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

Background Study

Etude de base

PROGRAM EVALUATION DIVISION DE L'EVALUATION DES PROGRAMMES

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

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

OCS PROGRAM EVALUATION

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

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Synthesis Report

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TABLE OF CONTENTS

SUMMARY

This review of other governments' programs and policies was conducted in order to provide the Department of Communications with a basis on which to evaluate its OCS strategy. The findings revealed a diversity of approaches are currently being used to affect developments in the high technology sector generally and office automation specifically.

In comparing the Canadian approach with those of other countries one significant feature is evident. Policies designed to have direct impacts on a given sector are usually tied to a broader set of programs which are part of a long term strategic initiative. In Britain, France, the Republic of Germany, Japan, Singapore and Korea the governments have provided strategic plans for the evolution of the high technology industry. The plans provide a framework within which various policy instruments such as legislation, procurement, field trials, R & D and fiscal tax incentives can be linked in order to maximize their impact on a given sector.

In the U.S., less emphasis is placed on a strategic policy framework but this is counter balanced by market forces which combine adequate supply capabilities with a strong and growing domestic and export market. The U.S. has also been quite influential in setting a tone of less government involvement and consequently fostering the return to a reliance on market forces to ensure the health of a given industry sector. This was particularly the case for office automation where much of the recent efforts have been directed to encouraging greater productivity in the public and private sectors through the use of advanced information technologies.

The use of field trials as an instrument of government policy to stimulate a given industrial sector has been no more successful in other countries than is the case for Canada. The most closely related programs are those being conducted in Great Britain and France. In neither case were final results available but the goals, objectives and early results are similar to those being uncovered in the OCS field trial evaluations. Only in the Federal Republic of Germany was a large scale field trial directly linked to the successful development of an innovative office product which has subsequently been marketed worldwide.

Field trials have not been shown to be very effective in the direct stimulation of the market for office automation. Their impact on the supply side through enhancing the product development cycle is more likely. However, only a few examples exist to substantiate such results and that justify the costs necessary to undertake large scale studies. Field trial activities must be combined with other measures and should be viewed as only one part of the process necessary to build a healthy base for the provision of office automation hardware and software.

One of the more useful outcomes from the review of office automation field trials was the realization of the problems associated with conducting large scale tests in operating environments. These stem from the lack of rigorous procedures or plans for undertaking field trials and the lack of measurable criteria to assess their outcomes. The CCTA in Britain has made a significant advance in this area through the publication of methodologies for conducting and evaluating trials and the setting of measurable achievement criteria.

In Canada, the need exists for specific sectoral programs to be placed within a broader, long term strategic high technology policy framework. Without such a long term strategy programs are introduced in isolation and may even conflict with policies and measures designed to enhance other sectors. Co-ordination of various government programs is required if full benefit is to made of the fiscal tax incentives and R & D initiatives already in place.

Within the government, co-ordination is required if redundancy is to be avoided, standardization encouraged and purchasing power enhanced. Several countries have already instituted measures which facilitate such co-ordination through a central agency responsible for all micro-processor based technologies. Procurement policies can also be easily followed when one rather than several agencies have authority for large scale acquisitions.

Given the need for large scale investments to ensure successful product developments, co-operation and co-ordination of research efforts are essential. The formation of research networks which are supported partially by government funds presents an ideal opportunity to maximize on existing expertise for developing a particular technology innovation. This has been successful in Japan and the Federal Republic of Germany and seems suited to the Canadian context.

RESUME

L'examen des programmes gouvernementaux étrangers et des politiques qui est présenté ici, a été réalisé pour le Ministère des Communications, afin de lui fournir un ouvrage de base pour évaluer les stratégies de bureautique mises en place à l'Administration Fédérale. Les résultats de cette recherche montrent qu' une variété d'approches est actuellement utilisée pour affecter les développements du secteur de la technologie de pointe et plus particulièrement ceux de la bureautique.

Lorsque l'on compare l'approche canadienne avec celle d'autres pays, il apparaît évident qu' à l'étranger les politiques destinées à influencer directement un secteur particulier font normallement parties d'un ensemble de programmes plus vastes qui sont eux-mêmes inclus dans une initiative stratégique à long terme. Que ce soit en Angleterre, en France, dans la République Fédérale d'Allemagne, au Japon, à Singapour ou en Corée, les gouvernements ont institués des programmes stratégiques de plannification, pour l'évaluation des industries liées aux technologies de pointe. Ces programmes dessinent un cadre général à l'intérieur duquel différents instruments politiques, tels que la législation, l'obtention de fonds, les essais en vraie grandeur, le développement et la recherche, ainsi que les incitations fiscales, peuvent être combinés en vue d'obtenir les effets les meilleurs dans un secteur donné.

Aux Etats-Unis, le rôle joué par le cadre stratégique politique est moins évident, mais ceci est contrebalancé par les forces du marché qui, à une provision de materériel adhoc allient un marché domestique et d'exportation fort et en croissance. Les Etats-Unis ont également eu une influence notable en soutenant un engagement gouvernemental minimum, relançant ainsi un retour dans la confiance placée dans les forces du marché pour assurer la santé de secteurs industriels spécifiques. Ceci est particulièrement visible dans le domaine de la bureautique, où la plupart des efforts récents tendent à encourager un accroissement de la productivité des secteurs publics et privés grâce à l'utilisation de technologies de communication avancées.

L'utilisation d'essais en vraie grandeur, envisagés comme instruments de politiques gouvernementales visant à stimuler un secteur industriel défini, n'a pas été plus réussie à l'étranger qu' au Canada. Les programmes les plus facilement comparables sont ceux qui ont été développés en Grande Bretagne et en France. Dans ces deux cas, les conclusions des rapports ne sont pas encore disponibles, mais les objectifs, ainsi que les données déjà produites, sont semblables à ceux mis à jour pour les évaluations d'essais en vraie grandeur de la bureautique canadienne. Seule la République Fédérale d'Allemagne a réalisé des essais à grande échelle qui ont conduit à la création d'un produit bureautique, lequel a ensuite été mis en vente sur le marché mondial.

Les essais en grandeur réelle ne se sont donc pas prouvés très efficaces pour stimuler directement le marché de la bureautique. Leur bénéfice semble plutôt se situer du côté de l'amélioration du cycle du produit bureautique. Cependant, cette observation ne s'appuie que sur les quelques exemples disponibles, ce qui, du même coup, tend à justifier les dépenses destinées à la mise en route

d'études de plus grande ampleur. D'autres instruments de mesure devraient être associés aux essais en vraie grandeur, ces derniers n'apparaissant que comme l'un des constituants d'une démarche nécessaire à la mise en place d'une base solide pour le développement du matériel et du logiciel bureautique.

La mise en évidence des problèmes liés à l'administration de tests de grande envergure dans un environnement opérationel, est apparue comme l'un des résultats les plus significatifs émanent de la présente étude. Ces problèmes proviennent d'un manque de plannification et de procédures rigoureuses associées aux essais en vraie grandeur, ainsi que d'un manque de critères mesurables pour en évaluer les résultats. On notera cependant l'avance importante réalisée dans ce domaine grâce à la publication par le CCTA britannique de méthodologies relatives à la conduite et à l'évaluation d'essais ainsi que la composition de critères de réalisation mesurables.

