• GENERAL DISTRIBUTION

• ••••

• •••• OCDE/GD(92)188

! CANCELS AND REPLACES THE SAME DOCUMENT !
! SENT ON OLIS ON 30 NOVEMBER 1992 !

COMMITTEE FOR INFORMATION, COMPUTER AND COMMUNICATIONS POLICY

SPECIAL SESSION ON INFORMATION TECHNOLOGY POLICY

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

Paris 1992

FOR TECHNICAL REASONS, THE FIGURES AND TABLES ARE NOT AVAILABLE ON OLIS

PREFACE

In October 1992, the OECD Committee on Information, Computer and Communications Policy (ICCP) held a high-level Special Session on Information Technology Policy: New Challenges for Global Competition and Co-operation. This conference was attended by 124 Delegates from 21 Member countries and the Commission of the European Communities, and representatives from industry, trade unions and the World Bank.

The Conference considered the global framework for the development and application on Information Technology, the role and goals of government policies for the 1990s, strategic applications for global problems, and future international co-operation.

Three documents are presented here:

1. The Concluding Statement of the ICCP Committee's Chairman,
• Mr. Richard Beaird, Deputy Co-ordinator of the Bureau for International Communications and Information Policy, State Department, United States;

2. A background issues paper prepared by the Secretariat;

3. A synthesis of a survey of government organisational structures in Member countries in the IT policy area, also prepared by the Secretariat.

A summary report on the main results of the Conference will be made available at a later stage.

ICCP Comittee

Special Session on Information Technology Policy

1. Chairman's concluding statement

13 October 1992

The OECD Committee on Information, Computer and Communications Policy held a Special Session on Information Technology Policies on 12-13 October 1992 at OECD Headquarters in Paris. The 124 Delegates attending this high-level meeting came from 21 Member countries and the Commission of the European Communities, from various government ministries such as industry, commerce, science and technology, telecommunications, economics and from the private sector. OECD's Business and Industry Advisory Committee (BIAC) and OECD's Trade Union Advisory Committee (TUAC) were represented; other observers were from Hungary and the World Bank.

The conference considered the global framework for the development and application of Information Technology (IT); the role and goals for the 1990s of government policies, and public demands in this field; strategic applications for global problems; and future international co-operation.

There was unanimous consensus that information technology has now achieved a truly global dimension. IT has become a strong factor in the globalisation process, and at the same time is affected by this globalisation, as new players have emerged. This poses new problems not only on the supply side of IT, where drastic changes in the composition of suppliers are taking place; also the users of IT have emerged as a major force in reshaping the area over the last few years. Technical innovation continues unabated in this field: far from being a mature industry, the forces of innovation propel the various sectors comprising the IT field towards constant structural adjustment. There was a concern expressed that there is a widening gap between the IT industry and knowledgeable users. There is a need to bridge this gap through better co-ordination and continuous interaction between IT suppliers and users.

These forces of change constitute a continuous challenge to government policies and structures. Given the increasing complexity and the emergence of new players in the industry, there was recognition that government could play an active role as co-ordinator and facilitator. For example, where market forces alone will not suffice to bring about further progress, governments have, to a varying degree, responsibilities in promoting or co-ordinating new applications of IT. In cases where market failures exist, some leadership by governments is called for, in order to overcome barriers to further progress in the applications of IT for solving common, increasingly global problems, while always respecting the pre-eminence of market forces and free trade.

In this regard, it was felt that new challenges are emerging for many IT players to better contribute to achieving sustainable development and assisting in solving some of the present problems facing modern economies, such as the protection of the environment, transport problems in cities, on roads and in the air, including a better co-ordination of various modes of transport, and a better geographical distribution of economic activities, such as the one to be achieved by teleworking.

In the field of information technology, the globalisation process is characterised by strong international competition and, at the same time, co-operation among the major suppliers of IT through so-called strategic alliances, pre-competitive R&D and development consortia. This phenomenon poses new problems to policy-makers in areas such as R&D policies, competition policies, intellectual property protection, privacy protection and information systems security. The need for more international co-ordination to explore areas where international rules-of-the-game in information technology would be appropriate was also expressed. During the course of the Special Session, a number of suggestions were made for the future role of the OECD. These include:

-- monitor the development of international trade practices and its implications;

-- compare national policies and activities for the enhancement of informativity;

-- clarify the roles that governments play as users in IT standardisation on national and international levels;

-- explore the ways that IT and the IT industry may be instrumental in contributing to the solution of social and economic problems of critical importance.

