by moving away from custom development toward the use of commercial packages and the sharing of operational software.

During 1985, revisions to several OMB circulars were expected which would give policy direction, establishing priorities when buying software. Also, agencies will be required to establish a technology planning system, and to report certain information about plans for major investments.

Government agencies will be asked to reduce their software maintenance costs by 25% between 1986 - 1989. Plans for reducing software maintenance costs will be reviewed and monitored through the yearly budget reviews. Agencies are also working with OMB to develop five-year plans for their major systems, to review options early in the process. In addition, careful planning will provide the private sector with a preview of needs, in order to maximize competition for government business.

7.0 INCENTIVES FOR PRIVATE INDUSTRY TO USE OA

There are no specific measures in the U.S. to promote OA in private industry; however, this topic was considered as part of a larger examination of how to improve domestic productivity.

The White House Report on Productivity, "Productivity Growth: A Better Life for America", was a report to the President completed in April 1984. In 1982, President Reagan requested that a White House Conference on Productivity be held so that he could make relevant recommendations to Congress within 20 months. However, as of March 1985, no actions had been taken.

The report emphasizes the importance of information workers, who make up over 54% of the nation's work force. It stresses the importance of information as a strategic asset, and urges that responsibility for information resources should lie with the top levels of a corporate structure.

The basic point of this report is that a decline in productivity growth that began in 1968 has weakened U.S. economic vitality. It also suggests the private sector has suffered from poor management and work practices, and from government interference. As well, the public sector has impeded productivity growth throughout the economy by providing a poor environment for investment in capital and technology, because of a cumbersome tax system, and by protectionist measures that impede the competition necessary for productivity growth.

Recommendations contained in the report urge the private sector to improve productivity, especially for information and service workers. Recommendations for government include: developing greater public recognition of the importance of productivity; creation of a stable economic environment; and a fundamental reform of tax laws. Improvement in productivity should be a standard against which tax reform proposals are evaluated. Also, antitrust laws should be revised to make joint ventures, including joint R & D ventures, a more effective means to meet world competition and reduce the influence of "foreign cartels".

Generally, the report reflects a "hands-off" approach for government. It specifically sets aside the argument that the federal government needs to make interventions in the private sector to stimulate productivity growth, beyond removing its own impediments to productivity. If a particular activity increases productivity, it will be undertaken without government stimulation unless prohibited by rules and regulations of government.

Furthermore, the report states that the responsibility to pursue technology-based productivity enhancements lies with managers, not government. Government policies are considered to affect only the environment for investing in new technologies; it is managers who must educate their employees about the applicability of a new technology to their jobs.

The ways in which government affects productivity are considered to include :

1. Fiscal and monetary policies that create the economic environment.
2. Funding for R & D that leads to new technologies.
3. As an employer, federal, state and local governments employ approximately 16% of the civilian labour force.

To create an environment more conducive to productivity growth, the government can:

1. Take actions that affect capital formation. Recommended actions include changes in fiscal and monetary policy, and changes in tax policy (for example, broadening the tax base, or introducing a Value Added Tax to close the budget deficit gap and thus reduce other taxes).

The report argues against incentives for specific types of capital investment, which tend to divert funds from more efficient use of capital.

2. Make productivity improvement an explicit criteria in judging government policies. Public policies and legislative actions have not recognized productivity as a key element in attaining other national goals such as full employment, price stability and economic growth.
3. Provide leadership in public recognition of the importance of productivity. A set of annual awards from the President are recommended.
4. Make changes in antitrust laws. American companies no longer dominate many markets as they once did. Current laws may be inhibiting competition by U.S. firms in international markets. Joint research and development, for example, should be judged by a rule of reason and not considered illegal per se.
5. Promote R & D by providing a stable environment and consistent incentives for R & D. Government support for R & D should be concentrated on the "middle zone" of the innovation process to stimulate application of existing knowledge and technology.
6. Focus attention in the education system on technical needs.
7. Restructure the Dept. of Commerce so that it can provide micro-economic analysis on a sectoral basis, such as the Japanese Ministry of International Trade and Industry does.
8. Development of different measures of "productivity", "output" and "input"
9. Establishing information workers as an occupational category in the Bureau of Labor Statistics classifications. Also, a GNP scheme should be devised in which information products and information services are separately classified for the purposes of input/output analysis.

8.0 EVALUATION, ASSESSMENT, SOCIAL IMPACTS

8.1 Office of Technology Assessment, Congress of the United States

The Office of Technology Assessment (OTA) is conducting a broad, year long study to be submitted to Congress in June (86), looking at OA over the next fifteen years. This study focusses mainly on employment effects that will result as productivity increases. It also discusses organizational change; occupational change; changes in the workplace (ergonomics, stress); labor-management relations; worker satisfaction and quality of working life; alternatives to conventional offices facilitated by OA (including temporary and part-time help, home-based and offshore work); privacy and security. The study is examining society as a whole, and the public sector is also considered separately.

8.2 National Academy of Sciences

Another major study is being conducted by the National Academy of Sciences, an independent "think tank" that receives funds from both government and private sources. A major examination of the impacts of technology on women's employment opportunities has been underway recently with office automation an important area of study. A panel of 16 people has been commissioned to conduct the research and write a summary report (at the present time research papers are not available). This study was partially funded by the Women's Bureau of the Department of Labour and the Economic Development Administration in the Department of Commerce. That Department plans further studies examining technology and employment in the near future.

8.3 National Science Foundation

The sociology division of NSF funds occasional studies relating to the implementation of new technology. In the division of Information Sciences and Technology, three programs are concerned with OA:

- the Information Impacts Program (which has done some work on OA)
- the Information Technology Program
- and the Information Sciences Program.

NSF has also had a Productivity Improvement Research Program which funded a study on the implementation of office automation, at the Rand Centre. The Rand Centre is now developing a cooperative centre, whereby industry will cooperatively fund research in OA.

9.0 SUMMARY U.S.

The approaches to office automation in the U.S. federal government are diverse and incorporate elements of the Canadian OSC program but are more general in scope. They tend to incorporate OA within the broader context of high technology and productivity within government. Within each of the areas identified, reference was made to the importance of OA and that further efforts to develop OA technology in government were required.

A main theme in the U.S. activity is the desire to shift the efforts in all industrial stimulation activities, whether or not related to high technology, to private industry. This reflects to a large degree the administration's desire to operate in a laissez-faire context and to minimize the extent of government involvement. As well, the OA industry is healthy commanding a dominant world-wide position in the provision of a wide diversity of equipment and systems.

Several private institutes and agencies are currently funded to conduct evaluation and assessment studies of new technologies, which parallels much of the Canadian effort in similar areas. Internal government assessments have usually been focussed on the critical aspects of efficiency, productivity and reduction in expenditures by the government. Thus, a very pragmatic and applied perspective underlies much of current internal U.S. government efforts to acquire and implement office automation.

EXHIBIT 3

Government Policies and Actions which Influence Office Automation in the United States

Industry Stimulation

No intervention from an anti-trust perspective in the activities of a consortium of high-tech firms.

R & D (1982, 26.1B) allocated for operational needs

International Revenue System:
- stimulant of optical character reading

Library of Congress
- contributions to terminal graphics and optical discs

US Navy:
- contributions to database design

Department of Commerce:
- The Office of Microelectronics and instrumentation acts as an information resource on subjects related to electronics components and medical instrument industries.

Procurement

Office of management and budget (OMB)
- assigned fiscal and policy control over data processing related procurement policies and sets overall policy

General Services Administration (GSA)
- Central processing agency
- assigned procurement authority for data processing

Oversea Acquisition
Office of the Information Resources Management (OIRM)
- procurement of information technology
- provides technical assistance to agencies
- prepares procurement schedules which contain information for pre-negotiated terms and conditions and discount prices
- established commercially operated computer stores

Incentives for the Private Sector to use OA

No measures in the U.S. specifically established to promote OA in private industry

Related Measures:
The White House Report
Report on Productivity

Evaluation and Assessment of Effects and Implications of OA

Office of Technology Assessment, Congress of the United States:
- examined OA as it relates to employment, productivity, etc. and makes recommendations

National Academy of Sciences

National Science Foundation:
- funds Studies related to the implementation of new technology

Department of Communications:
provides funds for technology assessment particularly as it relates to employment implications

General Accounting Office:
funds small studies on the effects of OA (i.e. of word processing)

EXHIBIT 3 (Continued)

Government Policies and Actions which Influence Office Automation in the United States

Industry Stimulation

- Country Market Surveys
run by an arm of the DOC this branch provides information on international developments (i.e. electronics)
- Trade Adjustment Assistance
advises firms having difficulty adjusting due to foreign trade competition

ITA

- trade promotion (non-subsidized)
- Trade Opportunities System (TOPS)
promotes U.S. firms to foreign and commercial services
- Grants to universities and research centres through National Science Foundation

Department of Defence

- contracts given to develop military equipment, etc.

Procurement

Department of Commerce:

- Set Standard
- The Brooks Act (1965): enacted to manage the growth of computers in government and encourage a competitive environment for computer manufacturers
- Paperwork Reduction Act (1980)
urged greater productivity within government agencies
- established an information resource manager within each agency to manage information - related activities, and strengthen the role of the OMB in information policy

Federal Information Resources

Management Regulations:

- govern the purchase of information technology

Buy-American Act:

- for purchases below \$169,000, at least, 50% of the equipment bought must consist of American components unless a foreign bid is between 6-12% lower.

Competition and Contracting Act:

- facilitate better prices for government through increased competition in procurement

Incentives for the Private Sector to use OA

Evaluation and Assessment of Effects and Implications of OA

EXHIBIT 3 (Continued)

Government Policies and Actions which Influence Office Automation in the United States

Industry Stimulation

Procurement

Incentives for the Private Sector to use OA

Evaluation and Assessment of Effects and Implications of OA

National Bureau of Standards:

Software Engineering Group

- provides guidance for the use and maintenance of software
- produces guidelines on documentation, software tools, software maintenance, etc.

Grace Commission:

- examined the need for improved productivity in the federal government

10.0 OFFICE AUTOMATION IN BRITAIN

10.1 Introduction - Overview of Strategic Initiatives

A recent report presented by the technical advisory panel to the Prime Minister's Office in Britain, entitled "Making a Business of Information", "A Survey of New Opportunities", made a number of recommendations with respect to the way in which new high technologies should evolve in Britain. The government was identified as having four basic roles that affect the information sector. Primarily, it sets the legal and regulatory framework for information services and is the largest processor of information in the country; thus it can influence the market for new services. Furthermore, it can act as the national focus of development on policy issues and can provide financial support. In general, the report concluded that the principal responsibility for exploiting the opportunities opened by new computing and communication technologies must rest with the private sector in Britain. Government, however, can be instrumental in establishing an environment in which new developments would be encouraged. It was also noted that industry and government in Britain are fragmented in their approach to dealing with information technology. There are a diversity of groups which, it is recommended, should come together as a representative body in order to better promote the development of this sector. Government, it was argued, should review its current responsibilities and identify one department as having overall control on the development of the tradeable information sector.

One of the more direct ways that government could influence information technology development is by using its information gathering ability as a means of stimulating the creation and growth of new information technology based services. Also the report recommended that extensive opportunities be developed for joint ventures with private sector organizations.

One of the major thrusts of the British government's approach to information technology is to focus equally on the information side of new technologies as on

the technology side. Almost all of the business of government is concerned with information processing. The government takes in, manipulates and puts out vast quantities of information, much of which can arguably be processed more effectively through the appropriate application of technology. Various initiatives are now underway within different government departments to assess the potential for the application of new information technology. The government is therefore concerned not only about the direct effect on its own administrative processes but also with the external opportunities that emerge.

10.2 Financial Support

In Britain, the Department of Trade and Industry (DTI) has outlined a number of methods for assisting with the cost and launching of new projects in the information technology sector. Generally, these fall within a program known as the "support for innovation scheme". In addition, DTI can stimulate awareness through specific programs such as one called "micro's in schools". The mechanisms are thus in place for the government to assist new ventures through financial incentives; (a typical scenario pursued in a number of other countries reviewed as part of this study). The main emphasis on these specific programs rests on hardware rather than software.

In Britain, there are several forms of government assistance available for high technology ventures. Generally, this assistance is discretionary and thus dependent on the merits of each case. In certain cases assistance is an automatic entitlement. Government assistance can be grouped into two general categories.

- a. Assistance available to industry at large from which high technology ventures may benefit on the same terms as other businesses.
- b. Assistance specific to high technology projects available through the support for innovation program. The objectives of this program are

to encourage the development of new products and services in high technology and to help these get into the market. The program is administered by the Department of Industry in consultation with the External Requirements Board. There are five of these boards, with numerous subcommittees examining high technology projects. The most relevant boards are the electronic and aviatronics requirements board and the mechanical and electrical engineering requirements board. As of March 1983 the total funds allocated to the five programs were in the order of 350 million pounds.

10.3 Support for Innovation

The standard terms for the grants in this program allow up to one-third of the qualifying costs of any particular project. Basically these include all direct costs incurred in taking the project from inception to commercial production and a reasonable amount for overhead. The qualifying costs exclude any element of profit. In some cases the cost of investment in-plant and buildings may be included. Alternatively, the support may be increased to 50% of qualifying cost in exceptional circumstances. In such cases there would be a provision for subsequent cost recovery by means of some levy on future sales. In addition to the standard terms, several of the individual schemes under this program provide for grants towards the cost of initial feasibility studies by external consultants. The main schemes concerned primarily with R & D and new product development are; biotechnology, micro-electronics, fibre optics/optic electronics and software.

The micro-electronics industry program provides funds for micro-electronics awareness, training courses and grants for projects involving the application of micros and and computer processing. There is also a pre-production order scheme (PPOS) under which the Department of Industry will fund the placement of prototype equipment for field testing for up to one year. Unlike other schemes the PPOS provides support for 100% of qualifying costs. However, it is

contingent on the test users buying the equipment from the Department of Industry upon the completion of any evaluation or field trial if they are satisfied. This scheme essentially provides an interest free loan to the host department repayable only if the equipment is purchased.

The British Government has also recognized the difficulties faced by high technology entrepreneurs when obtaining private sector venture capital. The March 1983 budget announced that the "support for innovation" program was to be extended by the introduction of an innovation linked investment scheme intended to assist new products and processes into the market. These products and processes will be those whose development has already been supported by the DOI or those which have been eligible to receive such support.

Another program designed to assist micro-electronics, is the Joint Appraisal Scheme which involves the department of industry and sixteen investment institutions. Under this scheme, a company seeking financial support from an institutional investor for a new venture involving micro-computers may request a formal DOI appraisal of its project. This appraisal will examine both the technology and market prospects. It is thus, in effect, free consultancy. The appraisal must be undertaken by career civil servants or people temporarily attached to the civil service.

To summarize, the basic aspects of government support to high technology include:

- a. They are intended to top off other sources of financial support and not to provide the basis of support. Consequently they are relevant only to situations where there is an already established and commercially sound funding base.
- b. They are administered by civil servants.

- c. The time taken to reach a decision is usually several months rather than a matter of weeks or days.