Au Canada, il existe un besoin reconnu pour que les programmes sectoriels spécifiques soient intégrés dans un contexte plus large de stratégies politiques à long terme consacrées aux technologies de pointe. Sans une telle stratégie à long terme, des programmes particuliers sont instaurés de façon isolée et peuvent même, dans certains cas, entrer en conflit avec des mesures et des politiques destinées à l'amélioration d'autres secteurs. La coordination des divers programmes gouvernementaux est donc indispensable si l'on veut obtenir le bénéfice maximum des avantages fiscaux et des initiatives de recherche et de développement qui sont déjà en place.

La coordination à l'intérieur du gouvernement est indispensable si l'on veut éviter les redondances, encourager la normalisation et améliorer le pouvoir d'achat. Plusieurs pays ont déjà instituer des mesures visant à faciliter une telle coordination, comme la création d'une agence centrale responsable de toutes les technologies fondées sur les microprocesseurs. Les politiques d'obtention de fonds peuvent également être suivies plus facilement lorsqu' une seule agence fait autorité lors d'acquisitions importantes.

Compte tenu des investissements considérables nécessaires aux développements prospères du produit, la coopération et la coordination des efforts de recherche apparaît donc fondamentale. Pour développer des innovations technologiques particulières, la mise en place de réseaux de recherche partiellement financés par le gouvernement semble offrir l'outil idéal afin d'obtenir les meilleurs résultats de l'expertise actuellement existante. Cette stratégie a déjà été couronnée de succès au Japon et en République Fédérale d'Allemagne et apparaît appropriée dans le contexte canadien.

1.0 INTRODUCTION

This summary report was prepared in response to a Department of Communications request to conduct a review of other governments' office automation programs and policies. This 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?

This summary provides a synthesis of the detailed findings presented to the Department of Communications as part of the original report produced for this study. The focus here is on the most relevant and direct policies affecting office automation rather than broader high technology and industrial stimulation measures. In some cases more general policies are mentioned but only if there is a direct linkage to office automation. The results are presented by country although the nature of policy measures and programs is relatively consistent across all jurisdictions.

In 1983, the world market for office products was about $100 billion and for Canada about $5 million. In the same year the net trade deficit for these products was approximately $3 billion. The OCS program, developed by the federal government, had as one of its principal objectives, the need to reduce this deficit through the stimulation of the Canadian industrial efforts.

A recent Science Council Report* noted that in Canada, the public sector is capable of providing the infrastructure industry needs to create its products and services. Today it is recognized that the infrastructure must be updated to accommodate new technologies and the ability to use them. This report supports the perspective that broad financial support from governments is needed to improve productivity and the international competitiveness of Canadian industry, primarily because of insufficient private capital and the need to minimize risk. The information technology sector, comprising micro-electronics, computers and telecommunications, is considered critical to Canada's long term position in the world economy.

On a more fundamental level, the government is anxious to learn about and gain experience from the active use of these integrated systems. They are also concerned about the ways such systems and technologies should be implemented, operated and evaluated.

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

In many countries, government programs for developing high technology do not always designate a single component or technology. Rather, policies are set out in terms of macro scale 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.

The desire to stimulate office automation and to conduct research in that sector has in several countries been closely tied to a long term strategy for making computerization a central part of the national economy and the desire to develop a strong export market. 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.

1.1 Provinces and Countries Selected for Review

The investigation of government initiatives for the development of office automation was made for the following provinces of Canada and foreign countries.

1. Canada
   - British Columbia
   - Alberta
   - Manitoba
   - Ontario
   - Quebec
2. U.S.
3. Britain
4. France
5. Germany
6. Japan
7. Singapore
8. 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 by government jurisdictions is complemented in a detailed report and appendix which provides individual contact names and department affiliations and which outlines the nature of involvement in a designated industry sector.

The first step in this study was to conduct a systematic appraisal of the relevant literature dealing with office automation programs, both domestic and international. The second activity involved the selection of relevant contact names followed by interviews with the 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 RATIONALE FOR GOVERNMENT POLICY TO STIMULATE INDUSTRIAL ACTIVITY

The Canadian Governments rational for undertaking the stimulation of the office automation industry through the OCS program was to aid in correcting the balance of trade deficit for this sector. Programs and policies have been put in place which are designed to impact the supply and to some degree the demand for office automation equipment. In this sense the governments efforts are designed to correct an imperfection in the overall market forces for this sector. Several reasons can be put forth to explain why the market fails to perform and why government efforts are necessary.

2.1 Inappropriabilities

Inappropriabilities are associated with activities where it is difficult or impossible to charge users of specific services directly according to use. The presumption that it is difficult for firms to appropriate all the benefits of their research and development (R & D) underlies government support for such activities. This would be the case for manufacturers of new office automation equipment where firms cannot appropriate all the benefits of their design and development activities. Some of the benefits may be appropriated in part by office equipment users or by other equipment manufacturers. Given the high cost of R & D for new micro-processor based systems and the competitive nature of this market sector, this aspect represents a significant consideration for government policy.

2.2 Inadequate Information and Other Market Failures

Imperfections in the market can result if individuals are not sufficiently well informed to be able to make rational decisions in light of their preferences. In a world of increasing specialization and complex technologies, it may not be possible to extract from observed characteristics the information required to undertake relatively well-informed transactions for a wide variety of goods and services. The information available to the market can be inadequate for several reasons. First, the information is usually costly to produce, but can be disseminated at a relatively low additional cost. Social efficiency would require that the charge for information not exceed the marginal costs of its distribution. If this were done, however, the supplier of the information might not be able to recover his or her total costs of generating it. The result might be that a less than optimal amount of information is produced and disseminated. A closely related notion is that it may be difficult for the producer of information to retain proprietary ownership if the information is widely disseminated through private exchange. In this case, production of such information might be seriously retarded. These properties of information distribution increase the likelihood of problems in the market and are an ostensible rationale for government actions such as R & D grants and patent protection.

Information inadequacies are directly relevant to the economics of the office automation industry. In particular, failures may occur in financial markets if risk-averse potential investors require substantial amounts of information about the specific office automation development plans of producers, while the production of this information is either extremely costly to generate, or would threaten proprietary ownership of the equipment. In effect, such information inadequacies would place a premium on firms being able to finance office automation development through internally generated funds.

2.3 Capital Market Imperfections

Capital market imperfections may be related to restrictions on eligible investments by financial institutions. Specifically, performance clauses pertain ing to the stability of earnings and dividends may limit the access of smaller firms to external equity capital. The preference of Canada's major financial institutions for investing in relatively large, dividend-paying companies leaves smaller high-technology companies to obtain equity financing largely in the venture capital market. For reasons related to economics of scale in risk diversification, it may be unrealistic to expect Canadian venture capital firms to fill the equity financing gap created by the investment preferences of established financial institutions. (One point that might be noted in this regard is the relatively high cost of new share issues). The Economic Council of Canada estimates that the underwriting process requires owners of small and medium-sized firms to sacrifice about 50 percent of the value of their shares to gain access to the public equity market. An implication of these observations regarding inefficiencies in Canada's financial markets is the potential need for policies that promote internal investment funds in emerging high technology companies.