2. Background Issues Paper

New Challenges for Global Competition and Co-operation in Information Technology Policy

Information technology (IT) policies have developed in Member countries as a result of government efforts to cope with a broad range of opportunities and challenges generated by technological and economic change. Each Member country has formulated its specific responses in line with its own traditions and structures. Thus, IT development and diffusion are part of the social, cultural, economic and industrial fabric of each society. Every country has sought to find its own way of adopting, and adapting to, new technologies.

The differences between approaches are often striking: IT policies in European countries, Japan or the United States, for example, will reflect different scales of priorities relating to the promotion of technological capabilities, IT diffusion, deregulation, framework conditions, etc. (1). There are also, however, significant similarities and shared concerns, reflecting the common characteristics of advanced economies, and the forces at work worldwide to increase inter-dependence.

The Special Session on Information Technology Policy, the first of its kind organised by the OECD's Information, Computer and Communications Policy Committee (ICCP), will thus provide an opportunity for an exchange of experiences between Member countries, with three major objectives:

-- bring to light areas of convergence in the national information technology policies of Member countries, and identify common challenges;

-- consider future policy orientations emerging as a result of technological change and globalisation;

-- suggest new directions for international co-operation and the work of the Committee.

The emergence of new goals

The field of Information Technology (IT) in general, and the interest of governments towards it in particular, have undergone many changes over the last 15 years, reflecting profound shifts in social and political attitudes.

There were high peaks of expectations and concern at the end of the 1970s. In the quest for new productivity gains and sources of growth, IT was seen as the royal path to a new frontier of technological opportunities and innovation that would open the gates to the post-industrial economy and the "information society". As such, IT was widely regarded as conditioning the future competitiveness of a country. This strategic role was recognized in many countries by the launching of special government programmes, at national and international levels, to support IT industries, to foster R&D, and to promote education and training.

The key role assigned to IT also evoked fears: for example, of the computer as a job-killer that would generate rising unemployment as a result of IT diffusion in the economy, of increasing vulnerability to accidental or criminal interference, of "Big Brother is watching you" visions and major threats to individual privacy, or even of excessive concentration of economic power within a small number of transnational industrial enterprises challenging the sovereign rights of nations.

These fears have receded. Even though IT has eliminated many routine jobs, it is no longer seen as a threat of massive unemployment, but has been recognized as a source of skilled job creation, especially in services (2). And because of the reality of public concerns with the possible misuse of the new IT technologies, many governments have implemented legal and regulatory safeguards in areas ranging from privacy protection to computer crime. These national measures have also been to some extent extended to the international sphere, for example as a result of the development of the OECD guidelines on privacy protection or transborder data flows (3). Public acceptance of the new technologies has thus been facilitated.

There has been rapid diffusion of IT in many sectors. There were also disappointments among some users because the expected productivity gains were not as large as anticipated. To a certain extent, the difficulties of adoption of new IT systems by government administrations and industrial organisations had been underestimated.

Furthermore, the results of many large national programmes that had been launched to support IT development have not always been satisfactory. The scientific successes of important R&D efforts were not always readily translated into commercial applications, for lack of an adequate industrial base. "Picking the winners", or promoting "national champions" also had sometimes disappointing results: the achievement of advanced technological competence by firms failed to endow them with decisive competitive advantages in international trade, since marketing abilities and lead-time in the consolidation of standards in key markets often turned out to be even more decisive factors of success (4). The focus of government action shifted away from direct public policies to promote IT supply as such. Efforts became more pointed in favour of the core industrial activities that seemed to play a strategic part in maintaining a nation’s competence and competitiveness. More generally, however, the pendulum swung towards more indirect measures such as deregulation and strengthening of market forces at national and international levels.

In contrast with the high expectations, ambitions and fears of the past, a more balanced outlook, if not a somewhat disenchanted one, has prevailed in the last few years. In spite of its major achievements and potential, IT thus seems to be generally taken for granted, more banal in other words: as if the engine of competition and market forces were enough to optimize future developments, as demonstrated by the decreasing cost of memories and ever greater availability of computing power.