10.4 Government Agencies and High Technology

Within the British Government the Central Computer Telecommunication Agency (CCTA) has the job of promoting the best use of information technology and assisting departments with their information technology developments. Its work, while related primarily to the administration of the civil service, has relevance to other large organizations and technology suppliers.

Central government is the countries largest user of information technology. It spends around 750 million pounds per year (1.5 billion dollars) on installing and running computers, telecommunication and advanced office equipment to support its administration. It contains some 17,500 staff engaged in the design, implementation and operational use of computer systems.

The major role for CCTA is to support departments by concentrating on questions of strategic concern and on services which the central government body provides. CCTA advises departments on how to link information technology developments to their overall strategies and objectives as well as giving guidance on standards. The current role of CCTA is to assist departments and other public bodies in the use and acquisition of computers, telecommunications and office systems for administrative, scientific and other purposes, with the aim of improving efficiency and effectiveness in the government. CCTA employs 544 staff and its direct costs amount to some 14 million pounds (28 million dollars per year). At present the main functions of CCTA are:

1. authorizing departmental expenditures on IT (Information Technology)
2. encouraging the development of IT strategies in each department and assisting in the implementation of projects.

3. Disseminating information on standards and practices relating to all aspects of IT in the government.
4. Procurement and contracting for IT goods and services on behalf of various departments and certain other public bodies to the value of approximately 230 million pounds per year.
5. To maintain and develop communications with the IT industry so that the potential suppliers are informed about civil service requirements both for specific procurement and general applicable requirements in a manner which enables them to respond in an effective and timely manner.

Other functions which have recently been suggested for the CCTA include:

- a. that it play a role to distill information and expertise gained in one department and disseminate it to others
- b. that it provide an infrastructure and framework for IT in government
- c. that it promote standardization and best practices in government
- d. that it identify new products and techniques specifically in office technology which meet the governments needs for more information technology
- e. that it develop policies and practices on matters of common concern such as security, privacy, and data protection.

With respect to procurement and contracting for IT goods and services it is felt that CCTA is best suited because:

- a. it concentrates government purchasing power thereby achieving maximum discounts and favourable terms of supply
- b. it makes best use of expertise which most departments require only periodically
- c. it allows the lessons of experience in a fast moving market to be applied to the development of procedures and standard conditions on which contracts are based

- d. it facilitates the concentrated application of government purchasing policies to an industry which is of growing interest to the U.K. economy.

One of the main recommendations stemming from a recent investigation of CCTA¹ was that wider powers be developed for the promotion and servicing of information technology within government. This would assist the government in identifying the issues arising from changes in information technology and to disseminate the lessons learned from such developments in the form of guidance, advice and effective interdepartmental exchanges of information. A main purpose of the division would be to promote awareness and understanding of the impact and potential of developments in IT which are relevant to a number of government departments. The main examples of work in this area are:

1. Methodologies for the design, development, management and control of IT projects and the evaluation of their impact.
2. Guidance on the adoption of standards for use by departments in the IT area.
3. Advice on organizational and user issues.
4. Identification and promotion of IT applications in the office which contribute significantly to departmental benefits.
5. Identification and promotion of common information technology and applications. Examples include support for financial management initiative and standard software packages for the use of accountants, statistics, payroll and other services such as personnel management.
6. Identification of significant technical, organizational and personal issues connected with the planning and operation of IT strategies and systems and promotion of the effective resolution of these issues.

The methods specifically recommended for use by the division are:

1. The promotion of pilot and investigative projects.
2. The preparation of new guidance material on information technology, strategic planning, management techniques and the use of applications and standards.
3. Stimulating an effective interchange between and within departments on the lessons being learned about the impact and potential of information technology.

10.5 Methods for Evaluating Office Technology Systems

The Central Computer Telecommunications Agency has published a series of reports dealing with all aspects of information technology and evaluation. One of these publications specifically addresses office technology and sets out detailed information regarding the approaches, methods and procedures for evaluating such systems.² The report also provides an indepth appraisal of the need for evaluation and the methods and processes for carrying out an evaluation.

Although it is recognized that new information technology systems and applications have the potential for wide use throughout the civil service and other large organizations, the costs, benefits, uses and organizational implications of many office automation systems have yet to be clearly established. The report emphasizes the fact that their introduction and use needs to be carefully managed and monitored. It further states that it will be difficult to assess their impact without evaluating the introduction of early systems and pilot projects within an overall plan for the introduction of information technology. The report sets out a method for evaluating OA systems, for gathering relevant information and for placing monetary values on their costs and effects within large organizations.

The methods suggested in the report are designed so they can be applied when evaluating any size of office technology system from the smallest one or two terminal systems to the largest multi-terminals systems. The fundamental elements are: (a) that a clear profile must be established of the office or organization before the installation of a system, to provide a baseline from which to measure changes; (b) that the evaluation must be firmly linked to the project objectives and the user expectations; (c) that the information gathering techniques are sound and that there is structured reporting during, as well as after the trial; (d) detailed advice on how to carry out an evaluation is provided along with an indication of what issues should be examined.

The intent in developing an evaluation procedure has been to offer government departments a structured approach for the effective and consistent evaluation of the impact resulting from the introduction and use of information technology. The following exhibits are taken from the CCTA office system evaluation study, and illustrate the types of measures and techniques proposed as part of its effort to encourage office automation use in the United Kingdom.

EXHIBIT 4

**Examples of the Setting of a Achievement Criteria from Objectives
and the Collection of Relevant Information**

OBJECTIVE	ACHIEVEMENT CRITERIA	WHAT INFORMATION TO COLLECT	HOW TO COLLECT INFORMATION (May be on a sample basis)
<p>1. To Significantly Improve communications within the Division</p>	<p>(a) The average time that minutes, memos and other papers take from despatch to receipt of replies should be halved.</p> <p>(b) The number of abortive phone calls should be reduced by 40%.</p> <p>(c) 90% of all messages should be received within 5 minutes of being sent.</p> <p>(d) 70% of all messages should be read within 24 hours of being sent.</p> <p>(e) Telephone interruptions to be reduced by 40%.</p>	<p>(a) Times sent and times replies received - before and after system introduced.</p> <p>(b) The number of abortive phone calls before and after, split between those from people on the system and external contacts.</p> <p>(c) A record of the communication medium and the times sent and received.</p> <p>(d) In addition to (c) above a record of times when messages are read.</p> <p>(e) Number of incoming telephone calls before and after.</p>	<p>(a) User, clerical support or observer logging, machine recording.</p> <p>(b) User logging or observation.</p> <p>(c) Machine recording (EMS).* Sender and recipient logging of other than Electronic Messaging.</p> <p>(d) Machine recording (acknowledgements) or user (recipient) logging.</p> <p>(e) Automatic telephone logging, user logging or observation.</p>
<p>2. To make an appreciable improvement in the presentational quality of reports and speed up their preparation and production.</p>	<p>(a) There should be a consensus of opinion (at least 80% of line management/or clients) that report presentation has improved appreciably.</p> <p>(b) Report preparation and production time (elapsed) should be improved by 25%.</p> <p>(c) Total amount of effort put into report preparation and production should be reduced by 10%.</p>	<p>(a) Opinions of line management/clients on improvements in presentational quality.</p> <p>(b) Report preparation and production times (elapsed) before and after.</p> <p>(c) Man weeks of effort by author, typists etc, for reports (before and after).</p>	<p>(a) Questionnaire or structured interview.</p> <p>(b) Record start and completion dates for an adequate sample of comparative reports before and after.</p> <p>(c) Record actual time spent by authors, typists etc on reports referred to in (b) above.</p>

EXHIBIT 5

AREA TESTED	ISSUES EXAMINED BY TESTING THIS AREA	EXAMPLES OF INFORMATION NEEDED FROM PRE-IMPLEMENTATION TESTS	EXAMPLES OF INFORMATION NEEDED FROM IMPACT TESTS	TEST RECOMMENDED AT					SUGGESTED TECHNIQUES
				Pre Trial	2	5	8	12	
1a APPLICATIONS & USAGE	How the system and its facilities are used. What the system is used for.	Expected usage.	Counts of number of times and duration individual facilities are used. Patterns of usage. Operational factors	●	●	●	●	●	Ma R.
1b DATABASE	The nature and volume of information held on the system, and its usefulness to the users.	Type and volume of information used in daily working environment. Frequency of reference to existing information. Assessments of difficulty/ease of obtaining/referring to information. Frequency of updating the information	Type, volume and frequency of access to information held on the system. Assessment of how much information remains on paper and why. Ease of access and updating information on the system. Frequency of updating information on the systems. Some measure of usefulness/value of having information on the system.	●		●		●	Ma R. Q. UL.
1c SUITABILITY	The suitability of the system for the tasks it is designed or called upon to do, to replace or to enhance.	Details of the tasks the system may have to perform. The usefulness expected.	Opinions and objective data on suitability, usefulness, and ability of system to meet requirements (including "user-friendliness"). How system fits into existing environment. Shortfalls.				●	●	GD. I.
1d AVAILABILITY RELIABILITY	The availability and reliability of the system and whether or not this affects usage of the system. Whether reliability is adequate.	Level of availability expected. Criteria for that requirement	Records of system availability, reliability, faults, downtime etc. Impact of this on user attitudes and work. Proportion of time system availability is satisfactory/adequate/inadequate.		●	●	●	●	GD. MR.
1e SECURITY	The level of security/privacy and data protection	Levels of security etc, in the existing system and procedures for maintaining security of information. Proportion of classified information etc.	Identification of new security problems. General security of the computer system. Levels approved for holding/sending information on the system. Difficulties (if any) of maintaining classified information on the system. Effect on practice and procedures when dealing with secure information.	●				●	I.
1f CONSUMABLES	Comparison of type, amount and cost of the consumables used before and after introduction of the systems.	The types, volumes and costs of consumables used under the existing system with costs of providing, storing and distributing them. Maintenance costs for equipment.	Information as for previous system consumables plus similar information on consumables related to the new system.	●				●	NMR.
1g SYSTEM DEVELOPMENT	What additional system facilities should be provided; additional staff who should become users. Scope for linking the system to other systems. Scope for replication of system.	Any views as to potential for developing the system.	Requests from users for new facilities. Requests from staff to become users. Supplier reactions. In-house development plans. Views on possible expansion paths. Views on relevance to IT. Strategy of the organisation. Scope for multi-site/network development.					Continuous	Ad hoc review.

GD. = Group Discussion; I. = Interview; Ma R. = Machine Recording; MR = Management Records; O. = Observation; P&MR. = Project and Management Records; Q. = Questionnaires; SE. = Special Exercises; UL. = User Logging;

EXHIBIT 5 (Continued)

AREA TESTED	ISSUES EXAMINED BY TESTING THIS AREA	EXAMPLES OF INFORMATION NEEDED FROM PRE-IMPLEMENTATION TESTS	EXAMPLES OF INFORMATION NEEDED FROM IMPACT TESTS	TEST RECOMMENDED AT					SUGGESTED TECHNIQUES	
				Pre Trial	2	5	8	12		
2a USER	How user population develops	Numbers, grades, locations and branches etc of initial users.	As previously with reasons for changes.	●	●	●	●	●	I. MR.	
2b JOB SATISFACTION	The factors affecting levels of job satisfaction before and after the system is introduced and reasons for any changes.	Existing factors affecting job satisfaction, current levels of job satisfaction, motivation, and general attitude to work.	Factors now affecting job satisfaction and current level of job satisfaction. Reasons for changes.	●		●		●	I. Q.	
2c EXPECTATIONS AND ATTITUDE	How people's expectation of technology changes when they gain experience of it. Attitudes to technology in general.	Existing attitudes and expectations of what technology can provide. Current level of knowledge about technology.	Update of attitudes and expectations. Reasons for changes.	●		●		●	I.	
2d TRADE UNIONS	TU representatives attitudes to technology and their views and experience on the project or trial.	Views and any specific actions before project or trial.	Views during and after project or trial	●				●	I.	
2e SYSTEM MANAGEMENT	The number and grade of staff involved/required to manage system, perform training, take on data initially, regularly input data etc.	Resource plans	Resource plans, records & costs. Skills required.		Continuous					P & MR.
2f USER REACTIONS	The general user reaction to the system and its facilities.		Opinions and reactions to system, facilities used/not used. Usefulness of facilities.		●	●	●	●	GD.	
2g TRAINING	How the level of education and training might affect users' attitudes to, and usage of the system etc.	Opinions on any training and awareness education already received.	Opinions on all aspects of training - quantity, quality, methods, timeliness.		●	●	●	●	GD. Q	

GD. = Group Discussion; I. = Interview; Ma R. = Machine Recording; MR. = Management Records; D. = Observation;
P & MR. = Project and Management Records; Q. = Questionnaires; SE. = Special Exercises; UL. = User Logging;

EXHIBIT 5 (Continued)

AREA TESTED	ISSUES EXAMINED BY TESTING THIS AREA	EXAMPLES OF INFORMATION NEEDED FROM PRE-IMPLEMENTATION TESTS	EXAMPLES OF INFORMATION NEEDED FROM IMPACT TESTS	TEST RECOMMENDED AT					SUGGESTED TECHNIQUES
				Pre Trial	2	5	8	12	
3a PLACE OF WORK	Changes in the work place brought about by the system.	Existing work flows, time constraints, priorities, need for involvement of particular grades in certain jobs, changes in location, office layouts, space required etc.	All previously measured aspects.	●		●		●	I. Q.
3b INDIVIDUAL COMMUNICATION FLOWS	Any effects of the system on the numbers of people communicated with, the nature and volumes of communications, eg the number of telephone calls, messages sent, formal and informal meetings, journeys undertaken etc.	Existing frequency, number and need for formal and informal meetings, length of meetings, numbers attending, volume and frequency of phone calls, numbers of hand written and typed notes messages etc. Time and cost of travelling.	All previously measured aspects Reasons for change.	●	●	●	●	●	I. UL.
3c INDIVIDUAL WORKING METHODS	The effect of the system on individuals' ways of working, the level of control over one's own activities, of managers over the work of staff.	Existing work patterns, external constraints, need to follow documented procedures, existing freedom to vary working patterns, level of control over own work or that of subordinates.	All previously measured aspects. Reasons for change.	●		●		●	Q.
3d QUALITY OF WORK PRODUCED	Improvements in the quality of work produced resulting from the system	Level of service, accuracy, neatness, timeliness, turn-round etc.	All previously measured aspects. Reasons for change. The reliability, etc of work produced, quality of forecasts and decisions, volume and reliability of information produced.	●		●		●	I. Q.
3e QUANTITY OF WORK PRODUCED	Increases in the amount of work produced or a reduction in the time to do a job.	Amount of work produced and time taken, extra work undertaken, work delegated, better use of time.	Previously measured aspects.	●		●		●	I. Q.
3f GENERAL INFORMATION FLOWS	Changes in the use of existing communication channels.	Existing communications channels and usage.	Existing and system based communications channels and usage. Reasons for using system channels.	●		●		●	UL.