2.4 Economies of Scale

Another efficiency-based rationale for government intervention arises from the existence of economies of scale, or decreasing unit costs as output rates increase substantially. The existence of significant economies of scale introduces a potential conflict between efficient production and a larger number of competitive suppliers. This is an especially relevant concern where the sustainability of the efficient production structure is threatened; that is, where existing prices do not discourage inefficient entry.

Another aspect of economies of scale that suggests the potential for government intervention is economies of risk spreading. It is well known that the variance of returns is reduced by pooling projects whose returns are imperfectly correlated. A potential argument for government intervention exists in this context if there are reasons to believe that the private capital markets cannot pool risk efficiently.

Several possible sources of inefficiency in Canadian venture capital markets exist such as biases in the tax code, regulatory restrictions on eligible investments by financial institutions, and barriers to competition in the financial

sector. These sources of inefficiency constitute a potential rationale for public policy. Additional motivation for direct government intervention exists if government agencies have lower transaction costs than private sector investors in pooling risky investments. This would also be the case if potential problems of moral hazard were less severe in public investment agencies. Transaction costs refer to the costs of identifying and making investments in any given set of projects. Moral hazard refers to the possibility that self-insurance (through portfolio diversification) will lead an investor to be less careful (on the margin) about the quality of his investments or to formulate less precise estimates of the cash flow characteristics of given projects. Where higher transaction costs and greater moral hazard characterize private sector venture capital investing, there is an argument, other things being constant, for venture capital investing by government agencies.

2.5 Merit Goods

One additional argument that is often made for government intervention is that an activity or product is intrinsically beneficial for society, although — for one reason or another — the benefits may not be recognized or widely appreciated. This argument has been made in the context of policies to promote Canadian culture and to reduce the import of technology from outside Canada. It has also been invoked regarding the quality of jobs in high technology sectors as compared to jobs in other sectors of the economy. The products referred to in such arguments are called "merit goods". The high technology sector and particularly the office automation segment has been the target of such merit good arguments.

The assessment of specific public policies should examine very carefully what is going wrong in the market place. However, it should be remembered that, beyond intrinsic market imperfections, the extensive involvement of other governments has already distorted "pure" markets for office products. Policies and programs which do not address the underlying sources of inefficiency are unlikely to move the sector(s) involved toward greater efficiency. For example, if inappropriabilities are the major source of market failure in a given set of activities, the problem is probably best dealt with by subsidies which can be varied with the circumstances of each project, rather than by across-the-board tax incentives, which are certain to over compensate or under compensate for the inappropriate benefits of any particular project and may err substantially in many cases. On the other hand, where the source of market inefficiency involves biases in the capital markets which restrict the availability of risk capital, and where the projects involved are relatively small and relatively homogenous, the administrative costs of discretionary grants may make tax expenditures a preferable way to stimulate output.

3.0 POLICY FRAMEWORK AND RECOMMENDATIONS

Before evaluating the specific policy instruments, the following section provides a useful framework within which to categorize alternative public policies. Public policies designed to promote increased economic activity in a given sector can be characterized along two dimensions:

- whether the policies operate primarily on the supply side or the demand side of a market
- whether the policies are directed at specific firms and/or specific types of equipment or whether the policies are generally available to all firms in a given industry.

Supply-side policies are those policies that are directed at increasing the availability of critical inputs to design, development, and marketing activities. An increase in the supply of inputs would lower costs, increase production and inventories and encourage an increase in the quantity of equipment demanded through the stimulus either of better quality, lower prices, or both. On the other hand, demand-side oriented policies would be directed at increasing the demand for office automation equipment perhaps by increasing government procurement of locally developed products or by allowing more favourable depreciation treatment for capital equipment that embodies locally developed components.

If demand in the market is growing rapidly as a result of market forces, additional demand stimulus as a result of public policy is unlikely to have significant marginal impact. On the other hand, if industry supply is increasing at a fairly rapid rate as a result of market forces, public policies that act on the supply side of the industry are likely to be difficult to justify on grounds of cost-effectiveness. Similarly, evaluation of the merits of targeted, versus general policies should be sensitive to the nature of the activities involved. For example, where it is difficult for policymakers to distinguish between claimants for government assistance, it may be more effective for government to adopt broad-based tax incentive programs rather than specific grants. On the other hand, when projects are relatively large and heterogeneous, selective grants may be both a viable and efficient policy.

This review has substantiated the existance of policies designed to affect both sides of the demand curve for office automation and which address issues such as inadequate information and the promotion of merit goods. Specifically, the types of policies which have emerged to stimulate office automation include:

a. government procurement
b. tax and fiscal incentives
c. venture capital assistance
d. R & D assistance and research centers
e. field trials and evaluations

f. sectoral studies and market appraisals
g. indirect assistance through establishing research networks and consortia
h. legislation to encourage co-operative ventures
i. information and public awareness campaigns

The underlying purpose for conducting the investigation of other government programs was to assess their effects relative to those achieved in the OCS program. Another concern was to determine the appropriateness of a given policy and program and to provide some recommendations about their use and probable effects.

The types of policy instruments and programs identified in this study have been concerned with the supply side of the market. They range from non-specific sector oriented programs to firm level assistance for R & D. This appraisal suggested that often attempts are made in other government jurisdications to create an environment which is conducive to a broad range of developments taking place within the high technology sector. Information technology is one component of this sector which is now receiving increased attention in all of the countries examined.

The most fundamental requirement for Canada is the need to develop a coherent and well defined strategy for high technology. Once that is set in place specific sectoral programs can be undertaken which promote those industries deemed essential for future growth and which assist in strengthening the crucial export sector. Given the significant trade imbalance for office automation equipment this is by necessity a critical sector for the government's attention.

Governments can be most effective by first developing broader programs which improve the overall infrastructure for an industry sector. The first requirement however is the setting of long term and strategic initiatives which are focused on basic R & D for this sector. This strategy however requires the selection of those components which provide a unique edge for Canadian produced products and for which Canadian companies can realize a competitive advantage in their production. Consideration must be given to those components for which their is an established and recognized capability for their production. In this respect the need exists to minimize redundancy and to make the most efficient use of the governments resources among the many agencies and institutions competing for funding and other forms of support.

A need exists in Canada for the legal and regulatory environment to be structured in such a way that research networks and industry consortia can be allowed to develop with government assistance. Governments can identify priority areas and provide assistance through research studies, funding of specific programs, and coordination of activities. This type of assistance can facilitate formal and informal networks which are directed to specific programs or which simply facilitate the exchange of information among those organizations, institutions and agencies undertaking activities in this sector.