This is not to imply, of course, that all is well. For example, the IT hardware industry has been challenged by somewhat stagnating markets since the end of the last decade. This situation reflects cyclical factors and overall economic circumstances, but may also be caused by more profound structural

adjustment problems. There is also wide recognition of the fact that the diffusion of IT in many sectors is still inadequate, perhaps due to insufficient development of user-friendly systems, to the relative difficulty of education and training to adapt to new requirements, as well as to problems met in well integrating IT systems into the activities of industry and services.

These developments leave less scope for IT supply-oriented policies to play a useful role in overcoming these problems. Is there another role for governments?

The challenges of demand

A number of recent Information Technology developments (5) show that the industry has entered a period of change and adjustment. These developments include, for example: slower growth (if not stagnation) of IT hardware markets; continuing expansion of software markets; emphasis on the promotion of "open" standards to promote inter-operability and portability (6); more systematic implementation of legal or regulatory conditions to govern IT usage and protect IT users; increasingly explicit demands for users' involvement in the definition of future IT products; and greater caution on the part of potential buyers when invited to adopt new data-processing systems.

One might draw the conclusion from these trends that IT has become a "mature" technology, in other words, a technology that has already partly exhausted its initial potential for radical innovation. It would now evolve at a slower rate. Diffusion would thus become more important than creation. This might be reflected in the new urgency of previously secondary concepts such as open standards and user-friendliness that become all the more important to accelerate diffusion of new technologies. The present period would thus appear as "the beginning of the end" of unchecked innovation, rapid growth and savage competition between mutually exclusive products.

When other factors are considered, however, it turns out that the "maturity" of the IT sector cannot be taken for granted.

-- On the technological front, a number of advances are about to open new markets for multi-media applications and innovative computing architectures. Future work-stations will probably be completely different from those of today. In addition, progress towards the complete digitalisation of information processing will open many new dimensions in international computer networking. Artificial intelligence, expert systems and even software as a whole, are far from having reached maturity (7).

-- The rapid growth of IT networks, based on electronic messaging and "languages" such as Electronic Data Interchange (EDI), is another factor that should be taken into account. These networks are being rapidly extended vertically (to involve manufacturers and service providers as well as users and government agencies) as well as horizontally (worldwide). New synergies can be expected as a result, as well as unexpected technological challenges (8).

-- There are hopes of increasing the instrumental capabilities of IT as well as its appeal to users, based on new concepts such as "fuzzy logic" or parallel programming for high-speed computing networks. Such developments would lead to the more general introduction of "embedded intelligence" in all products, ranging from household appliances to advanced CAD-CAM systems, and would directly affect areas as diverse as transport, environmental control, energy conservation, public administration, health and education, urban management, agriculture, etc.

-- On the industrial side, the IT sector will undergo transformations that may entail restructuring in many other industrial branches. This effect has already been apparent for some time in the convergence of IT with telecommunications. Now, however, technical "convergence" seems to extend to new areas such as broadcasting. Recently, the IT sector has started to move towards consumer electronics which IT firms intend to penetrate, and that will in any case undergo profound transformations with the arrival of fully digital High-Definition Television (HDTV). It is often asserted, in fact, that HDTV represents a new generic technology with wide-ranging implications in many areas.

These are not the signs of a "maturing" industry, but -- on the contrary -- of a technology that is gaining in coherence and effectiveness to achieve a new "great leap forward" in terms of innovations and their diffusion throughout society and the economy. This new era would thus be based on significant and diverse technological achievements, but would draw much of its dynamics from a steadily expanding wave of rising expectations and demands.

This new phase in the development of the technology triggers a new concern: will market forces suffice to spur rapid, effective and balanced diffusion of IT? The lessons from the past do not suggest excessive optimism. Many users who have already developed their IT bases and strategies are more reluctant to shift from the maintenance and incremental up-dating of their installed capacities, to the acquisition of completely new systems requiring large capital outlays. The more so in view of the fact that acquiring hardware and software is the easiest step in a process that requires wide-ranging adaptations of the work-force and of an organisation in order to take full advantage of the technology. This type of constraint has significantly affected the diffusion of IT in the past, and may still do so in the future, in particular in traditional industrial sectors, smaller firms and services (9).

Another preoccupation is coherence. Scattered breakthroughs in the adoption of IT solutions in certain areas will not necessarily, and automatically, reflect major national policy concerns as diverse as environmental quality, public safety or land-use management.