GD. = Group Discussion; I. = Interview; MR. = Machine Recording; MR. = Management Records; Q. = Observation;
 P&M.R. = Project and Management Records; O. = Observation; S. = Self-Recording; S.R. = Self-Recording; U. = User Interview

EXHIBIT 5 (Continued)

AREA TESTED	ISSUES EXAMINED BY TESTING THIS AREA	EXAMPLES OF INFORMATION NEEDED FROM PRE-IMPLEMENTATION TESTS	EXAMPLES OF INFORMATION NEEDED FROM IMPACT TESTS	TEST RECOMMENDED AT					SUGGESTED TECHNIQUES	
				Pre Trial	2	5	8	12		
4a ORGANISATION OUTPUTS	Role of the Organisational unit which will use the system and any changes which occur. Whether the organisation can revise its work outputs, eliminating tasks or taking on new ones, increasing the scope of activity.	Profile of the role and responsibilities of the organisational unit. General statement of the organisations aims, scope of activity, volume and nature of outputs etc.	Any significant changes to role not due to new systems (? implications for project). Any effect of new system on role and relationships with rest of organisation etc.	●					●	I.
4b IMMEDIATE ENVIRONMENT	Whether and by how much, the system affects the need for furniture, space, heating, lighting, air conditioning etc. To monitor health and safety aspects of the system.	Existing provisions of space, furniture etc. Existing health and safety arrangements.	Changes in space requirements or health and safety arrangements etc, problems encountered.	●					●	I.
4c DIRECT COSTS	Comparison of costs before and after using the system.	Details of all costs of an organisation, including costs of staff. Payments for travelling, overtime, agency and bureau services, cost of accommodation, support services, equipment values and costs etc.	Current position on all previously measured aspects plus new features.	●					●	MR.
4d OVERALL EFFECTIVENESS	Whether "customers" or "clients" detect changes in the overall effectiveness of an organisation.	Views of clients on the level of "service" provided eg scope, quality, timeliness etc	Views of clients on changes and comments on reasons.	●					●	I. Q.
4e ASSOCIATED WORK AREAS WITHIN ORGANISATION	Effects upon other parts of an organisation not using the system.	What parts of an organisation interface with, are affected by, supply work to, or receive work from, users of the system, what work procedures, etc, are affected by requirements of the "user group".	Any changes in the interfaces previously identified, new interfaces established.	●					●	I.

GD. = Group Discussion; I. = Interview; MR. = Machine Recording; MR. = Management Records; O. = Observation;
P & MR. = Project and Management Records; Q. = Questionnaires; SE. = Special Exercises; UL. = User Logging;

EXHIBIT 6

Schedule of Typical Trial/Project Costs

CATEGORY	TYPE OF COST
SYSTEM	Hardware (H/W) Software (S/W) Telecommunications/Interfaces Running Costs (Maintenance, Power Consumed etc) Consumables Enhancements (H/W, S/W)
WORKS & SERVICES	Accommodation Air Conditioning etc Furniture Data Wiring (Networks) Power Supplies Telecommunication Lines Physical Security Items
PERSONNEL	Feasibility Study Procurement (Tenders, Operational Requirement etc) Project Team (Training Development Support) Consultants Bureau Services User Effort (Loss of Productivity whilst Learning etc) User Training System Management Acceptance Testing Data Conversion/Take On Data Integrity Support and Quality Assurance Presentations/Demonstrations

EXHIBIT 7

Examples of Possible Benefits
from the Use of New Office Technology

POTENTIAL BENEFITS	MOST LIKELY INVESTMENT APPRAISAL CATEGORY		
	Capable of Quantification and Valuation	Generally Quantifiable, difficult to Value	Identifiable but not Quantifiable
Freed Staff Time	●		
Work Downgraded	●		
Overtime Reduced	●		
Travelling Time and Cost Reduced	●		
Consultancy/Agency Use Reduced	●		
Use of Bureau Services Reduced	●		
Consumables Reduced	●		
Less Accommodation Required	●		
Manning for Peaks Avoided	●		
Greater Accuracy		●	
Tasks Eliminated	●		
New Tasks Taken On	●		
More Work Taken On	●		
Greater Range of Information		●	
Greater Variety of Services		●	
Fewer Mistakes		●	
Better Forecasts		●	
Better Image			●
More Reliable Information		●	
More Creative Thinking Time			●
Improved Turnround Time		●	
Quicker Production Time		●	
Better Quality Output		●	
Improved Presentation		●	
Lower Staff Turnover		●	
Better Attendance	●		
More Job Satisfaction			●
More Flexible Working		●	
More Sociable Hours	●		
Better Tools/Facilities/Services		●	
Hands-on Experience			●
Added Value		●	
Smoother Peaks/Troughs	●		
Better Management Control		●	
Wider Spans of Control	●		
Easier Communications		●	
Greater Organisational Flexibility		●	
Lesson Learning		●	
Flexibility of Approach to		●	
Calls for Change or New Tasks		●	

10.6 Office Pilot Trials

The British Government's most direct involvement in office automation is through a series of 21 pilot trials being administered by the Department of Trade and Industry (DTI). These pilot projects are being implemented at 21 public sector sites throughout the United Kingdom. The stated objective of the DTI program were (a) to secure the competitive standing of suppliers, (b) to help condition and inform the market, (c) to foster independent office automation expertise and (d) to demonstrate advanced office automation products and their use. It should be noted that many of these same objectives were iterated for the Canadian office automation program.

These trials and activities were designed to create public awareness of office automation within industry and throughout various government departments. They were also important in supplying a ready source of studies to assess users needs and requirements and to assist in developing procedures and methods for implementation. They also fostered a large public sector involvement and thus provide procurement from the public sector to British industry. Furthermore, there was a desire to include an element of product development and to allow testing within an operating environment. Finally these pilot projects allowed a certain amount of testing and evaluation to take place, the goal of which were similar to the Canadian OCS program. The specific goals were:

- a. providing a response to user hesitation in implementing office automation technology.
- b. demonstrating and highlighting the use of government purchasing power and procurement capabilities.
- c. providing a partially controlled environment within which to identify opportunities for users and manufacturers.

- d. creating a body of operating experience.
- e. promoting information technology at home and abroad.

The 21 trials were mounted by the DTI in the public sector. Four of these were in government departments, four in local authorities, six in nationalized industries, and seven in other public sector bodies. The accompanying exhibit provides a breakdown of the DTI pilots in various departments along with their supplier.

EXHIBIT 8
DTI PILOTS IN LOCAL AUTHORITIES

User	Supplier
Cambridgeshire CC	IBM (UK)
Greater London Council	Rank Xerox
Nottinghamshire CC	Plessey Office Systems
Strathclyde RC	Honeywell Information Systems

DTI PILOTS ELSEWHERE IN PUBLIC SECTOR

User:	Supplier:
Science & Engineering Research Council (two pilots)	ICL/OT (Data Recall)
BBC Breakfast TV	Hewlett Packard
BBC Personnel Dept.	Racal
Brighton Health Authority	Allied Business Systems
Leicestershire Constabulary	Future Technology Systems
National Economic Development Office	Systime

DTI PILOTS IN NATIONALIZED INDUSTRIES

User:	Supplier:
British Rail Engineering	Office Technology Ltd (OTL)
British Gas	Aregon International
Central Electricity Generating Board	Burroughs
Wales Gas	Logica VTS
British Telecom	DEC
National Coal Board	Wang

- c. assess the performance of the systems which were implemented and evaluate their ability to meet functional specifications.

The evaluation team devised 10 criteria to measure the success of the system within the pilot trial:

1. That the system works; that it meets the functional specifications that were originally agreed upon.
2. That end users can operate the system.
3. That end users positively accept the system.
4. That user organizations can be shown to have obtained net benefits through cost reductions or improvements in productivity, quality or speed of reaction.

Concerning the exercise as a pilot, some of the objectives were:

1. That user organizations learn the technology in terms of implementing it, including its management and required support staff.
2. That the manufacturer be informed of useful features of the systems applications and mode of implementation.

Concerning the longer term marketing goals:

1. The system and or its application be sufficiently innovative to provide a meaningful demonstration that the United Kingdom can make and implement leading edge information technology.
2. The user organization keep the system at the end of the trial.

3. That the user organization buys more equipment if appropriate.
4. That other organizations buy the equipment partly as a result of its pilot demonstration.

Of particular interest, on a comparative basis, to the criteria set up for the Canadian field trials were the items considered within "organizational benefits". The types of benefits of an organizational nature were considered as:

- a. Directly "valuable" such as head count reductions, savings in direct costs and better management of the financial resources.
- b. Executive time savings, staff turnover reductions, faster response time, lower number of failures, an increased ability to meet deadlines, increased communications capability and information retrieval or text output.

The evaluation of the department of trade and industry office automation pilot program is an extremely complex and long term affair. Consultants are currently evaluating a variety of issues including the organizational, human and technical implications. Much is still to be learned from the pilots and the evaluations conducted at individual sites are still being analyzed. As yet no firm details of these results are available.

Interim assessments of the reactions to the systems to date entail a variety of responses stemming from extreme satisfaction to extreme dissatisfaction. Some of the factors which seem to have influenced the success or failure of a trial were the extent to which a number of components were already designed and where new product development was only a minor part of the process. As well as maintaining good feedback and monitoring of the system both internally and externally, evaluation has been identified as a key factor in dictating the success or failure of a given trial.

The specific tasks defined for each pilot project include:

- a. technical audit of the manufacturer
- b. matching of a supplier to particular sites
- c. the assessment of the feasibility of a particular application for a particular site
- d. implementation process
- e. the evaluation process.

A number of criteria were set up to define the eligibility of certain systems and suppliers for participating in the pilot project activity. Specifically, this included the requirement that the system have certain technical capabilities, and that the trial would lead to a tangible product by its conclusion. The technical requirements called for the systems to have text processing and communications capabilities, as well as information storage and retrieval. While these are the basic components of any office automation system, the DTI pilot program also wanted to evaluate systems which had some innovative component and which presented new developments and opportunities for the types of systems being implemented. The final criteria was that the systems be operable by the end of the trial period so that the effort expended throughout the trial would lead to a tangible product which would be commercially viable. The following are examples of the required innovative components:

- a. graphics display
- b. personal computer capability
- c. calendars or diaries
- d. linkages outside local area networks
- e. capability to link various word processors to data processing systems

10.7 Organization of the DTI Pilots

The office automation pilot projects were structured in the following way:

The department of trade and industry offered to purchase systems outright with a cost limit set at 250,000 pounds or approximately \$500,000 Canadian dollars. Of this sum, up to 25 percent was allowed for R & D. Once the system was purchased from the vendor, DTI would lend the system to the user for the trial period. The user was obliged to utilize the equipment for a full two year period, and at the conclusion of this period, the user would buy the systems that had been developed as part of the trial process from DTI.

Pilot evaluations consisted of a number of methods and procedures, all of which are similar in many ways to the Canadian experience with evaluation techniques including user questionnaires. While each pilot was kept strictly confidential, some basic elements of the trial methodology were as follows:

- a. one pre-implementation evaluation
- b. five assessments made during the trial process
- c. a final report which would summarize the results of the trial experience
- d. a final overall report for public consumption
- e. a number of internal bulletins
- f. a significant number of periodical public presentations
- g. public relations announcements regarding the progress of the trial.

The evaluation team, which was made up of a consortium of companies coordinated by the Economist Informatics Unit, had overall responsibility for evaluating the project's 21 public sites. In broad terms the evaluation team was charged with the responsibility to:³

- a. demonstrate the nature and extent of any cost savings and other benefits realized by the system users
- b. assess the effects on employee jobs and responsibilities, the productivity of organizations, the best means of implementing office automation and training users

10.8 Summary of Office Automation Activities in Britain

The British government has undertaken several initiatives in order to assist the micro-electronic sector of the high technology industry in Britain. These initiatives are both direct and indirect with an underlying principle being the desire to assist industry, but not to be the primary force in the development of new ventures.

The four basic roles identified by the government are:

1. To provide a legal and regulatory environment in which to operate.
2. To act as the largest processor of information in the country.
3. To develop a policy framework for industry to evolve.
4. To provide financial support.

The main financial assistance scheme for industry is the "support for innovation scheme" operated through the Department of Trade and Industry. The program is designed to encourage the development of new products and services in high technology and to get them onto the market. The principal areas where support has been directed are: biotechnology, micro-electronics, fibre optics, optic electronics and software.

A related high technology scheme is the pre-production order scheme which provides funds for 100% of the qualifying costs for the placement of prototype equipment.

The government's main role in the use and purchase of high technology is represented by Central Telecommunications Agency (CTA) with expenditures of 750 million pounds per year. Its functions are:

1. To authorize departmental expenditures on IT technology.
2. To encourage development of IT strategies in each department.

3. To disseminate information on standards and practices.
4. To procure services and equipment up to 230 million pounds per year.

Other functions specifically related to office automation are:

1. To develop methodologies for the design, development, management and control of information technology in the government.
2. To provide guidance on standards for information technology.
3. To advise on organizational issues.
4. To promote information technology applications in the civil service.

The most direct involvement being undertaken by the British government is the conduct of 21 pilot projects of new office technology within local authorities, public sector organizations, and nationalized industries. The funding for these projects averages 250,000 pounds.

The assessment of these various pilot trials is currently underway, and results detailing all of the issues being monitored are not yet available. Initial evaluation results have suggested issues similar to those which have emerged in Canada. New product development has been much slower than anticipated particularly with regard to the design of totally new software. Those companies with established products have had the greatest success with their implementation. Larger vendors, such as IBM, have tended to meet their project requirements more effectively than smaller, less established vendors.

The extent of user satisfaction with the different systems has varied by site, organizational type and size. Other key initial findings have emphasized the importance of effective training, internal user support, senior management participation, and system documentation. Currently, no indication of the actual success or future of these systems has been made available, with the exception of an interim report documenting the progress of the trials to date.

11.0 SUMMARY: OFFICE AUTOMATION IN THE FEDERAL REPUBLIC OF GERMANY AND HIGH TECHNOLOGY POLICY

11.1 Introduction

The European information industry is currently faced with a number of problems arising from the high importation rates of machinery originating in Japan. European manufacturers of typewriters and copiers along with a growing number of companies manufacturing small computers and printers, face stiff competition due to the influx of large quantities of low priced Japanese imports. The Japanese threat is being examined by all EEC countries producing information technology. It is generally acknowledged among all members that cooperation, co-existence and technology transfer should not be disturbed by protectionist measures. There is a feeling within Europe and specifically in Germany that the best response to the Japanese threat is the strengthening of international competitiveness, rather than artificially influencing the trade and competitiveness of external suppliers. Recommendations have been made to deal with competition and advancing microelectronic technology developments from countries such as Hong Kong, Singapore, Korea, Taiwan and Japan. These include:

- a. software technology that can be used to solve programming problems and develop new applications
- b. increasing the number of qualified information technology experts experienced in a broad spectrum of applications
- c. developing more public acceptance of new techniques as a tool for the work force in factories, offices or homes.