A critical concern for all companies involved in the development of office automation products is the access to capital. Venture capital assistance presents the most direct approach to aiding in this process. Financing for new technology ventures can take the form of equity capital loans, or project financing. Equity usually involves permanent ownership of some portion of a company; loans usually are time limited and do not involve ownership. Project finance is concerned with the funding of a specific activity. Government involvement usually is directed to the latter two rather than the former. Furthermore the history of federal government involvement in innovation and venture capital markets in Canada is one which is not marked by great success. Therefore efforts would be most effective if placed on the provision of low cost loans or loan guarantees to industry which have definable payback periods and which minimize the extent of dependency generally inherent in the provision of direct grants or subsidies.

Government procurement policies are not likely to have a significant effect on the overall, demand for office automation services. They do however help ensure equity in the ability of Canadian supplier to compete with foreign suppliers. There are problems however in defining Canadian content particularly since most microprocessor based products have a significant foreign manufacturing component. Procurement policies also may conflict with other government initiatives which emphasize efficiency and effectiveness since domestically produced products may not necessarily offer the greatest cost/benefit.

Government procurement policies are desirable from a structural perspective when centralized purchasing of information technologies can be achieved. This minimizes duplication and can aid in the standardization of procedures and products throughout government. The increased purchasing power should ideally be manifest in lower prices and therefore greater efficiencies for the government.

Tax and fiscal incentives have been shown generally to be more effective in stimulating a given industry sector than direct assistance through R & D grants and project financing. Measures such as accelerated depreciation allowances for certain classes or types of office automation equipment provide financial benefits to users and therefore may increase demand. An increase in demand or a potential increase may provide the incentive for a producer to undertake the necessary product development (as opposed to basic R & D) which leads to domestic production rather than the importation of products.

The use of field trials within government departments should be related to the needs of government as well as those of industry. Government funds to support field trials by industry should be allocated only under conditions which ensure the return of funds or some percent thereof when products are successfully introduced to the market place. Direct grants with no liability for payment provide little incentive for final product development. Field trials should ideally be kept relatively small and have a well defined purpose. They are not the appropriate

setting to undertake large scale product development but should be oriented to product refinement such that specific applications can be pursued.

Field trials can also be effectively used to increase the understanding of office automation and its impacts on organizations and individuals. The collective experiences of a variety of government departments, if coordinated, can be used to develop guidelines for implementation, methods for assessment and evaluation and the development of measurable performance criteria of the efficiency and effectiveness of new information technologies. This type of information can be provided to the public and industry to aid in increasing the awareness of information technologies and to expand the base of research about such products.

Related to the previous recommendation is the need for in-depth market intelligence studies of export markets for new information technologies. Such studies would aid industry in assessing its own strengths and weaknesses in particular markets and serve as a basis for developing longer term strategies for product development and marketing. Such studies are costly to produce on an individual company basis and therefore government can play an important role in collecting and disseminating the necessary information to individual firms.

This assessment of policies and programs led to the principal recommendation that longer term and more strategic initiatives need to be employed which link the specific measures for office automation to a general information and high technology strategy for Canada. The most effective approaches to assist this industry are likely to come from selective tax and fiscal policies for broad sectoral stimulation, the establishment of research networks and consortia for basic R & D and the provision of low cost loans and loan guarantees to industry for product development.

The role government procurement is most effective for promoting standardization within government, avoiding duplication of purchases and gaining lower costs through volume acquisitions. The overall long term impact on market demand while important may be offset by the inability to realize the greatest efficiency within government when certain products are precluded from purchase.

Government sponsored and hosted field trials are not likely to affect demand and only indirectly influence supply and product development. Their greatest benefit is likely to be achieved through learning about the impacts of information technology and dissemination this knowledge to industry and the general public. Finally government can play an important role in the conduct of market intelligence studies for various sectors within domestic and foreign venues.

4.0 PROVINCIAL GOVERNMENT POLICIES AND PROGRAMS FOR STIMULATING OFFICE AUTOMATION

A diversity of approaches to the stimulation of office automation were revealed in the review of public policies and programs for British Columbia, Alberta, Manitoba, Ontario and Quebec. In the remaining provinces either no programs of relevance were known or information could not be obtained and verified. This was the case for Saskatchewan where the government is known to be examining the office automation area but representatives would not release information about policies, strategies or research being undertaken.

Indirect approaches to the stimulation of office automation were more likely to be employed at the provincial level than direct approaches. Indirect stimulation results from the incorporation of office automation hardware and software within a broad policy perspective for high technology development. Fiscal policy measures incorporate tax incentives, venture capital funds, export incentives, research and development grants. Procurement policies designed to assist Canadian suppliers are common and generally provide guidelines for local purchasing.

Using government departments and agencies as an environment to test office automation equipment and to provide a "first client" opportunity was less prevalent than the utilization of broader policy instruments. Only the provinces of Quebec and Manitoba had programs in place which parallel the efforts of the federal government. In the area of field trials and evaluation very few activities have actually been implemented and in no case were final assessments and results available.

Most provincial authorities appreciate the importance of the office automation area but few have actually taken steps to give it a dominant position within an overall industrial strategy. Some efforts however have been made to address the use of office automation within government and to the ways productivity gains may be achieved. There has however been very limited formal investigation of the issues arising from the implementation of office automation within government and no formal criteria has been developed for any of the provincial programs reviewed in this section.

4.1 Procurement

Procurement policies were usually designed to encourage local sourcing for a wide variety of products and services. In British Columbia this was typified by a broad based approach administered by the B.C. Purchasing Commission. Government requirements for office automation equipment and computer services are published in a booklet produced through the Ministry of Finance entitled "We want you on our shopping list".

In British Columbia the procurement of computer systems, including integrated office automation equipment, has for the past number of years been the

responsibility of the B.C. Systems Corporation (BCSC). In January 1985 procurement responsibilities for much of these activities passed back to the Purchasing Commission. BCSC has over the past few years established a list of qualified vendors for word processors and minicomputers. An undulying goal of this was to ensure compatibility with certain existing equipment and network activities. In this capacity standardization is achieved and redundancy is minimized. In certain situations, e.g. software, individual ministries can purchase what they wish but BCSC supports only certain material (chosen on the basis of performance, availability of local support, cost and user friendliness).

BCSC has a significant direct impact on local industry through the administration of betwen $12 M and $15 M annually for purchasing and operating systems and services which meet the computing needs of the province. The corporation assists firms in identifying needs and in the development of new products through outright purchasing and other supportive measures. (A software firm might for example be given free computer time for product development). The criteria for support is primarily the utility of the product to the public sector since in many cases the product could subsequently be taken to the market place. The corporation also contracts training and system development work to the private sector.

Manitoba has a specific program, Infotech, which uses procurement to stimulate economic development in the province. Procurement is the responsibility of individual ministries. Treasury board approval must be obtained however and this includes a review by the Ministry of Industry, Trade and Technology.