Comparative studies on information technology in the major industrialized nations reveals a strong emphasis on the need to stay competitive in the world market. Forecasts made for the Federal Republic of Germany indicate that by the end of this decade, qualified experts in information technology will comprise 4% to 5% of the work force.⁴ In addition to their professional expertise, 15% of

the work force are expected to develop a good working knowledge of specific areas of information technology. Approximately 50% of the work force will know enough about information technology to readily accept it as a tool and an aid important to their work. Therefore, there is a recognized need to increase the emphasis on research, education and job training to cope with the critical technical developments expected for the future. This has led to the development of policies for the Federal Republic of Germany which focus on:

- a. courses in information technology within public schools, general educational institutions, technical high schools, universities and extension programs in the work place
- b. funding for basic and applied research and development
- c. international cooperation in science and economics to promote competition and to help highly developed and developing countries work together on information technology projects.

11.2 High Technology Policy

Currently, there are no policies relating specifically to the promotion of office automation in the Federal Republic of Germany. As was observed for North America, most policy discussions tend to place office automation within a broader context of microelectronics, and information technologies (which are outlined as large-scale integrated electronic components, computers and computer applications, communications technology, and industrial production engineering)⁵. Policies relating to these categories of technologies fall within a broad framework referred to by the German Federal Government as the New Research and Technology Policy.

The objectives of the new research and technology policy are geared to contribute to:

1. to expand and intensify scientific findings
2. to conserve resources and the natural environment
3. to improve humane living and working conditions, and
4. to increase economic efficiency and competitiveness.⁶

Related goals of the policy include:

1. to ensure effective cooperation based on mutual trust between science, industry and government in research and technology
2. to strengthen the institutions of science and science promotion and to assist them in developing new innovations
3. to help provide qualified young scientists
4. to improve the use of Government promotional funds
5. to intensify international scientific and technological cooperation⁷.

This policy also includes the support of research efforts assessing the effects of technology in the following areas:

1. The investigation of opportunities provided by new technologies and the control of their applications.
2. Technology assessment and safety research. In the case of new technologies, the effects of technological progress on jobs will be a priority.

An overriding objective of the the Federal Government's Program is to improve the basic framework within which the market functions. This is to be accomplished in the following manner:

1. Improving the overall economic conditions in such a way that on the one hand, a greater challenge is presented to companies, but on the other hand, achievement - with innovation being a central part of entrepreneurial performance - is rewarded. Furthermore, the Federal Government hopes to ensure that the decisions required for long-term extensive investments, as well as licensing provisions are conducive to innovation in the high technology sector.
2. Through the setting of research and technology policy, which will contribute to improving the framework conditions for research, development and innovation.

The main goals of this general strategy are:

1. to expand the infrastructure for providing technology information and the utilization of the patent system;
2. to eliminate barriers to the technology transfer between basic research, application-oriented research and market-related development;
3. to intensify cooperation in research and development between industry and higher education institutions as well as government-funded R&D institutions;
4. to make available more venture capital for promising innovations, but in particular for new technology-based firms;
5. to expand markets for new technologies and products through public procurement.

11.3 Instruments and Measures for Promoting R & D and Innovation

The Federal Government of Germany has developed a number of research promotion tools which can be classified as indirect and direct. (The selection of a specific promotion method depends on the promotion target).

1. Indirect R & D promotion is applied whenever the general R & D and innovation problems of a company are to be solved, or its innovation potential strengthened. A company's own R & D activities are not usually the subject of government intervention since government interest is focused on the global result of promotion. The Federal Government gives priority to broad-based, general and evenly working promotion measures over selective industrial promotion activities. Supporting the market's own selective function, indirect promotion strengthens industry's own capabilities while reducing the danger of misguided government intervention.
2. Direct project promotion is considered wherever solutions are sought for specific problems and where other promotion measures are either too expensive or not specific enough. Direct promotion is applied whenever there is an excessive technical, scientific and economic risk, when the financial commitment to be met by the companies concerned is too great and when the market is considered unable to produce new technological solutions on its own.

Indirect promotion methods have recently been emphasized through the following measures:

- reintroduction of special depreciation allowances for research and development investment as of 1984;
- a threefold increase in support of contract research and the development of industrial enterprises;

- continuation of promotion for cooperative industrial research through the Union of Industrial Research Associations (AIF);
- continuation of grants towards the R&D payrolls of small and medium-sized companies;
- examination of whether to supplement this scheme by offering additional support for the recruitment of new staff to increase industrial R&D capacity;
- improvement of technology transfer from research institutions to industry by providing incentives and facilitating the exchange of scientists between these sectors. The introduction of an award for technology transfer from government-funded non-university research centres;
- promotion of new technology-based firms under a multi-year pilot experiment with a financing of DM 100 million.

Between the general strengthening of the industrial R&D potential and the promotion of specific programs, there are other goals of R&D policy which, though aiming at a specific promotion target (e.g. the increased application of microelectronics in industry), leaves it to companies to identify tasks and find solutions for their R&D problems. This is indirect specific promotion and is usually applied wherever research and development in technology requires broad-based but temporary promotion for a variety of economic considerations.

Indirect specific promotion is provided in the following ways:

- under the special program on the application of microelectronics (1982-1984)
- in the promotion of the application of CAD/CAM and of robot development in production engineering (1984-1987)
- in the planned special program on microperipherals which is part of information technology promotion concept (1985-1988).

3. Research Networks

Basic research in the high-technology sector increasingly requires that companies cooperate for a prolonged period of time. This is being addressed through the fostering of joint efforts by companies and research institutes working on interrelated problems in research and development. These research networks are considered suitable for encouraging an open participation by a variety of industry, educational institutions and scientific centers in the development of new technology ventures. The goal of such networks or consortia is to reduce the number of individual projects undertaken by government and to rationalize the allocation of government funds for R & D.

The Federal Government of Germany has indicated it will give greater weight to the promotion of research networks as compared with the traditional direct promotion of industrial R&D projects. It has also indicated that it will take care to identify those areas where network research is reasonable and appropriate. This is being carried out in the following programs:

- in the new program known as "Production Engineering 1984-1987";
- in the promotion concept "Information Technology", adopted by the Federal Government in March 1984;
- in the program "Environmental Research and Environmental Technology 1984-1987".

An increasingly important condition for successful innovation is the prompt and reliable availability of specialized information. Innovating companies have a great need for information about economic and technical developments, emerging technical problems and potential solutions in applied research. The Federal Government is dedicated to improving the environment for the establishment of efficient information systems for industry and applied research.

The Federal Government has begun support of the development of a German Research Network (DFN). Participation in the network is available for universities, research institutions, private enterprises and specialized information agencies. This network will facilitate the exchange of news, data and computer software between the members comprising the network.

Procurement

Public procurement is currently oriented exclusively towards goods already available on the market rather than new or innovative products. In order to improve the government's ability to use its role as a buyer and to increase more innovative procurement, the Government is currently amending the provisions governing the awarding of contracts for services. These amendments allow more innovative products to be purchased by Government Departments. The Federal Government is intent upon procuring contracts from smaller but technologically more efficient companies.

In 1984 the Federal Government issued a report on Information Technology which presented a comprehensive concept for the support and development of micro-electronics, information and communications technologies.⁸

The measures embodied in this report were designed to fit within the overall economic policies of the government, and were aimed at providing improved conditions for supporting the German information technology industry in its efforts to take advantage of the opportunities available in the world-wide market.

Measures were specified for five areas:

1. Improvement in the general market conditions, economic conditions, and competitiveness of the Federal Republic of Germany specifically and of Europe generally, with particular emphasis on venture capital, opening of markets, and innovation-oriented public procurement.

2. Motivation of people to meet technological challenges through increased incorporation of information and communications technologies in education.
3. Encouragement of innovation-oriented markets through the development of futures-oriented communications infrastructures and innovations in hardware.
4. Widening of the technology base to assure the long-term security and defence capabilities of the Federal Republic of Germany.
5. Intensification of the research capabilities in the field of information technology with the aim of developing internationally competitive R & D capacities in the public and private sectors.

11.4 Office Automation Trials

There is only one example of direct government involvement in the development of office automation technology in Germany. This was a field trial conducted jointly between the Federal Government Department of Research and the Alliance Insurance Company in Munich from 1979 to 1983. This trial was funded for 6 million DM and represented a scientific field experiment aimed at gathering information and research on the use of teletext service. (Teletext is an advanced form of Telex services).

The main objectives of the trial were to stimulate the development and acceptance of teletext services and to test various factors such as:

1. the compatibility of terminals and systems connected nationally and internationally
2. the compatibility with existing telex services

3. the ability to provide high speed and reliable transmission of text documents
4. the ability to keep telecommunications charges low.

The field trial was conducted over a five year period within federal government offices and was divided into two stages. The first stage a technical trial which ran from 1979 to 1981 and its purpose was to focus on and demonstrate international protocols. The second stage was an additional technical trial that ran from 1981-1983. During this second trial, users paid no subscription charges, but were able to gain experience by operating their terminals and sending telexes world wide. Users were able to take advantage of the full teletext service, with international links being provided as and when other nations developed their own capabilities.

Twelve teletext centers were operated throughout West Germany, with the three major ones located in Frankfurt, Munich, and Stuttgart. The users were composed of secretarial and clerical staff selected from two diverse groups. One group was drawn from large organizations which already use medium or large size PBX's and word processing equipment, and the other from medium size, small and very small firms. Prototype teletext terminals were manufactured by Siemens, Triumph Adler, Olympia, Phillips, and Standard Elektrik Lorenz. The main functions provided to users were text creation, editing, and messaging.

An evaluation of the trial focussed on such issues as productivity, production time, flexibility, efficiency, work load, social environment factors and overall user satisfaction.

Subsequent to the trial activities, it was forecast that there should be up to 40,000 terminals in use by 1987 and up to 100,000 by 1992. It was also expected that up to 40% or 8 million of the letters produced each day in West Germany would be produced and sent by the new service. The results obtained from the

trial led directly to the development of Olympia typewriter's teletext machine: an intelligence typewriter which can be used as a replacement for a standard telex machine. Contracts have now been negotiated with Xerox and IBM for the further development of software to run the teletext service.

One of the principal outcomes of the trial was that each of the companies that participated in the original product development and received government funds now have a commercial product which is making significant gains in the European and North American markets.

The conclusion of the German teletext trial represented the last major effort by the government in the direct development of new informatics products. The current government strategy is to avoid becoming directly involved in joint ventures with industry, and today, new policies emphasize the development of longer term strategies which will foster a more stable infrastructure for industry development.

11.5 Summary

The development of policies and programs affecting informatics and high technology sectors in Germany have been significantly influenced by the competitive threat posed by a large influx of Japanese imports for office automation. Policies have also been formulated with consideration of the need to foster co-operation with other European countries rather than encouraging competition.

Currently, there are no policies or programs directed specifically toward the office automation industry in Germany. Direct and indirect programs are oriented to the broader issues of R & D development, high technology, as well as public acceptance and awareness of new technologies. Government procurement policies have recently been revised to allow additional purchasing from smaller and more innovative companies which will provide improved and cost effective services and equipment to the government.

The broader objectives of the Government's programs are to improve the overall market conditions in which industry operates, and to provide assistance of a global nature rather than to specific companies. Thus, methods of assistance can be either direct or indirect depending on how specific a requirement exists and the extent of government interest in a particular project.

Assistance can take the form of:

- a. depreciation allowances
- b. increased contract research
- c. industrial incentives
- d. increased efforts for technology transfer
- e. promotion of new technology based firms.

A prime activity in Germany is the promotion of Research Networks. These are co-operative associations involving government, universities and industry. The concept behind these networks is to foster longer term projects and to minimize the duplication of effort in R & D expenditures and activities.

The only example of direct government involvement in the office automation area was a field trial funded at 6 million DM which ran over a five year period. This trial was ducted to the development of a new teletext service (enhanced telex) using intelligent typewriters produced by Olympia. The results of the trial lead to the development of a marketable product which today is making significant progress on the world market.

12.0 OFFICE AUTOMATION ACTIVITY IN FRANCE

12.1 Introduction

The approach to the development, implementation and support of office automation in France is more centralized and controlled than is the case in Canada or the U.S. Only Britain, with the strong influence of the Department of Trade and Industry can be considered to have more direct government involvement in the formation of high technology policy and in designating industry sectors which could benefit from government intervention.

A draft law on the nationalization of industry and banking presented to the French National Assembly in 1981 noted "the lack of a true industrial policy" and stated that "it is necessary for the state to have the instruments for efficient interventions and for the planned orientation of the country's development". The most important of these instruments was considered to be "the enlargement of the public sector"⁹.

In a recent speech given by Jeanne Pierre Chevenement, Minister of Research and Industry, the French socialist government stated that first advantage should be given to technological and industrial development and that a principal goal should be technological progress. Two areas given special attention were the electronics and fibre optics.

The plan "filiere electronic" was budgeted to spend 140 billion francs (in 1982 prices) on investment and R & D in electronics over a five year period. Of this 11 - 12 billion francs a year were to come from the government budget. In 1983, 9.5 billion francs were spent, with 11 billion being spent in 1984.

The French electronics industry reached a growth rate of 8% in 1983, and reduced its trade deficit from 13 billion francs in 1982 to 6 billion in 1983.

One of the main focuses of the French Government's high technology development strategy is the support of the BULL; a nationalized microelectronics and computer manufacturer. In 1983, BULL received a pledge for capital infusion by the government of 4.5 billion francs to be made available between 1983 and 1986. BULLS research and development program is estimated to be 13 - 14 billion francs; an amount which is small by world standards.

The French have typically taken a "faire cavalier seal" attitude in their microelectronics, integrated circuits and computer manufacturing. This has meant there have been only very limited attempts to form consortia with foreign suppliers to develop new and innovative high technology products. In order to insure the viability of unilateral ventures, the French have typically relied upon government procurement to provide stability in the market place.

France has typically chosen highly centralized solutions for establishing high technology ventures. This is the case, for example, with the establishment of a nationwide cable network, to be controlled and financed by the Director Generale des Telecommunications of the PTT. The PTT is providing much of the approximately 60 billion francs needed for the program.

Likewise, the French have taken a similar approach with computer software and office automation technology. One of the main criticisms of this centralized approach has been the effect on the natural forces of supply and market demand. In the case of fibre optics, considerable debate has arisen about whether the country actually needs a sophisticated fibre optic network. The desire to provide industrial stimulation and fulfill government policy objectives rather than matching needs with technological capabilities, is a prime cause for concern among many of the critics of such centralized approaches.

12.2 Government Support to R & D

In 1981, spending on R & D for industry was targeted to grow 20 percent a year between 1981 and 1985, and to increase from 2.0 to 2.5 percent of the gross domestic product during this period. Currently R & D is about 2.2 percent of GDP.

Industrial stimulation has generally been based on selective credit in France; a policy which has been extended through the establishment of CODEUI (compte de developement industriel). CODEUI apportions money to FIM (Fonds Industriel de Modernisation) which then distributes money to firms and also borrows in domestic and international markets. Loans made to industry by FIM are subject to approval by the ministry for foreign trade and industry. The state provides full guarantees to the loans made by FIM. This practice has meant that in some cases unprofitable operations have received funding, thereby distorting the mechanism to foster profitable ventures rather than non-profitable ones.