In Ontario a decentralized purchasing system is in place, where each ministry is responsible for purchasing the goods and services it needs. Purchases are subject to "thou shalt" policies which are designed to ensure compatability. In this The Ministry of Industry and Trade for example have standardized on Phillip's Micom word processors.

Specific policies related to purchasing are; The Canadian Preference Policy which gives special consideration to products with Canadian content. In this regard ten percent of a suppliers stated Canadian content is subtracted from its total bid to arrive at an "evaluation bid". Canadian content is based on the value to the economy and considers such things as; manufacturing taking place in Canada, creating employment, adding value and furthing technical expertise.

An office of procurement policy within the Ministry of Industry and Trade has been established to maximize the Canadian content of purchases made by the government. A purchasing directory, "Ontario's Public Sector Markets" provides a list of purchasing contacts within the government while another directory "Computer Systems Sources", encourages government departments to purchase Canadian hardware, software and consulting services.

Related to these activities is the "Industrial Development Review Policy" applying to purchases over $250,000. This is intended to ensure that maximum economic benefits result to Canadians from such large purchases.

Quebec has formed a consultative committee to examine office automation purchases in Government. This consists of; Bureau Centrale de l'Informatique in the Ministry of Communications, the Ministry of Industry Commerce and Tourism, the Service des Achats and the Ministry of Science and Technology. Approved products for computing include Phillips and three others all compatible with IBM. For word processing, the approved systems are Phillips and AES but a given department may standardize internally.

In 1983 a committee comprising the Ministry of Communications, Ministry of Industry, Commerce and Tourism and the Ministry of Science and Technology made the following recommendation; Quebec made products should be purchased, where possible and that needs that could not be purchased might form the basis of pilot projects carried out with manufacturers who could offer economic and technological benefits to the province.

The Ministry of Communications was given responsibility for examining office automation needs, proposing technological directions, proposing implementation strategies and co-ordinating the development of guidelines for implementation. The Ministry was also required to promote and co-ordinate the start-up and evaluation of "project pilots" within ministries, government departments and large institutions.

4.2 Field Trials and Testing in Government Departments

Manitoba, Quebec and Ontario are the most active in the use of field trials to assist industry in product development, evaluate impacts and examine alternatives for implementation within government.

In Manitoba the new Infotech program utilizes field trials and R & D grants to act as a catalyst when promising developments emerge. At the present time no specific programs have emerged which are directly related to office automation. However, the Work Place Innovation Centre helps in the adjustment process when office automation is implemented. Seminars are provided to explain the process of adoption and how to involve management, workers and unions in the implementation of office automation.

Ontario has a number of programs which utilize some aspects of the field trial process for evaluating and assessing new information technologies. The Quality of Working Life Centre (QWL) conducts much of the socio-technical evaluation in co-operation with government departments. The most recent project has been concerned with word processing in the Ontario Ministry of Consumer and Commercial Relations. The Centres main interest is in the office automation area and it is continually seeking opportunities to participate in such projects. One limitation on its activities is that it works in unionized settings while many organizations implementing office automation; banks and insurance companies for example, are non-unionized.

Quebec appears to be the province most actively engaged in office automation programs. Within the Ministry of Communications, the Bureau Central de l'Informatique (BCI) is mainly involved with office automation, field trials and 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. (Micom 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, Ministere de Communications 1985) found that overall planning for office automation was usually lacking, and that attention to organizational impacts, training and links between office automation and larger systems was low.

A three year field trial program was recently funded in Quebec for $2.5M. 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 office automation 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 office automation, 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 office automation 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.*

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

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:

- a document on scenarios for implementation
- a program of seminars to increase awareness about office automation among senior management
- a training program for those responsible for office automation
- 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 Ministere de Revenue a start-up study has been completed. The companies participating so far include Comterm, AES, Philips (Micom), Becterm, Ogivar.

- a document on "orientation technologies", i.e. guidelines for compatibility and "made-in Quebec" criteria (still not formalized).

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 illustrates the diversity of planned field trials within the Quebec government.

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.

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

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
  Evaluateurs Municipaux

- Ministère de l'Habitation et Protection du Consommateur
  Inspecteurs de Bâtiments Publics

Expérimentation Technologique

- Ministère du Revenu
  Traitement de l'Image

- Ministère de l'Education
  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

EXHIBIT 1 (Continued)

Services Decentralises en Region

- Minstère 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

Formation Assistee par Ordinateur

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

Automatisation des Activites Administratives des Bibliothèques

- les Bibliothèques Gouvernementals
  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

4.3 Fiscal Tax and Related Incentives for Office Automation Programs

A review of the selected provinces indicated there were very few fiscal incentives directly related to stimulating office automation. In most cases programs are oriented to the broad area of high technology. (A description of which is provided in the detailed report prepared for this study).

In British Columbia stimulation for high technology takes the form of the Discovery Enterprise Program (DEP) which was funded in 1984 for $7 M. This provides a pre-venture capital fund for equity financing in high tech businesses. This includes electronics, software, biotechnology, mechanical engineering, engineering and aquaculture.

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.

There are, according to Alberta government spokesmen for the Industrial Development Branch, no specific office automation 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 oriented to high technology ventures.

The province of Alberta 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 program (venture capital) which can be utilized only when a project is near the commercialization stage.

Ontario has placed most of its efforts in the area of procurement rather than supporting R & D or giving grants specifically for office automation ventures. The Ministry of Industry and Trade provides R & D and small business development grants to a variety of high tech areas while the Board of Industrial Leadership and Development (BILD) program has funded several high technology projects. These however, are now being phased out. Six "high tech" centres were also funded but none was concerned specifically with office automation.

Quebec has several high technology venture capital, grant and incentive programs related to the micro-electronics area. However, special emphasis has been 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 of Industrial Development (SDI) is responsible for encouraging this industry.

Programs for high technology are set-out within an overall plan; "Le Virage Technique, Batir le Quebec - Phase 2, Programme d'action economique 1982-1986". An important part of this plan is the SDI (Societe de Developement Industrielle de Quebec) which promotes development through financial incentives and administers the "Assistance for the Electronics Industry". Aid is provided through grants, interest free loans and the aquisition of non-voting company shares with qualifying criteria set up to ensure that benefits accrue to Quebec. Office automation is considered an integral part of this particular program. Related to these programs are those which focus on R & D and export; These generally aid in the setting up of missions to foreign countries or the funding of research for high risk ventures.

The Centre de Recherches Industrielle du Quebec (CRIQ) provides help for small companies to get to market by assisting with technology transfer, inventions and giving technical expertise to high technology firms. AGVIR, The Agence Quebecoise de Valorisation Industrielle de la Recherche, provides grants, loan quarantees and equity capital to high risk companies (including high tech). Facilities for designing micro-electronic circuits and components are provided through the Societe de Micro-electronics Industrielle de Sherbrooke Inc.

A new $3 million program specifically related to applied research for information technologies, has recently been set up by the Ministry of Communications. The program focuses mainly on software and is aimed at the informatization of management, production and distribution within communication firms (Aide a l'Informatisation des Entreprises Communications).