12.3 Information Technology and Office Automation

The French Government has in the past two years undertaken a major re-evaluation of the role that informatique and bureautique play in the civil service. The evaluation was based on an examination of the government's use and support for computer and office automation products and services. The report "Les Technologies D'Information" was prepared for the prime ministers office in 1982. It provided a review of existing government activities in the information sector and made recommendations about the future role of new microprocessor-based information technologies in the civil service and for the country as a whole. In general the report supported the implementation of new technologies and also emphasized the role of existing government agencies for developing, assessing and evaluating new information technologies. The report recognized the importance of new technologies in affecting the way government develops processes and disseminate information. One important aspect of the report was the attention paid to various agencies dealing with information technology.

12.4 CESIA¹⁰

This agency is directly involved in the development, research and investigation of office automation and related technologies for the French government. Their function is: to act as a consultant to government departments instituting office automation; to assist in the administration of office automation systems within government; to gain experience with new technologies; and to assist in the development and evaluation of new technologies.

CESIA functions as a supplier of services and conducts social, as well as economic research for the government. Much of this work is also utilized as input to the design and implementation of office automation products being produced by companies such as BULL. Another function of CESIA is to ensure standardization of OA and related equipment both on an internal basis and as part of the broader international perspective.

12.5 SCRIBE

In the past two years, CESIA has been working with the French civil service on a large scale office automation project known as Systeme de Communication et de Reseaux Informatiques et Bureautiques Evolutifs (SCRIBE). This project was developed by the government out of the recognition that there is generally an under-utilization of automated systems in the civil service and that there is a need to develop a domestic integrated office system.

The integrated office system is designed to provide the capabilities for:

- a. word processing
- b. telecommunications
- c. electronic reproduction
- d. electronic archiving and document access
- e. automated office work station organization.

The project is being carried out at the Ministry of Economy, Finance and Budget of the federal government.

Project SCRIBE evolved from several other office automation projects. In 1979, project Kayak was undertaken to assess the primary configuration for an integrated office automation system. This was composed of local network work stations and an electronic mail service, a decision was made in 1981 by the French government to promote the commercialization and industrialization of project Kayak through a direct government and industry project. The project was considered critical to the domestic development of an integrated office communication project.

Project SCRIBE is now being instituted as part of the building of a new Ministry of Economics and Finance which will be staffed by 6,500 people.

The project is being promoted as a showcase of national know-how in the area of office automation and is expected to demonstrate these systems as vital tools for communication in the future, as well as a means for improving the productivity and efficiency of government operations. The project is expected to be completed in 1986.

Project SCRIBE, was begun in 1982 when a new experimental program for testing office communication technology was instituted. The initial steps defined for the project included:

1. Setting up of a steering committee to direct the project within the ministry.
2. Selecting the applications and departments which were expected to participate in the project.
3. Drawing up technical specifications.

In January of 1983 the actual consultation and design of the system was undertaken. This involved the selection of technical proposals from companies designing the system specifications and those undertaking the planned socio-organizational assessment.

12.6 Project Organization

The project organization is composed of five (5) committees:

- a. steering committee
- b. technical committee
- c. monitoring committee
- d. SCRIBE committee
- e. technical studies group

Efforts are being made in the system development and implementation to allow a maximum of input from the organizations involved. This is being facilitated through a series of user committees, management committees and software development groups.

Evaluation of the project is being conducted by CESIA and will be undertaken at various stages as each of the technical steps are achieved.

Stage One of the project includes:

- a. local business network
- b. local network/DSA server interface
- c. development of a multi-functional work station
- d. word processing interface

Stage Two Includes:

- a. extensions to the work stations
- b. development of print interfaces
- c. addition of videotex
- d. implementation of a voice interface.

Throughout the duration of the field trial activity a series of socio-economic studies will be undertaken to assess the impacts of the system on government operations and users. The perspective of the evaluation is very much oriented to the concept of organizational impacts.

The other major objective of Project SCRIBE is the prototype development of an integrated office communication system incorporating the various elements being test. The prototype system is being developed by BULL, with the software being developed by a number of other companies operating as a consortia. The network developments are being undertaken by the DGT of the Telecommunications branch.

Project SCRIBE is only now being implemented within government offices with results from this activity still only at a very preliminary stage. This activity represents however a major undertaking by the government and is one which they anticipate will lead to the development of a world class office automation product.

Evaluation criteria which have been set up to assess the program focus mainly on the internal effects of the technology on users and organizations. Economic assessment of the direct and indirect effects of the government expenditures have not been outlined with the exception of the need to develop a commercially saleable and world class product.

12.7 Summary

France has undertaken a number of initiatives for the direct stimulation of high, technology industries. Within the micro-electronics sector the activities of BULL and the procurement policies of the government demonstrate the extent of direct intervention in the market place.

Major changes in French policy began in 1981 with the process of nationalization undertaken by the new Federal Government. In association with this process of nationalization there were attempts to increase R & D expenditures in the electronics sector, in 1983 9.5 billion francs were spent with 11 billion in 1984. Efforts have also been directed to the reduction in the trade deficit in micro-electronics which was reduced by almost 40% between 1982 and 1983. The Governments role has been to encourage through direct fiscal and policy measures the growth of a domestic micro-electronics industry particularly in the office automation area.

Project SCRIBE represents a large scale experiment designed to assess the way new office technology affects government operations and which will lead to the development of new products by French Industry.

13.0 REFERENCES - BRITAIN, FEDERAL REPUBLIC GERMANY
AND FRANCE

Britain

1. Wescom Interview with Mr. Graham, DTI, April 1985.
2. IT series No. 6 "Method for Evaluating the Impact of Office Technology Systems", Information Technology in the Civil Service, March 1984.
3. Interview, Jan Gower, Consultant EIU, London, April 1985.

Germany

4. Report of the Federal Government on Research, 1984 Federal Ministry of Research and Technology, 1984.
5. Bonn: Report of the Federal Government on Research 1984, The Federal Ministry of Research and Technology, 1984, p. 12.
6. Ibid. pp. 12, 13, 14, 15.
7. Ibid. pp. 20, 21, 22.
8. Bonn: Report of the Federal Government on Research 1984, Federal Ministry of Research and Technology, 1985.

France

9. Balassa Bela, "Industrial Policy in France Under the Socialist Government"; paper presented to the American Economic Association, Dallas, Texas, 1984.
10. CESIA, "Cahier des Charges du Project Scribe"; Ministere de l'economie des finances et du duget, Marseille France, 1984.

14.0 INTRODUCTION - JAPAN, KOREA AND SINGAPORE

This section of our report presents a review of the developments in informatics, office automation and related areas for three countries, Japan, Korea and Singapore. This assessment of programs and policies for these countries is by necessity somewhat more limited than in the U.S., Canada and Europe sections. Programs in these areas tend to be more generally related to overall high technology industry development than office automation specifically.

The most in-depth appraisal is provided for Japan where interviews were conducted with industry and government spokesmen along with reviews of policy papers and other secondary sources. Information about Korea was derived mainly from secondary sources. While details about Singapore were gathered as part of a study visit and from secondary sources.

The Japan section reviews various policies and programs currently being implemented to aid and promote the development of high technology and informatics. Following that review is a description of current market developments which reveals the growing importance of software and office automation. This review provides some indirect indication of the success which the different government programs and policies have had in fostering a healthy market for office automation products and associated software.

Japan is heavily committed to the implementation of office automation domestically as a primary means of increasing the productivity of the expanding service sector within private industry and government. A main focus of office automation implementation is to make the office environment more efficient by lowering the costs for information production. Also there is a recognition of the need to improve the effectiveness of management decision making and to improve the overall level of utilization of new office technologies within the Japanese business and government environments.

15.0 JAPAN

The emphasis on government support for industry in Japan has in the past few years shifted from the heavy industry sectors to those which contribute to high value added productivity and resource conservation. The chief targets of this shift in strategy are:

- a. computers and software
- b. robotics
- c. aircraft industries

Presently the governments' goals are to support technological innovation in hardware, operations system software and to integrate computers more fully into the service sector of the economy. The focus of these goals is on technological innovation with specific attention placed on the use of entire information systems. The government's main efforts in R & D for the informatics sectors include:

- a. Promotion and Development of Technology for the next 5th generation computers
- b. High Speed Computer Systems for Scientific and Technological Uses
- c. Next Generation Industries, Basic Technologies and R & D Programs
- d. Optical Measurement and Control Systems
- e. R & D Relating to Basic Technology for the 5th generation computer.

During 1982 government subsidies to private companies for advanced R & D in computers, software and integrated circuits were estimated at 11.2 billion yen. From 1976 to 1982 subsidies totalled 78.2 billion yen.¹

Policies supporting the growth of high technology industries particularly those focussed on computers have usually been implemented through the setting of temporary laws which promote the electronics and machinery industries. The

main policy tools which are being used in Japan include joint industry government programs for research and development of indigenous technology and tax and other measures designed to foster the diffusion of technology.

The main criteria set out for industries receiving government assistance in Japan are that they meet three basic criteria:

- a. high technology
- b. high value added
- c. knowledge intensive

Based on this criteria the computer industry has been designated as the foundation of the new technology based industrial structure in Japan.

15.1 Temporary Laws Affecting Technology Development

Two laws which have had significant effects on Japans high technology developments are the Law on Extraordinary Measures for the Promotion of Specific Electronic and Machinery Industries "Kidenho" and the Law on Extraordinary Measures for the Promotion of Specific Machines and Information Industries; "Kijoho". Each of these laws were designed to foster mergers and joint activities within industry in a way that avoids existing antimonopoly laws.

15.1.1 Kidenho

This law emphasized the government of Japans increased attention to the information processing industry and computer manufacturing. It provided the basis for the development of "enhancement programs" and set out major industry objectives in three categories:

- a. prototype R & D
- b. start-up of large volume commercial production
- c. manufacturing processes which would reduce costs

Projects under the enhancement programs were to be partially supported with direct government funding and low interest Japan Development Bank loans. The Ministry of International Trade and Industry (MITI), was given responsibility for guiding manufacturers in concerted activities pertaining to the procurement of raw materials and components, use of production facilities, industrial standards and efforts to improve technology. The Kidenho law also provided for corporate mergers when necessary to help achieve the targets of specific enhancement programs and tax benefits to encourage rationalization of high technology industries.

One of the most well known developments stemming from this law was the joint government industry project for the development of very large scale integrated circuits (VLSI). This grew out of a joint effort by Nippon Telegraph and Telephone Corporation (NTT) the public communications monopoly with Hitachi, NEC, and Fujitsu. Research estimated at 72 billion yen was provided by the government and industry over a four year period. It has been estimated that about 1,000 patents have resulted from the project.

15.1.2 Kijoho

The Kijoho law increased the emphasis on developing unexploited and leading edge technologies and made provisions for specifying which technologies were to be developed. This law has provided the legal basis for government support to the computer industry since 1978. It advocates and facilitates joint activities as a means of fostering product development rather than company mergers which were proven somewhat unsuccessful in the past. The "Kijoho" supports enhancement programs for specific products and provides access to funds and joints activities needed to implement programs. Particular interest is directed to the computer software industry.

15.1.3 Information Technology Agency

In 1970 the Information Technology Promotion Agency Law was passed which established the agency as the major channel for government funding of computer software and services. Support is provided through the agency for the production and maintenance of applied software through direct lending credit guarantees and consignment programs. The agency works primarily with small and medium sized data processing firms.

15.1.4 MITI

The Ministry of International Trade and Industry has by law the major responsibility for designing and implementing industrial policies. Responsibility for computers, robotics and aircraft are handled by the Machinery and Information Industries Bureau.

Development and implementation of the governments research and development policy is handled by MITI's Agency of Industrial Science and Technology. This agency shares major responsibility for government supported R & D projects, funds and administers a diverse range of activities.

The tools being used to promote designated growth industries such as computer and related information industries are:

- a. joint R & D programs
- b. direct financial assistance
- c. preferential tax treatment for the development and diffusion of technology.

15.2 Financial Assistance

The most common form of government financial assistance in Japan are direct subsidies for R & D through corporations or associations with a number of private company members. In many cases, depending on the overall size of a project, funds are usually matched in some proportion by industry. In most instances funds are provided on the basis of a pay back if commercial production is profitable.

In the case of the software industry loans have usually originated at long term credit banks. In these cases the government agrees to purchase a certain amount of credit bank issues, the proceeds of this are loaned to software companies through the Information Technology Promotion Agency.

A prime vehicle for assisting in the financing of the software industry is the Japan Development Bank which provides low interest and long term loans. These are usually provided below prime for terms ranging up to 25 years.

Japan Development Bank (JDB) loans for 1980 were given primarily to companies involved in the basic research and development for computers or domestic manufactures. These two categories accounted for 518 million yen or 56%² of new loans issued in that year. In addition to the Japan Development Bank there is the Small Business Financial Corporation and the People's Finance Corporation which lends primarily to small high technology companies. The Information Technology Promotion Agency provides guarantees to software companies borrowing from private banks.

Another method of providing financial support to industry is through the setting up of leasing organizations. These activities constitute post R & D incentives and are deemed crucial to moving R & D to industrial applications and marketing of products or processes resulting from R & D. These are designed to accomplish four objectives:

- a. make Japanese manufactured computers available to a wide spectrum of businesses (increase domestic consumption)
- b. allow domestic manufacturers to compete more effectively with companies such as IBM
- c. facilitate the flow of capital back to the computer manufacturer.

Tax measures applied specifically to the computer field include a scheme which allows up to 40 percent tax differal on revenue accruing from the sale of general purpose software. This helps to provide companies with a tax subsidy for revenue that is used for the development of general purpose software programs and for promoting their diffusion.

15.3 R & D Development Measures

In comparison to others Japan has been increasing its expenditures on R & D activities faster than any other advanced industrialized country.³ A two pronged technological research and development approach has been set up which provides incentives to productive firms which allows these to play the main role in technological development and by mobilizing governmental agencies and institutes to perform a "curtain raising" role - i.e. opening up new areas for further or future technological development through targetted R & D activities.

The governments direct role in financing R & D is considered quite low in comparison to other countries. This amounted to 23.6% in 1982 compared to 57.6% in France (1981), 43% in West Germany and 46% in the U.S. (1982). The approach taken by the Japanese government is to assume a secondary position with respect to financing.

It is expected that in the future, rather than increases in direct financial support for R & D there is likely to be more collaboration between government and industry through the sharing of costs, facilities and manpower as well as R & D results and patents.⁴

Plans are currently underway for MITI to introduce (in 1985) the "Affiliated Joint Research Scheme". This is designed to encourage researches from private firms to take part in joint research groups at MITI's own research institutes. Participating firms would have an entitlement to patents arising from these activities.

Overall the incentive devised to promote technological R & D activities within the private sector include:

1. risk and cost reduction incentives
2. post R & D incentives aimed at assisting commercialization of end market development for R & D results
3. statutory incentives to allow firms to form research associations

Related to these measures are related institutional activities which include:

- a. The establishment of the Japan Research and Development Corporation which finances the development of new technologies for industrial applications and commercializes unused patents held by universities and public research institutes.
- b. Another planned activity is the establishment of the organization for the promotion of Industrial Technology Development. This will act as a quasi public agent for financing technological development activities of private firms either through making loans at an annual interest rate of 7.1% or investing in equity of selected private firms active in frontier technology such as micro-electronics and new materials.

15.4 Summary - Policies and Programs for New Technologies

The emphasis placed on high technology in Japan means that most of the government initiatives are in support of company efforts to develop and diffuse innovative products and processes. A principle feature of industrial policy is the establishment of joint industry/government R & D activities which are widely

used for longer term development projects. These efforts have also been facilitated by specific laws such as Kijoho and Kidenho and the activities of MITI which co-ordinates many of the programs, provides funding and directs policy implementation.

The government also provides assistance to industry through private financial institutions in the provision of low cost loans to firms in the high technology and computer fields. Also government supported leasing companies have encouraged the domestic adoption of new computer products in both the manufacturing and service industries.

15.5 The Japanese Software Industry

An essential element in the growth of Japan's computer industry and its office technology sector are the associated developments in the areas of software. Software is important because it is increasingly becoming the main cost component in office automation products. Software is also often the component that differentiates office automation products and provides the unique competitive edge for a given supplier.

The Japanese computer market is the second largest in the world after the United States, and Japan exported \$2.7 billion worth of computers in 1983.⁵ IBM's CEO has estimated that Japan's combined data processing and telecommunications industries comprised more than \$30 billion in 1981 and will grow to twice this figure by 1986. Although the Japanese are not presently strong global competitors in the software field and also had less than 2% of the US market for all types of computers in January 1984, within the decade they will be a major threat, and IBM is anticipating that within a half decade its real rivals will no longer be Honeywell, but will be Japanese firms which are totally vertically integrated from chips to mainframes and which will have software divisions for each new product line which they enter.

Presently most Japanese software houses have less than 80 employees, and the largest independent suppliers average 150. There were 1,965 Japanese companies supplying software in January 1984. Less than 50% of these had half the total revenues, and only seven firms had revenues greater than \$25 million (US) annually. These 1,965 firms collectively employed 153,000 persons in mid-1984.

Since applications are mainly written by users, packaged products have been slow to develop, rising from \$0 sales in 1977 to less than 10% of the total domestic market in 1983. Of the total software workforce, less than 25,000 persons are working on packages and most are involved in custom software production.

The current battle in the Japanese computer market between IBM and her adversaries (Fujitsu, with 1983 sales of almost \$4 billion; NEC Corp., with 1983 sales of \$6.1 billion; Hitachi, with 1983 sales of \$16.3 billion) is centering around computer software and personal computers for office use. The significance of the personal computer in offices is due to the intricate form of the Japanese written language. Using conventional typewriters to print the literally thousands of characters in Japanese is impossible. However, with a perscom plus printer there is little effort involved. There is a large market for word processing software and hardware which can handle iconic forms of Asian languages in countries such as Singapore, Taiwan, China and South Korea.

15.5.1 The Japanese Software Effort

It is often claimed in western countries that in areas of original research, such as software production, which often resembles the chaotic process of artistic creation, the Japanese, with their structured Shintoistic traditions, are not very good and have succeeded thus far mainly by licensing and modifying technology from the west (more than \$10 billion worth in the last decade).

This belief may not prove well founded, and in spite of the fact that in recent lawsuits a number of Japanese firms have been publicly degraded by being forced

to open their products for inspection by IBM to make sure they were not copying software, the Japanese are now putting major efforts into the development of software.

Many of the big hardware manufacturers such as Fujitsu, Hitachi, Mitsubishi and NEC have thus far put comparatively little effort into software development. However, given the fall in the comparative price of hardware compared to software, all these firms have announced a shifting of research resources into software development. Exemplary of these developments is Hitachi, which in the past three years has increased their R&D software budget from 10% of total R&D to just under one-third. Similarly, Fujitsu now spends one-third of its total R&D budget on software, but this is written mainly for Fujitsu's mainframe computers and sold domestically in Japan.

The Japanese have to date not had significant software exports outside of Asian countries which have iconic languages. Due to a number of semantic shifts and other problems, when programs are translated from English to Japanese or vice-versa, they often have to be totally rewritten, and business accounting practices may be totally different cross-culturally. For example, Japanese and British accounting practices are so different that Japanese accounting programs are not useful in the US or Britain.

The Japanese have to date been comparatively slow to develop off-the-shelf software packages and have usually produced customized software. For all of these reasons, an independent Japanese software industry is developing only slowly.

15.5.2 Software Factories

One of the basic forms of producing software in Japan involves the software factory. Toshiba, for example, has a software factory of 2,800 software developers focusing on industrial CAD/CAM software. Plans are now in place to

increase this number in the near future by 2,000 additional programmers. The NEC Corp. is also spending up to one-third of its \$400 million research budget for software in 1984 on productivity aids to improve the quality and amount of Japanese software. NEC has also started its own series of software factories.

15.5.3 Government Support for Software

In 1981 the Information Technology Promotion Agency of Japan's Ministry of International Trade and Industry set up a software technology centre which collectively involved software writers from the universities, industry and government. The Japanese private sector is also continuing the practice of starting new software subsidiaries for each new product area that a firm enters. Most significantly, the government allows 50% of revenues from sales of packaged software to be tax-exempt for four years. But the firms must re-invest these monies in further package development.

MITI also made a major thrust into the export market with the January 1983 signing of a treaty for China-Japan technical cooperation in software. Fujitsu and NEC have opened training centres in China, and the Japanese clearly hope to replicate their success in Singapore.

Of special interest is Japan's fifth generation computer project which is focusing on parallel processing computers and AI software. Begun in mid-1981, the government is supporting 35% of the development costs of this project and has invited firms from all over the world to join in. In 1984 the software component of this project was budgeted at \$23 million, and MITI also set up tax breaks and low interest loans to software producers.

MITI is also attempting to nurture its software industry with proposed revisions in the copyright law by basically making it legal for Japanese firms to copy existing software without the permission of the owners. In the meantime, US software producers are still significantly ahead of Japan. In 1983, for example,

the total Japanese software sales were still between one-quarter and one-third of those of the US firms.

Presently Japan, like Canada, has virtually no significant share of offshore systems software or applications software markets. The Japanese, well aware that software is becoming an increasingly larger value-added component, continue to devote high outlays to R&D spending, focusing this effort in the area of applications software. Still they have not come up with any useful methodologies for the much vaunted automated programming, and are still having great difficulty due to their languages and other documentation problems with serving software end user needs overseas.

Since almost all software documentation is written in English, Japanese programmers must first learn this language, and their programmers are no better at learning natural languages than ours are. Secondly, the design of systems software is still essentially an art rather than a disciplined procedure which requires a unique blend of conceptual and intuitive thinking. The Japanese are still more proficient at developing hardware. For all of these reasons, over the next half decade the Japanese are likely to produce software for the export market that is intrinsically better or cheaper than rivals in other countries. More significant is the fact that the Japanese will be copying and modifying North American software packages for resale at costs significantly below those of the original, as is now the case in Singapore and several other countries.

15.6 The Office Automation Market in Japan

The office automation and computer market in Japan has been growing quite steadily over the past few years. In 1983 Japan's total value of production for office machines, for the January-December period of 1983 increased 19% to 932.7 million yen. Exports of office technology accounted for 70% of the total production (653.5 billion yen). This represented an 11% increase over the preceding year with domestic demand increasing by 23% to approximately 280

billion yen. The items contributing most to the growth of the office automation industry were word processors, alphabet-based typewriters, personal and office computers.

As illustrated in the following exhibits, personal and office computers are expected to realize significant growth over the next nine to ten years.

15.6.1 Japanese Language Word Processors/Office Computers

The Japanese language word processor the main component of office automation in Japan has been experiencing significant growth over the past few years. Between 1981 and 1983 production of this equipment began with initial sales mainly to large corporations. As in North America, there is now a steady movement into the medium and small size business sectors.

In 1984 there were 170,000 word processors produced in Japan worth 115.5 billion yen. Production of Japanese word processors has been forecast to reach a value of 300 billion yen by 1989 and to grow to 500 billion by 1994.⁶

Other products enjoying significant growth in the Japanese market include office and personal computers. Office computers accounted for 430 billion yen in domestic sales in 1983 and this is expected to rise to 1,602 billion yen by 1994.

Personal computers are also growing in popularity with the business and home market. Japan's personal computer shipments totalled approximately 1 million units and were worth 283.9 billion yen in 1983. This is estimated to grow to 1.49 million units worth 376.5 billion yen in 1984 and 2 million units worth 470.9 billion yen in 1985. The highest growth possibilities exist for the 16 bit products rather than the older 8 bit machines which by 1990 are expected to grow to 5.4 million units worth 986 million yen. Of this amount 1.8 million units are forecast for the export market.⁷

EXHIBIT 9

Office Automation and Related Products Production and Exports

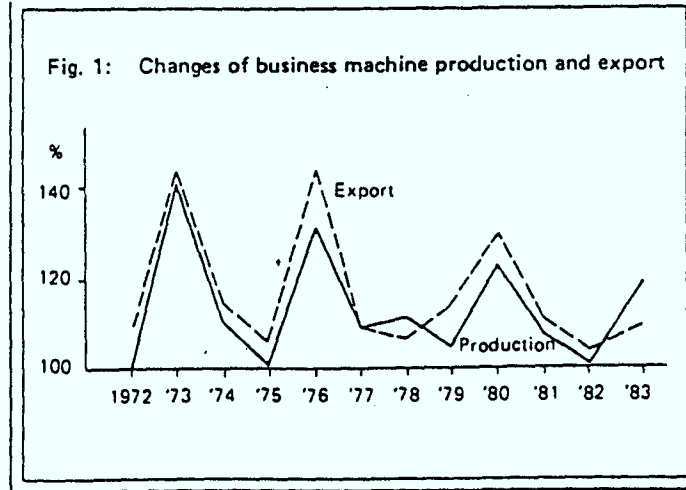


EXHIBIT 10

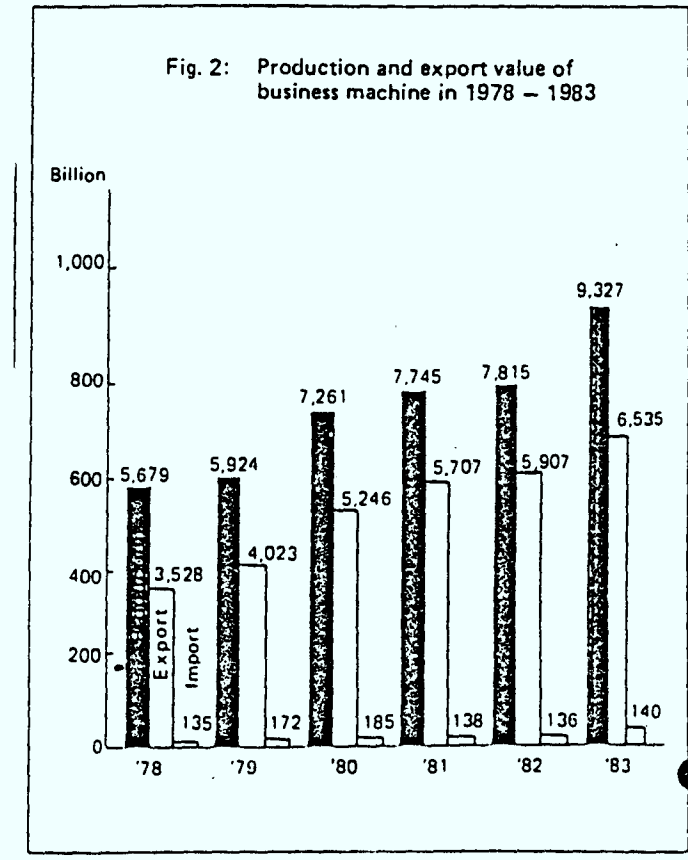
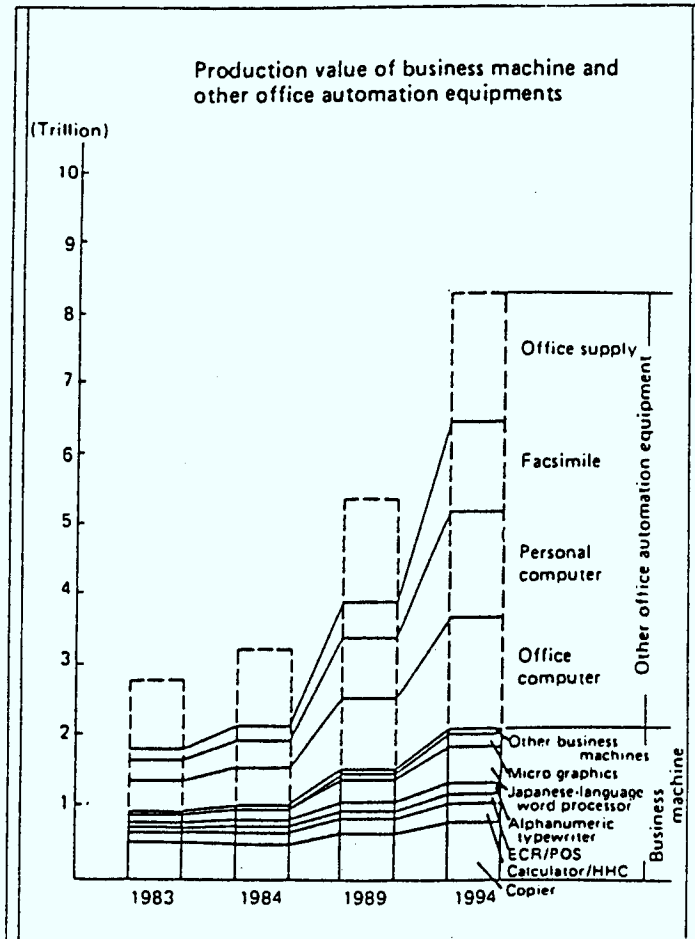


EXHIBIT 11



15.6.2 Other Product Areas

Facsimile machines are a major feature of Japans success in the office automation market with demand for this product expanding steadily in the past few years. In 1982 facsimile production grew by 57.8 percent in quantity and 19.9 percent in value. Estimates provided by the Communication Industries Association of Japan forecast facsimile production at 323 billion yen in 1987. The office facsimile market is expected to account for 96.3 percent of the total production value in 1987⁸.

15.6.3 Work Station Developments

A recent survey conducted by the Mitsubishi Research Institute found in a survey on office automation that the integrated work station is expected to be one of the most important machines in the office in Japan over the next decade. Sophisticated work stations are expected to experience annual growth rates in Japan of 49% between 1983 and 1989.⁹

15.6.4 Summary Office Automation Market Development

Japans policies for high technology are directed mainly to long term development of basic R and D for selected products and components. The current success of the office produces industry in Japan indicates that specific assistance to industry is generally not required. In the office automation area Japans private sector has achieved remarkable success in dominating its own domestic market and in gaining a large share of foreign market in particular product sectors. The two areas where Japan has not been a world leader are in software and integrated workstation developments. However this is likely to change as a result of a concerted government effort to encourage and support software industries in Japan. The integrated workstation is expected to be quite successful in the domestic and Asian market over the next few years.