4.3.1 Conference sur l'Electronique et l'Informatique

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

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

According to the first 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 "societies" and encourage new products and innovation through fiscal incentives rather than procurement or direct grants and other forms of funding.

5.0 GOVERNMENT POLICIES AND PROGRAMS FOR STIMULATING OFFICE AUTOMATION: U.S.

5.1 Introduction

The policies and programs to stimulate 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 office automation within the broader context of high technology and productivity within government. Within each of the areas identified, reference was made to the importance of office automation and that further efforts for its development in government were required.

In the U.S. the dominant theme is 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 laisser-faire context and to minimize the extent of government involvement. As well, the office automation industry is healthy and commands a dominant world-wide position in the provision 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 U.S. governments efforts to acquire and implement office automation.

There are four main areas which encompass the U.S. federal governments activities for stimulating office automation: Industry Stimulation, Procurement, Incentives for Private Sector Use and Evaluation and Assessments of the Effectiveness and Implications of Office Automation. The most direct impacts on the office automation industry are related to procurement and incentives provided to private industry.

5.2 Procurement

5.2.1 Indications of Market Size and Demand for Office Automation Related Services

The importance of the federal governments' procurement practices is emphased 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 lar-

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* Harvard Business Review, Oct/Nov. 1984

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

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

gest user of information technology in the world and this is predicted to expand significantly in the next few years. Overall expenditures on office automation type services are also predicted to rise quite dramatically from a 1983 acquisitions level of $240 million to a 1987 level of $573 million.

5.2.2 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 office automation).

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).

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 office automation) 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 competi-

tion in procurement. This act may counteract a tendancy 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.

5.2.3 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 that $500,000 can be delegated to individual agencies. Purchases of greater amounts may also be delegated if the OIRM approves. As most office automation purchases are for relatively small sums, in most cases agencies have acted independantly in their procurement of office automation 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.

5.2.4 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.

5.2.5 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

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* Computerworld, November 19, 1984

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 interchangability 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").

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.

5.2.6 Office Automation as a Means to Improve Productivity in Government PPSSCC (The Grace 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 office automation.

1. General Report

   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.

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 coordination and planning resulting in a high degree of incompatability 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 office automation together could reach $22.633B.

- Office Automation Recommendations

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

  Common office automation 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 office automation plan and status report
  - the FIRM and GSA should provide guidance for office automation plans
  - agencies should review office automation 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.

5.2.7 Office of Management and Budget: 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 activities were not being administered even 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) to 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 they determined that:

- agencies would be required to document at least a 10% return on their information technology investments;

- agencies would be required to implement standards that foster open systems of communications and permit the exchange of information among systems;

- greater reliance should be placed on the acquisition of commercially available software to reduce the Government's dependance upon locally-developed, customized software.

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. Government agencies were asked in 1985 to reduce their software maintenance costs by 25% between 1986 - 1989. Plans for reducing these 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, and 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.

5.3 Field Trials and Evaluations

There are numerous small scale pilot and field trials of office technology currently underway within the federal government. The size and diversity of the government program limits, however, the extent of in-depth appraisal of all programs. Thus, attention has been placed on the broader based trials sponsored by the federal government.

5.3.1 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 office automation 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 faciliated by office automation (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.

5.3.2 National Academy of Sciences

The National Academy of Sciences, an independent "think tank" that receives funds from both government and private sources is conducting a major examination of the impacts of office technology on women's employment opportunities. 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.

5.3.3 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 office automation:

- the Information Impacts Program (which has done some work on office automation)
- 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 office automation.

5.4 Industry Stimulation

The U.S. governments approach to industry stimulation is generally "hands-off" and non-interventionist. The Department of Commerce has various types of activities available to assist industry but these are far less targeted than those promoted by its Canadian counterparts at DRIE. The concept of picking "winners and losers" has not been considered an acceptable approach for the U.S. government to follow and even the high technology sector has not been singled out for special treatment.

The main activities include market surveys, market and sector information studies and trade promotion. None of these efforts, however, are focused exclusively on the areas of office automation either as hardware, software or integrated systems.

Research and development expenditures by the U.S. government are substantial and accounted for $36.1 billion in 1982. Five agencies accounted for 90% of these funds including the Department of Defense, NASA, and the National Science Foundation. However, expenditures for R & D in information technology has dwindled now to the point where the 1983 Grace Commission criticized the government for backwardness in the areas of data processing and office automation.

Despite this backwardness, several major developments in office automation have occurred as a result of the governments efforts to develop products for its own use:

a. IRS; optical character reader for processing tax returns
b. Library of Congress; terminal graphics and optical discs
c. U.S. Navy; data base design.

5.5 Incentives For Private Industry To Use Office Automation

Improving domestic productivity was the subject of a major study requested by President Reagan in 1982. The White House Report on Productivity, "Productivity Growth: A Better Life for America", was completed in April 1984. The report emphasizes the importance of information workers, who make up over 54% of the nation's work force and stresses the importance of information as a strategic asset. It also urges that responsibility for information resources should lie with the top levels of a corporate structure.

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".

The ways in which government affects productivity were 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 could:

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. Establish information workers as an occupational category in the Bureau of Labor Statistics classifications. Also, devise a GNP scheme in which information products and information services are separately classified for the purposes of input/output analysis.

6.0 GOVERNMENT POLICIES AND PROGRAMS FOR STIMULATING OFFICE AUTOMATION: BRITAIN, FEDERAL REPUBLIC OF GERMANY, FRANCE

The efforts of Britain, France and the Federal Republic of Germany to stimulate office automation parallel to a large extent those reviewed for Canada and the U.S. In all three countries there are policies designed to assist the high technology sector generally, field trials to aid in product development and assessment of office automation, procurement policies and fiscal incentives addressing the need for high risk financing of research and development.

6.1 Strategic Initiatives

This three countries review revealed similarities in the basic approaches to stimulating office automation, but significant variation in the role of office automation and information technology within particular governments. Comparatively more effort seems to have been placed on attempting to structure longer term plans and strategic initiatives for the informatics sector than is the case for Canada.

The British government has undertaken several initiatives to assist its micro-electronics sector. 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. Programs have also been initiated which are specifically related to office automation.

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 establish them in 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 (PPOS) which provides funds for 100% of the qualifying costs for the placement of prototype office equipment in government departments.

The government's role in the use and procurement of informatics technology is represented by the Central Computer Telecommunications Agency (CCTA) with expenditures of approximately 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.

In relation to these functions, the government is currently conducting 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 policies and programs effecting the informatics and high technology sectors in the Federal Republic of Germany have been influenced significantly by the competitive threat posed by Japanese imports for office automation. Policies have also been formulated in response to the need to foster co-operation with other European countries rather than competition.

Currently, there are no policies or programs directed specifically toward the office automation industry. 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. This it is hoped will provide improved and more 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 takes the form of:

1. depreciation allowances
2. increased contract research
3. industrial incentives
4. increased efforts for technology transfer
5. promotion of new technology based firms.

A focal activity in the Federal Republic of 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. The results of the trial led to the development of a new type of typewriter by Olympia which functions as an intelligent telex machine.