15.7 Japan Institute of Office Automation

The Japan Institute of Office Automation was established on July 16, 1981 as a non-profit professional organization. Its aim is to carry out applied studies and research on office automation, which will provide inputs for social, economic and industrial development in Japan. Members of the institute are drawn from industry and the academic community.

The institute undertakes studies in the following areas:

1. educating users and manufacturers of office automation equipment
2. encouraging communication between users and suppliers
3. disseminating study and research results
4. assisting in the development of effective office automation technologies.

Specific studies undertaken over the past few years have included:

1. Promoting office automation
2. Methodologies for rationalizing office work
3. Applicability of information processing equipment
4. Research for impact measuring methods
5. Research on Domestic and Foreign Markets for Office Automation.

The institute also provides a number of services for its members which cover:

1. Information and data services
2. Monthly news bulletins
3. Consultation on office automation problems and developments
4. Educational Seminars
5. Research Reports.

16.0 KOREA

Korea has no specific programs for the development of office automation equipment or related software. However, a number of efforts have been made to increase the infrastructure within which such industries may develop. The main instrument used for the establishment of a high technology base in Korea are Technology Laws.

In the early stages of its industrial development Korea relied heavily on the need for foreign capital and technology. It was through the Foreign Capital Inducement Act that commercial and public loans as well as the importation of technology were actively encouraged. This law was the main policy instrument governing foreign investment and foreign technology imports. It regulated foreign loans, investments and imports of technology through direct regulation of "technology transfer contracts".

Importation of technology is ruled by the Foreign Capital Inducement Law. Technology imports are defined as "technologies which involve patents and licences on which royalties are paid". It excludes all technology embedded in production facilities and in any intermediate goods.

Technology transfer may take various forms and could vary from license agreements, contracts for turnkey manufacturing plants, direct/foreign investment, joint ventures or wholly owned subsidiaries. In 1973 preference was given through an amendment to the Foreign Capital Inducement Law to joint ventures. By 1975 82% of foreign investment in new technology ventures was in the form of joint ventures.

The Korean Technology Promotion Law was directed toward the legal promotion of scientific research via the free use of any government research equipment and facilities support of technical information dissemination and tax incentives for R & D. This instrument was directed mainly at imports of foreign technology

whose R & D expenditures involve its replacement, assimilation or modification. Research could occur in-house or on contract to a qualified Korean research institute. The research expenditure was 100% of the net value of the technology imported, and if products only were imported, the allocation of research was set at 1% of the products imported value. The Technology Promotion Law provided a valuable source of revenue in building up Korea's scientific and technological infrastructure.

The law for the Acceleration of Technology Development allowed R & D investments by industry to be accounted for as expenses and where a specific industry established a research center, between 8% and 10% of that investment was exempted from all corporate and income taxes. This law focused on accelerating the commercialization of new technology which was developed domestically in Korea by allowing 8% to 10% of any investment in machinery and facilities as being exempted from corporate and income tax. This law also allowed a special deduction of 50% from corporate taxes on any equipment and materials used for R & D.

Recently Korea has become more aware of the need to make its industrial structure more technology intensive. One major component of this has been the move to increase R & D spending which were 457,688 million Y in 1982 (.95% of 1982 GNP). The government has also been encouraging the private sector to collaborate through R & D co-operatives in emerging field of importance such of biogenetics and computers.

Tax and related fiscal incentives have also been used by Korea to assist industries in acquiring and using high technology products. There is also a recognition that in addition to the continued importation of transferred technologies there is a need to develop a domestic capability to improve international competitiveness.

Tax incentives for R & D include: direct tax credits for R & D expenditures; accelerated depreciation for funds involved in commercializing R & D results; the technology development reserve (according to which any firm sets aside up to 20% of before tax profits or 1% of revenues in any year of expenditures involved in R & D programs) and reduction of excise tax on "technology intensive" products.

Tax incentives for the commercialization of R & D results involve either a 6% tax credit or a 50% depreciation in the first year of investment costs involved in the commercialization of technology. Also income from selected high technology consulting firms (including consulting in office automation) is tax exempt.

Technology transfer policies have recently been liberalized through the Foreign Capital Inducement Act which permits firms to import any technology they wished without government approval. This act covers all forms of technology and provides broad access in Korea for office automation and informatics products.

17.0 SINGAPORE

Singapore like Korea does not have a concentrated program of assistance to the office automation industry. However there is a significant amount of attention being directed toward the development of high value-added technology and knowledge based industries - such as software, computer service industries, automated banking and finance, engineering and medical/scientific consulting services.

Singapore's industrial strategy is comprised of three sets of interlinked measures:

- a. R & D support measures directed at new industries
- b. Export support measures
- c. Manpower training/upgrading

All computer hardware and software policies are controlled through the National Computer Board. The board has four functions:

1. To implement computerization in the Civil Service
2. To co-ordinate computer education and training
3. To develop and promote the computer services industry
4. To assess the supply of computer hardware to the government.

The Committee On National Computerization was put into place by the Singapore government to create a strategic plan with the aim of "establishing Singapore as a center of computer services and software".

In addition to the purposes outlined previously the NCB has formulated a series of innovative programs and industrial incentives to induce firms to set up software development companies in Singapore; particularly those which deal with software developed for state-of-the-art technology including office automation.

One of the main thrust of Singapore's new industrial strategy is the operation of special training centers for technology, which are collaborative efforts between the private sector and other governments. These are: The Japan Singapore Institute of Software Technology, the German Singapore Institute of Production Technology and the French Singapore Institute of Electro-Technology.

The training institutes cover several specialized areas such as computer based tool and die design, computer control of production processes, robotics, micro-processor and computer applications and software technology. Such collaborative efforts are of importance in the short term because they provide industrial incentives directed toward the development of R & D design and engineering capabilities.

The Japan-Singapore Institute (JSIST) began operations in February 1981 and provides training in computer software. Its purpose is to increase the supply of computer personnel requisite for the national computerization program as well as for the development of the computer software industry in Singapore. In 1983 approximately 300 persons were put through the institutes program. As part of this center the Japanese government agreed to provide technical assistance to Singapore in the form of NEC computers and a team of six software experts for five years.

In February of 1984 the Sperry Corporation announced they would open a software development centre within the year. The centre will be designed for the development of the Unidas software, a document retrieval system distributed worldwide in various installations.

17.1 Industrial and Export Support

Tax and export incentives are also being implemented by Singapore to re-structure its industries toward more technology intensive activities. Tax incentives are given to firms involved in technology upgrading, automation and software training. There are, for example, no import taxes on software packages.

Progressive tax incentives are given to firms involved in technology upgrading, automation and software training projects. There are, for example, no import taxes on software packages.

The following are the major incentives offered by the Economic Development Board to industry (EDB Annual Report, 1984):

1. Export Incentives:

These incentives give a 90% tax exemption on all profits above a specified base which are a result of export sales. The incentives are granted for three or five years, with the longer period being granted to companies which have not received a Pioneer Status Incentive.

2. Pioneer Status Incentive:

The Pioneer Status Incentive allows for total tax exemptions of 40% of a corporation's income tax for five to ten years, with this exemption being granted, amongst others, to firms which engaged in sophisticated software development and export. This was the most extensively used incentive by software firms between 1982 and 1984.

3. Investment Allowance:

This is an incentive for both manufacturers and technical service companies. It is considered as an alternative to the above two incentives.

In Singapore the investment allowance has mainly been used to promote automation. Under this incentive a firm is given tax exemptions on, "a specified amount of profits equal to the approved investment allowance which is a percentage (up to a maximum of 50%) of the fixed investment in plant, machinery and factory buildings actually incurred by the company on the project".

Such allowances are granted as a bonus over the normal capital allowances given to a firm. Thus, any firm can at the same time claim a three year accelerated depreciation on plant and machinery and not have any benefits of the investment allowance reduced.

4. The International Consultancy Services Incentive:

This incentive was instigated to increase the number of design and engineering firms located in Singapore which export. It gives a five year 20% tax write-off on export profits which are above a specified level. Export services which are eligible for the incentive include software, design and engineering, machinery production, data processing and all technical advisory services. However, only companies which have a gross export income of at least \$1 million are eligible. To date however, no software firms have been granted this incentive because (a) no firms have had a million dollars in software exports from Singapore, and (b) there has been difficulty with consulting firms in determining what percentage of exports is due to consulting and what percentage is due to software production.

5. Tax Incentives for Research and Development:

In addition to the above incentives, Singapore has introduced the following explicit R & D incentives:

- a. a double deduction of 200% of any R & D expenditures, except those on buildings and equipment
- b. accelerated depreciation over three years for machinery and plants used in R & D

- c. investment allowances up to a total of 50% of R & D capital investment, with the exception of building costs
- d. capitalization of lump sum payments for manufacturing licences for five years.

In addition, the Singapore Science Park, which is situated next to the National University of Singapore, has recently been developed to accommodate R & D organizations and activities in connection with the manufacture of high technology products. As part of this science park, the National Computer Board will operate a Software Technology Centre. Although their R & D incentives have been in place only a short time, thus far little original R & D is being done in Singapore.

17.2 The Capital Assistance Scheme

In addition, Singapore has a variety of financial assistance schemes available through industry, the first being the Capital Assistance Scheme. The CAS is a tool to promote projects of strategic value to industrial development in Singapore including high tech. Under the CAS, projects can obtain fixed interest loans at very low interest rates for long terms. The scheme basically acts as a catalyst to establish desirable industries through providing equity capital. By March 31, 1983, a total of S\$157.6 million had been committed to establish or expand 20 projects including software, aircraft components, and mainframe computer systems.

An equivalent computerization project is also occurring in the commerce, banking and financial sectors and there are plans for a major implementation of minicomputers throughout the republic over the next few years.

17.3 Summary

While there are no specific programs designed to stimulate the office automation industry, Singapore has embarked on a broader strategy of support for hardware and software manufacturing. In this way they are attempting to insure their position as a supplier of equipment and services to a variety of manufacturers producing a wide diversity of computer products.

Internally the government is dedicated to a broad based program of computerization ranging from database management and processing to office automation. Suppliers of equipment for this program will be both domestic and foreign, with the Japanese most likely to play a major role as a result of their connection through the Japan/Singapore Institute.

Singapore is heavily implicated in the computer and software industries and thus has established a wide variety of incentives and policy instruments to encourage development in these areas. Singapore has also opened a number of co-operative institutes with countries such as Japan to help develop the EDP user community and to train senior level systems analysts and programmers. A major computerization program has also been established to computerize ten government ministries over the next ten years.

18.0 REFERENCES - JAPAN

1. Estimates provide by U.S. Embassy, Tokyo, contained in report "Industrial Policy: Japan's Flexible Approach", U.S. GAO, June 1982.
2. "Loans for the Development of Technology in Industrial Policy", Japans Flexible Approach, pg. 61.
3. Kim, H. "Technological Development Strategies and Experiences in Japan", World Bank working paper, October, 1984.
4. Kim, H. Op. Cit. p. 17.
5. Business Week, February 27, 1984, p.95.
6. Viewpoint, the Office of the Next Decade, OEP, October, 1984, p.72.
7. Op. cit., p. 74.

APPENDIX 1
BIBLIOGRAPHY AND SOURCES

CANADA GENERAL

"Achievements of the Canadian Office Communications Systems Program",
Office Automation Conference 1985 Digest.

Canadian Workplace Automation Research Centre (Information Brochure,
Department of Communications, Government of Canada).

"Ontario's Public Sector Market", Ministry of Industry and Trade.

"Proposals for an Industrial and Science Strategy for Albertans 1985 to 1990",
White Paper, Government of Alberta, July 1984.

Science Council Canadian Industrial Developments Report 37, September 1984.

QUEBEC

La Bureautique: État de la situation et projection des besoins Jusqu'en 1987", Gouvernement du Québec, Bureau central de l'informatique, janvier 1985.

"Conférence sur l'électronique et l'informatique", L'industrie de l'électronique et du logiciel au Québec: créer ensemble un climat favorable à son développement. Les conférences socio-économiques du Québec, Rapport No. 1, février 1985.

"Conférence sur l'électronique et l'informatique", L'informatisation des entreprises et des administrations publiques. Les conférences socio-économiques du Québec, Rapport No. 2, février 1985.

"Conférence sur l'électronique et l'informatique", L'informatisation l'emploi et le travail. Les conférences socio-économiques du Québec, Rapport No. 3, février 1985.

"Conférence sur l'électronique et l'informatique", L'intégration de l'informatique à la culture. Les conférences socio-économiques du Québec, Rapport No. 4, février 1985.

Le Devoir, 22 mars 1985.

Gouvernement du Québec, Réunion du Conseil des ministères, Decision No. 83-256, 28 septembre 1983.

"Modalités de gestion du fonds de 2.5 M\$ concernant les projets pilotes de bureautique au gouvernement du Québec, Version révisée: juin 1984.

"New Ways of Growing in Quebec with S.D.I., société de développement industriel du Québec.

"Plan Scientifique, Centre de Recherche sur l'Informatisation du Travail (Montréal)", janvier 1984.

"Politique de la bureautique gouvernementale", Réunion du Conseil des ministères, Gouvernement du Québec, 28 septembre 1983.

"Session de Sensibilisation à la Bureautique", février 1985.

"Structure et contenu des études de démarrage", Bureau Central de l'informatique, décembre 1984.

"Le Virage Technologique", Batir le Québec - Phase 2. Programme d'action économique 1982-1986, Gouvernement du Québec Développement économique.

UNITED STATES

"ADP Schedule, FSC Group 70, Part 1, Section A", General Purpose Automatic Data Processing Equipment and Software, General Services Administration, Oct. 1, 1984 through Sept. 30, 1985.

"ADP Schedule, FSC Group 70, Part 1, Section A", List of Contracts Awards for the Period Feb. 1985, February 1985.

"ADP Schedule, FSC Group 70, Part 1, Section B", List of Contracts Awarded for the Period 4-1-85 through 3-31-86, April, 1985.

"ADP Schedule, FSC Group 70, Part 1, Section C", List of Contracts Awarded for the Period of April 1, 1985 through March 31, 1986, April, 1985.

Computer Science and Technology, "Structured Testing: A Software Testing Methodology Using the Cyclomatic Complexity Metric", U.S. Department of Commerce, NBS Special Publication 500-99, December 1982.

Computer Science and Technology, "Guidance on Software Maintenance", U.S. Department of Commerce, NBS Special Publication 500-106, December 1983.

"Current Thresholds for ADP Equipment and ADP Service Procurements", KMAS, October, 1984.

"End User's Guide to Buying Small Computers", U.S. General Services Administration, Office of Information Resources Management, August 1984.

"Establishing an Agency Microcomputer User Support Center", U.S. General Services Administration, Office of Information Resources Management.

"FIRMR Bulletin 15", (Federal Information Resources Management Regulation) General Services Administration, Washington, December 1984.

Federal Information Processing Standards Publication, "Guideline: A Framework for the Evaluation and Comparison of Software Development Tools", U.S. Department of Commerce, FIPS PUB 99, March 1983.

Federal Information Processing Standards Publication, "Guideline For Lifecycle Validation, Verification, and Testing of Computer Software", U.S. Department of Commerce, FIPS PUB 101, June 1983.