France has undertaken a number of initiatives for the direct stimulation of its high technology industries. Within the micro-electronics sector, the activities of BULL and the procurement policies of the government are oriented to 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 were attempts to increase R & D expenditures in the electronics sector. In 1983, 9.5 billion francs were spent and this increased to 11 billion by 1984. Efforts have also been directed to the reduction in the trade deficit for 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 in the process, develop marketable office automation product.

6.2 Procurement

In Britain, The Central Computer Telecommunication Agency (CCTA) has the responsibility of promoting the best use of information technology and assisting government departments with their information technology developments. Central Government is the largest user of information technology in Britain and spends approximately 750 million pounds (1.5 billion dollars) on installing and running computers, telecommunications and advanced office equipment to support its administration. CCTA has the mandate to:

1. authorizing expenditures on Information Technology (IT)
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 other public bodies to the value of 230 million pounds per year
5. to maintain and develop communications with the IT industry so that suppliers are informed of civil service requirements.

With respect to procurement and contracting for IT goods and services this centralized body offers the following advantages:

1. it concentrates government purchasing power thereby achieving maximum discounts and favourable terms of supply
2. it makes best use of expertise which most departments require only periodically
3. it allows for lessons of experience to be applied to development procedures.

These were no specific guidelines set out for purchasing from local suppliers however, it is generally acknowledged that a "buy British" perspective prevades most of the supplier choices.

Procurement practices in the Federal Republic are generally oriented towards goods already available in the market. The government is, however, currently amending the provisions governing the awarding of contracts for services such that more innovative products can be purchased by government departments. 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 communication technologies. Specific measures identified in the report were:

1. Improvement in the general market conditions, economic environment 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 competetive R & D capacities in the public and private sectors.

The French have generally made only limited attempts to form consortia with foreign suppliers for the development of new and innovative high technology products. In order to ensure the viability of such unilateral ventures, reliance has been placed upon government procurement to provide stability in the market place. One of the main focuses of this strategy is the support of BULL; the nationalized micro-electronics and computer manufacturers. Between 1983 and 1986 BULL was scheduled to receive a direct capital infusion from the government amounting to 4.5 billion francs.

CESIA, is the government sponsored agency responsible for the development, research and investigation of office automation and related technologies for the French government. They function much as the British CCTA does and act as consultants to the government departments instituting office automation to: assist in the administration of office automation systems within government to; gain experience with new technologies and; assist in the development and evaluation of new technologies. Another critical function of CESIA is to ensure standardization of office automation and related equipment.

6.3 Field Trials and Related Activities

Britain and France have recently embarked on two of the most ambitious office automation field trial programs. The British have focused on two critical elements; one is the assessment of methods for evaluating office technology systems; the other is the conduct of trials in a diversity of government departments using a number of different technologies supplied by a variety of vendors. One of the most comprehensive reports on evaluation methods was produced by the Central Computer Telecommunications Agency.* The report sets out detailed information regarding the approaches, methods and procedures for evaluating office automation systems. Methods for evaluation, ways to gather relevant information or placing monetary values on their costs and effects within large organizations are also provided.

The basic recommendations stemming from the report are: (a) a clear profile must be established of the office or organization prior to system installation (b) the evaluation must be linked to project objectives and user expectations (c) information gathering techniques must be sound and a structured reporting during as well as after the trial should be provided. The importance of this report is that it provides government departments a consistent and well defined approach for the evaluation of office automation.

The following Exhibit 2 provides an outline of achievement criteria required information, and methods for data collection as specified in the CCTA report.

Exhibit 3 presents the benefits which could be expected from the use of new office technology.

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

EXHIBIT 2

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

* EMS = Electronic Mail or Message Service.

EXHIBIT 3

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		●	

The Department of Trade and Industry is currently operating 21 pilot trials of office automation in a variety of public sector sites throughout the United Kingdom. The objectives of this program are:

1. to secure the competitive standing of suppliers
2. to help condition and inform the market
3. to foster independent office automation expertise
4. to demonstrate advanced office automation products and their use.

The specific goals of the trials were:

1. to provide a response to user hesitation in implementing office automation technology
2. to demonstrate and highlight the use of government purchasing power and procurement capabilities
3. to provide a partially controlled environment within which to identify opportunities for users and manufacturers
4. to create a body of operating experience
5. to promote information technology at home and abroad.

Four of the trials were in government departments, four in local authorities, six in nationalized industries and seven in public sector bodies. Each of the sites was supplied by a different vendor some of which included IBM, Hewlett Packard, Burroughs, DEC, Wang and Rank Xerox.

Eligibility criteria defined for systems and suppliers were: the trial would lead to a tangible product by its conclusion; the system would have text processing; communications, and information storage and retrieval. In addition the system was required to have an innovative component such as; graphic display personal computer capability, calendars or diaries, linkages to outside networks, linkages to word processors and data processing.

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 host department was obliged to utilize the equipment for a full two year period. At the conclusion of this period the user would buy the systems that had been developed as part of the trial process from DTI.

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.

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:

1. Directly "valuable"; head count reductions, savings in direct costs and better management of the financial resources.
2. Executive time savings, staff turnover reductions, faster response time, lower number of failures, an increased ability to meet dead lines, 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 entails a variety of responses stemming from extreme satisfaction to extreme dissatisfication. 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 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 also been identified as a key factor in dictating the success or failure of a given trial.

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.

Project SCRIBE has 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 a local network of work stations and an electronic mail service. A decision was made in 1981 by the French government to promote the commerialization 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 communications 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 as well as a means for improving the productivity and efficiency of government operations. The project is expected to be completed in 1986.

The initial steps defined for the project were set out in 1982. These included:

1. Setting up of a steering committee to direct the project within the ministry.

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

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.

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

1. steering committee
2. technical committee
3. monitoring committee
4. SCRIBE committee
5. 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 committes, 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:

1. local business network
2. local network/DSA server interface
3. development of a multi-functional work station
4. word processing interface

Stage Two Includes:

1. extensions to the work stations
2. development of print interfaces
3. addition of videotex
4. 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. Thus, results from this activity are still 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.

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 services. (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 was a technical trial which ran from 1979 to 1981 and focused on and demonstrated 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 telexs 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 Siemons, Triumph Addler, 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, socio-environmental factors and overall user satisfaction. Subsequent to the trial activities, it was forecast 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 the Federal Republic of 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 service.

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

6.4 Industry Stimulation, Fiscal and Related Policy Initiatives

In addition to centralized procurement and field trials several other policy initiatives have been implemented in Britain, the Federal Republic of Germany and France. In most cases these deal with the overall high technology sector but at the same time are particularly relevant to informatics and office automation. There are no major financial incentive programs oriented solely to the stimulation of office automation in Britain, France or the Federal Republic of Germany. The procurement policies and field trials are the most direct. There are however several schemes within which the office automation area qualifies for assistance.

In Britain the most relevant program is the, "support for innovation scheme".

This program is concerned primarily with R & D and new product development for: biotechnology, micro-electronics, fibre optics/optic electronics and software. Grants in this program allow up to one third of the qualifying costs for any particular project. This includes all direct costs incurred in taking the project from inception to commercial production and a reasonable amount for overhead. In exceptional cases support may be increased to 50% of qualifying costs.

A micro-electronics industry program provides funds for public awareness, training courses and grants for projects involving the application of mircos and computer processing. Under the Pre-Production Order Scheme (PPOS) the Department of Industry will fund the placement of prototype equipment for field testing up to on eyear. PPOS provides support for 100% of qualifying costs. This is contingent on test users buying the equipment from the Department of Industry upon completion of any evaluation or field trial if they are satisfied. Related to these programs is the Joint Appraisal Scheme which offers free consultancy to companies seeking financial support for new micro-computer based ventures.

In the Federal Republic of Germany the overall framework for industry assistance is based on the desire to improve the overall economic conditions within which companies operate. The goals of this 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.

The tools being used to achieve these goals include; indirect R & D promotion applied to broad industry programs rather than to individual companies. Direct project promotion which is applied whenever there is excessive technical, scientific or economic risk and when the financial commitment to be met by companies is too great or when the market is unable to produce technological solutions on its own. These methods have been emphasized through the following measures:

1. depreciation allowances for research and development investment
2. promotion of co-operative industrial research through the Union of Industrial Research Association (AIF)
3. improvements in technology transfer from research institutions to industry by providing incentives and facilitating the exchange of scientists between these sectors.
4. the implementation of a special program on the application of micro-electronics (1982-1984)
5. special program on micro-peripherals which is part of the information technology promotion concept (1985-1986).

One of the most important elements of the policies developed in the Federal Republic focuses on the formation of Research Networks. These are joint research efforts between industry, education institutes and scientific centers oriented to the development of new technology ventures. The goal of such networks is to reduce the number of individual projects undertaken by government and to rationalize the allocation of government funds for R & D. The government has planned several areas of work for these research networks with "Information Technology" one of the most important.

Related to the research networks is the German Research Network (DFN) which allows participation from universities, research institutes, private enterprises and specialized information agencies. This network facilitates the exchange of news, data and computer software between the members comprising the network.

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.

In France the nationalization of industries serves to ensure that government policies and programs will have direct impacts on sectorial development. The Ministry of Research and Industry has identified electronics and fibre optics as two priority areas for growth.

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.

The plan "Filiere Electronic" was budgeted in 1982 to spend 40 billion francs on investments in R & D for electronics over a five year period. The governments direct contribution was 11 billion francs in 1984. The main focus of the French Governments high technology development strategy is BULL, a nationalized micro-electronics and computer manufacturer. BULL received 4.5 billion francs between 1983 and 1986 with their overall research and development program estimated to be 13 - 14 billion francs. BULL will also be the main recipient of funds emonating from the SCRIBE project.

7.0 GOVERNMENT POLICIES AND PROGRAMS FOR STIMULATING OFFICE AUTOMATION: JAPAN, SINGAPORE AND KOREA

The policies and programs reviewed in this section focus on broader high technology areas and strategic considerations. The focus of this part of the study is centered on the long term strategic approaches rather than specific programs aimed at office automation.

Japan presents perhaps the best example of an integrated, co-ordinated long term approach to the development of informatics technology as part of a broader industrial strategy. Through the use of legislation, industry/government co-operation, intelligent product development and government support, the office automation industry has enjoyed rapid growth domestically and in the export market.

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 process. The principle feature of industrial policy is the establishment of joint industry/government R & D activities which are used for long term development projects. These efforts are facilitated through two basic laws, kijoho and kidenho and the activities of MITI (Ministry of International Trade and Industry).

Within the informatics sector the governments main activities include:

a. promotion and development of technology for the 5th generation computer
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.

In 1982, government subsidies to private companies for advanced R & D in computers, software and integrated circuits were estimated at 11.? billion yen. From 1976-1982 these subsidies totalled 78.2 billion yen.

The legal basis for providing government assistance to the computer and informatics industries is embodied in kijoho. This law was enacted in 1978 and advocates and facilitates joint activities as a means of fostering product development rather than company mergers. This law supports enhancement programs for specific products and provides access to funds and activities needed to implement programs with particular interest in the software industry.

Related to the broader strategic initiatives are measures that facilitate financial assistance to office automation firms and the private institutes which monitor the industry and conduct studies on the impacts of the technology.

The most common forms of government financial assistance in Japan are direct subsidies for R & D which are administered 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 these are loaned to software companies through the Information Technology Promotion Agency.

A prime vehicle for financial assistance 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% 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 three objectives:

1. make Japanese manufactured computers available to a wide spectrum of businesses (increase domestic consumption)
2. allow domestic manufacturers to compete more effectively with companies such as IBM
3. 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 deferal 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.

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 the industrial and academic communities.

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.

Korea and Singapore have no concentrated programs of assistance to the office automation industry. Both countries, however, have made extensive use of laws and tax and fiscal incentives to encourage the growth and development of new information technologies. In Korea, the laws and generous tax concensions have allowed an accelerated pace of development for new technologies through technology transfer and R & D programs.

In Singapore, a major thrust of the government has been the development of high value-added technology and knowledge based industries such as software, computer services, automated banking and finance, engineering and medical scientific consulting services.

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 primary thrusts of Singapores 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.

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.

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 the industrial development in Singapore including high technology development. Under the CAS, projects can obtain fixed interest loans at very low interest rates for long terms. The scheme basically functions 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 occuring 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.

While their 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 ensure 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 has thus established a wide variety of incentives and policy instruments designed 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 programers. A major computerization program has also been established to computerize ten government ministries over the next ten years.

APPENDIX 1

BIBLIOGRAPHY

BIBLIOGRAPHY- 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.

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

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

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

"Conference sur l'electronique et l'informatique", L'Intégration de l'informatique à la culture. Les conférences socio-économiques du Quebec, Rapport No. 4, février 1985.

Le Devoir, 22 mars 1985.

Government du Quebec, Reunion du Conseil des ministere, 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 developpement 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 ministres, Gouvernement du Québec, 28 septembre 1983.

"Session de Sensibilisation a 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, Governement du Québec Développement économique.

BIBLIOGRAPHY - 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.

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

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

BIBLIOGRAPHY - 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 Telecommunications 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

BIBLIOGRAPHY - THE FEDERAL REPUBLIC OF GERMANY

Stransfeld R., "Bildschirmtext und Bildung", Heinrich-Hertz-Institut fur 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 fur Forschung und Technologie, 1984.

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

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

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

"Report of the Federal Government on Research 1984", The Federal Ministry for Research and Technology, Bonner Universitats-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 fur Nachrichtentechnik, 1983.

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

BIBLIOGRAPHY - 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.

BIBLIOGRAPHY - 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.

BIBLIOGRAPHY - 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.

BIBLIOGRAPHY - 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.

BOOTH, PETER J.
--OCS program evaluation: review of other governments policies and ...