Federal Information Processing Standards Publication, "Guideline on Software Maintenance", U.S. Department of Commerce, FIPS PUB 106, June 1984.

"Federal Software Information Exchange", GSA Office of Software Development and Information Technology, Volume 3, Number 1, January 1985.

"Final Report on the GSA End User Computer Pilot Project", General Services Administration, September, 1983.

"The Grace Reports", Government Computer News, March 1984.

"In Depth - The Changing Picture of Federal Office Systems", Computerworld, November 1984.

"Information Science Program", Division of Information Science and Technology Fiscal Year 1984 Awards.

"Learning Technologies Project Pilot Research Studies on Learning Technologies", Institute for International Research Inc., February 1985.

"The Legislative Report", Washington Report, Vol. X, No. 12, American Federation of Information Processing Societies, Inc., December 1984.

"Management of the United States Government, Fiscal Year 1986", Executive Office of the President Office of Management and Budget, Washington, D.C.

"Managing End User Computing in the Federal Government", U.S. General Services Administration, Office of Information Resources Management, June 1983.

"Paper Work Reduction Act of 1980", Public Law 96-511, December 11, 1980.

"Research in Information Science and Technology", National Science Foundation.

"Software Engineering Publications, NBS Publications List 96", U.S. Department of Commerce, 1984.

ENGLAND

Gower, J. and R. Pye, "Evaluating the Office Automation Pilot Projects"
Policy Vol. 27 No. 2 March 1985, Butterworth & Co. (Publishers) Ltd.

"The Impact of Advanced Information Systems", National Economic Development
Office, September 1983

IT Series No. "Early Experience of Multi-User Office Systems", Information
Technology in the Civil Service, HM Treasury (Central Computer and Tele-
communications Agency), March 1984

IT Series No. 6, "Method for Evaluating the Impact of Office Technology
Systems," Information Technology in the Civil Service, March 1984

IT Series No. 8, "Review of the Central Computer and Telecommunications
Agency," July 1984

IT Series No. 9, "Inter-departmental Electronic Mail", Information Technology in
the Civil Service, HM Treasury (Central Computer and Telecommunications
Agency), February 1985

"Making a Business of Information", A Report by the Information Technology
Advisory Panel, London Her Majesty's Stationery Office, September 1983

Freyenfeld, W.A., "Obtaining Finance for High-Technology Ventures", NCC
Publications, The National Computing Centre Limited, 1983

"Office Automation Pilot Projects", User BBC Breakfast Television, Supplier -
Hewlett-Packard Ltd., Department of Trade and Industry

"Office Automation Pilot Projects", User BBC Television Personnel Department,
Supplier - Racal Information Systems, Department of Trade and Industry

"Office Automation Pilot Projects", User Brighton Health Authority, Supplier -
ABS Computers, Department of Trade and Industry

"Office Automation Pilot Projects", User British Telecom Long Range Strategic
Studies Division Supplier - Digital Equipment Co. Ltd. (DEC), Department Trade
and Industry

"Office Automation Pilot Projects", LAMSAC - Sector Study, Department of
Trade and Industry

"Office Automation Pilot Projects", Science and Engineering Research Council
Supplier - Information Technology Limited (ITL), Department of Trade and
Industry

"Office Automation Pilot Projects", Bulletin Number 1/May 1984, Department of Trade and Industry

"Office Automation Pilot Projects", Bulletin Number 2/July 1984, Department of Trade and Industry

"Office Automation Pilot Projects", Bulletin Number 3/September 1984, Department of Trade and Industry

"Office Automation Pilot Projects", Bulletin Number 4/November 1984, Department of Trade and Industry

"Office Automation Pilot Projects", Bulletin Number 5/January 1985, Department of Trade and Industry

"Office Automation Pilot Projects", Bulletin Number 6/March 1985, Department of Trade and Industry

"Office Automation Pilots", Conference: Day 1, March 21, 1984, EIU Informatics, London

"Office Automation Pilots", Conference: Day 2, March 22, 1984, EIU Informatics, London

"Office Automation Pilots", Conference: Day 3, October 10, 1984, EIU Informatics, London

"Office Automation Pilots", Conference: Day 4, October 11, 1984, EIU Informatics, London

Court, J.M., "Personal Data Protection, The 1984 Act and its Implications", NCC Publications, The National Computing Centre Limited, 1984

"Technological Change: Threats and Opportunities for the United Kingdom", Cabinet Office Advisory Council for Applied Research and Development, December 1979

THE FEDERAL REPUBLIC OF GERMANY

Stransfeld R., "Bildschirmtext und Bildung", Heinrich-Hertz-Institut für Nachrichtentechnik, Berlin, 1983.

"Development strategy of the Deutsche Bundespost for the public telecommunications system in the Federal Republic of Germany", the Federal Minister of Posts- and Telecommunications, 1984.

"Information Technology of the Government of the Federal Republic of Germany", FRG ReplInfoTech, February 1984.

"Informationstechnik", Der Bundesminister für Forschung und Technologie, 1984.

Stransfeld R., "Interaktive Breitbandkommunikation im beruflichen", Heinrich-Hertz-Institut für Nachrichtentechnik, Berlin, 1981.

"Jahresbericht 1984", Heinrich-Hertz-Institut für Nachrichtentechnik, Berlin, 1984

Seetzen J. et al., "Nutzungsmöglichkeiten Und Auswirkungen Neuer Informations Und Kommunikationstechniken", Heinrich-Hertz-Institut für Nachrichtentechnik, Berlin, 1982

"Office and Communication Systems and Technology Made in Germany", Vol. 2/1-84.

Seetzen J., et al., "Perspektiven der Telekommunikation", Heinrich-Hertz-Institut für Nachrichtentechnik, Berlin, 1982.

"Report of the Federal Government on Research 1984", The Federal Ministry for Research and Technology, Bonner Universitäts-Buchdruckerei, 1985.

"Teletex", Telefonbau Und Normalzeit

"Transnational Data Report an Information Politics and Regulation", Transnational Data Reporting Service, Inc., Vol VII No. 8, December 1984.

Seetzen, J., "Wissenschaftliche Begleituntersuchung zur Bildschirmtexterprobung in Berlin", Heinrich-Hertz-Institut für Nachrichtentechnik, 1983.

Seetzen, J. et al., "Zwischenbilanz zur Einschätzung der neuen Informations -und Kommunikationstechniken", Heinrich-Hertz-Institut für Nachrichtentechnik, 1982.

FRANCE

Centre d'etudes des systemes d'information des administrations.

CESIA, Rapport D'activite 1983, Marseille 1984.

Conseil Economique et Social Informatique et Emploi, Paris, 1984.

Federal Government of France, Project SCRIBE, April 1984.

Lemoine, Philippe, Les Technologies d'information rapport au Premier ministre, Paris 1983.

"Review of the Central Computer and Telecommunications Agency", IT Series No. 8, Information Technology in the Civil Service, HM Treasury Office, July 1984.

JAPAN

"The Automated Office in Japan", Japan Institute of Office Automation, July 1983.

"The Financial Post", Japan, Fourth Section/Western Edition, Pages 43-52, May 18, 1985.

"Fujitsu and the Computer Industry in Japan", Fujitsu Limited, December 1984.

"Industrial Robots - Their Increasing Use and Impact", Reference Reading Series 7, Foreign Press Center, Japan, 1982.

"The Japan Institute of Office Automation", Japan Institute of Office Automation.

"Nec Technical Journal", Vol. 36 No. 11, (Serial 170) November 1983.

"Office Automation in Japan", Japan Institute of Office Automation, July 1984.

"OA Information System", Japan Institute of Office Automation.

Tsuneki, T., "Psychological Experiment on Videophone Communication", Psychology of Telecommunications (1), Research Institute of Telecommunications and Economics, April 1979.

Tsuneki, T., "Psychological Experiment on Videophone Communication", Psychology of Telecommunications (2), Research Institute of Telecommunications and Economics, April 1979.

Tsuneki, T., "Psychological Experiment on Videophone Communication", Psychology of Telecommunications (3), Research Institute of Telecommunications and Economics, April 1979.

Tsuneki, T., "Psychological Experiment on Videophone Communication", Psychology of Telecommunications (4), Research Institute of Telecommunications and Economics, April 1979.

Tsuneki, T., "Psychological Experiment on Videophone Communication", Psychology of Telecommunications (5), Research Institute of Telecommunications and Economics, April 1979.

"Research Institute of Telecommunications and Economics (RITE), 1979, Japan.

"Research Institute of Telecommunications and Economics (RITE), 1980, Japan.

"Research Report Summaries '77", Research Institute of Telecommunications and Economics.

"Research Report Summaries '79", Research Institute of Telecommunications and Economics.

"Rite Review", No. 3, Research Institute of Telecommunications and Economics, 1979

"Rite Review", No. 4, Research Institute of Telecommunications and Economics, 1980.

"Summary Receptivity to the Image Media", (Interim Report), Research Institute of Telecommunications and Economics, 1979.

"Viewpoint", The Office of the Next Decade Part 1, OEP, September 1984.

"Viewpoint", The Office of the Next Decade Part 2, OEP, October 1984.

"Viewpoint", The Office of the Next Decade Part 3, OEP, November 1984.

"Viewpoint", The Office of the Next Decade Part 4, (Conclusion), OEP December 1984.

"What's Happening in Electronics", A Newsletter on New Developments in the Japanese Electronics Industry, Volume 6, No. 9, Public Relations Dept. of Fujitsu Limited, September 1984.

"White Paper on the International Trade 1982", Ministry of International Trade and Industry, Foreign Press Center, Japan, October 1982.

KOREA

Hyung Sup Choi, "Bases for SBT Promotion in Developing Countries", Asian Productivity Organization, Tokyo, 1983.

Korean Statistics Annual Economic Planning Board.

Ministry of Science and Technology Annual Reports on SGT, 1975-1984.

World Bank Report 5213-KO, September 26, 1984.

APPENDIX II
LIST OF CONTACTS

SINGAPORE

Annual Report, Economic Development Board (EDB) of Singapore, 1983.

Industrial Development Department, National Computer Board, "Singapore Computer Industry Survey", Singapore, October 1983.

National Computer Board of Singapore (personal communication).

National Computer Board Publication ISSN-0217-6432, January 1983.

LIST OF CONTACTS - CANADA

1. British Columbia

Joe McKay
Small Business Consultant
Ministry of Industry and
Small Business

Nigel Bailey
Discovery Foundation
Ministry of Universities,
Science and Communications
(430-3533)

Chris Slade
VP, Advanced Systems Centre
B.C. Systems Corporation
4000 Seymour Place
Victoria, B.C.
V8X 4S8

Russ Baker
(Private consultant formerly
with B.C. System Corporation)
986-6121

2. Alberta

Jim Hoffmeyer
Industrial Development Branch
Ministry of Industrial
Development
(403) 427-2005

Paul Wilkes
Industrial Development Branch
Ministry of Industrial
Development
(403) 427-2005

Robert Gehmlick
Information Services, Supply
and Services Public Works
(403) 427-7756

Alberta Research Council
Advanced Technology Department
(403) 282-9136

Rod Sprange
Information Technology Program
Ministry of Industry, Trade
and Technology
(205) 945-5857/5860

3. Ontario

George Hobson
Office of Procurement Policy
Ministry of Industry and
Trade
(416) 965-1809

Ken Davies
Corporate Systems
(i.e. systems for internal use)
Ministry of Industry and Trade

Bill Fowler
Director of Marketing
Services Branch
Computer and Telecommuni-
cations Services Division
Ministry of Government
Services
(416) 928-3817

Hans von Beinum
Ontario Quality of
Working Life Centre
(416) 965-5958

4. Québec

Gouvernement du Québec
Ministère de la Science et
de la Technologie
Direction
875, Grande-Allée est
Édifice "H", 3e étage
Québec, QC G1R 4Y8
(418) 643-3008

Alain Sepulchre de Condé
Directeur

Gouvernement du Québec
Ministère de l'Industrie
du Commerce et du Tourisme
Direction générale de l'Industrie
710, Place d'Youville
Québec, QC G1R 4Y4
(418) 643-1924

Anne Martineau, M.B.A.

Gouvernement du Québec
Ministère des Communications
Direction de la Planification et
de la Recherche
580, Grande-Allée est, suite 440
Québec, QC G1R 2K2
(418) 643-1903

Monique Charbonneau
Directrice

Gouvernement du Québec
Ministère de l'Industrie
du Commerce et du Tourisme
Direction générale de l'Industrie
710, Place d'Youville
Québec, QC G1R 4Y4
(418) 643-1924

Georges Corriveau

Gouvernement du Québec
Ministère des Communications
Bureau central de l'informatique
Direction générale de la
coordination interministérielle
700, boulevard St-Cyrille est
14e étage
Québec, QC G1R 5A9

(418) 643-8708

Georgette Faucher
Informaticienne-conseil

Gouvernement du Québec
Ministère des Communications
Service de la bureautique
1037, De La Chevrotière,
2ème étage
Québec, QC G1R 4Y7
(418) 643-2586

Maurice Larochelle
Coordinateur

LIST OF CONTACTS - UNITED STATES

Department of Commerce

Jack Clifford
Office of Microelectronics and Instrumentation
Dept. of Commerce
(202) 377-2587

Tim Miles
Office of Computers and Business Equipment
International Trade Administration (ITA)
Department of Commerce
14th and Constitution Ave NW
Washington, D.C. 20230
(202) 377-2990

Allan Bettis
National Technical Information Service
Dept. of Commerce

Lewis Padolski
Trade Development
Trade Adjustment Assistance
International Trade Administration (ITA)
Department of Commerce
(202) 377-4101

Assistant Secretary for Trade Development (202) 377-1461
Science and Technology Division (202) 377-4466

General Services Administration

Jack Landers
Information Resources Management
General Services Administration
(202) 535-7425

Harry Fuchigama
(Procurement Section)
General Services Administration
(202) 566-1072

National Bureau of Standards

Tom Pyke
(301) 921-3436 unable to reach

Wilma Osborne
National Bureau of Standards
(Software Engineering Group)
(301) 921-3545

Steve Recicar
Institute for Computer Science and Technology (ICST)
National Bureau of Standards
Department of Commerce
(202) 921-3723

Congress of the United States

Veri Coats
Mary Ann Madison
Office of Technology Assessment
Congress of the United States
(202) 566-1072

Ben Amick (202) 226-2003

National Academy of Sciences

Heidi Hartman
(202) 334-3590

National Science Foundation

Joanna Miller
Sociology Division

Bill Hetzner
Productivity Improvement Research
(202) 357-9572

Joanne Eastman
Information Sciences Program
Division of Information Sciences and Technology

John Connell
Office of Technology Research Association (OTRA)
(818) 796-2675

Canadian Consulate in Washington, Dr. Cobourne,
Margaret Tebbitt (202) 483-5505 ext. 339

Federal Office Systems Exhibition
Larry Jennings, Linda Milbonado (703) 683-8500

IDC Margie Clark, Bob Doern, (703) 893-0833

External Affairs, U.S. Marketing Division
Doug Patterson