It will not be easy, however, to define and implement such comprehensive policies in a situation characterized by emerging technological trajectories that cannot be fully anticipated or clearly assessed in the medium-term. These difficulties are compounded by the fact that technological developments could suffer rather than benefit if subjected to hasty government intervention and pressures. Errors could be costly in terms of wrong choices and missed opportunities.

And yet, as shown in the recently published OECD report on Technology and the Economy (10), policies are needed to accompany and facilitate industrial change and adaptation, to maintain competitiveness and avoid unforeseen socio-economic difficulties, also to encourage variety and creativity in usage of the new technologies. All these goals must be sought without unintentionally closing promising technological and economic options. This will not be an easy task, but one that challenges Member countries: a few are major producers of IT equipment, but all are struggling with the problems created by the range and complexity of demands for emerging IT applications.

This new innovation wave can be characterized by its systemic nature. It is not, as so often in the past, a conjunction of discrete events occurring on a broad technological front, but a coherent series of events rooted in the networking logic of the new information systems, that reflect to a large extent the technical blending of IT and telecommunications. Many of the promises entailed by such developments, however, still fail to be realized, mainly because organisational structures and institutions only change slowly to adapt to the new requirements. At all levels of the society and the economy, traditional lines of demarcation (for example, between government departments, between organizations, between disciplines or between special interests) prevent the easy flow of ideas and information that would be required as a basis for dynamic interaction and co-ordination.

Many examples, such as the difficulty of achieving universal electronic mail, or developing intra-modal integration in transport, or of taking full advantage of IT in trans-sectoral areas such as the environment, illustrate both the growing need and the great difficulties of horizontal approaches. Yet, these will be increasingly required to reap the full benefits of IT developments.

They will require active networking cutting across traditional administrative and organisational lines; focusing of education and training onto network-related skills; major reorganisations and re-assignment of responsibilities at operating levels; more open and transparent decision-making in various private and public bodies; the development of adequate incentives to promote systems integration between the different actors; the multiplication of institutional "meeting points" and fora where the various actors can confront their interests -- and discover their common stakes, etc.

At government level, this will be translated in terms of closer co-ordination between a number of different ministries and departments.

In this light, it is not surprising that IT policies have evolved in Member countries in a highly pragmatic fashion. These policies have recently shifted from a focus on supply of IT to greater attention paid to the stimulation and discussion of IT-related demands, diffusion of IT-applications and fostering of a social "terrain" that will not hamper IT penetration -- but which will not unduly suffer from it. Recent new dimensions of these policies also include efforts to assess the consequences and requirements of the globalisation of economic activities, leading to the recognition of the increasing role to be played by various forms of international co-operation.

Furthermore, even more recent developments, extend the IT-related policy concerns to even newer ground with the growing need for government to mediate between producers and users, as well as between other economic agents and the public at large. This is a difficult undertaking because of the heterogeneity of both sides, but an essential one, since successful resolution of differences in this sphere may well be one of the prime conditions for future growth.

Elements of such policies have thus emerged in many Member countries, often based on a step-by-step approach. They have not yet been discussed internationally, to bring to light the lessons drawn from national experiences that might contribute to more successful approaches in the future, at national and international levels.

For these reasons, it is suggested that Member countries present an account of their IT policy development efforts in recent years, as a basis for a discussion of the objectives sought in this area, and the instruments developed to pursue them.

Session 2: Policy-role and Goals for the 1990s: Fields of Decisions -- Public Demands

In the light of forthcoming changes in the pattern of opportunities offered by IT, as well as increasing sophistication and variety of demands, governments may be expected to take new initiatives in areas where market forces alone will not suffice to ensure the successful diffusion and utilization of the new technologies.

A much broader view of the social stakes of IT has in fact emerged in recent years, to a large extent in relation to developments in Eastern Europe: these events have suggested that there might be a strong link between the penetration of information-processing and telecommunications systems in society, and the progress of democratic attitudes and aspirations. As a result, the diffusion of IT tends to be viewed in a broader political context than a purely economic one. Increasing emphasis is being placed in some Member countries, for example, on user-friendliness, ergonomy and decentralized training, or even on special policies to ensure fair distribution of IT skills and benefits to minority groups.

More specifically, governments may in any case have to more clearly define their IT policy role when "public goods" are at stake in specific sectors, as in environmental or urban management. In such cases, and in the absence of adequate incentives, market failures may result in serious delays or inadequacies in taking advantage of opportunities which arise from IT, but are not yet fully recognized -- or which can only be implemented at the cost of developing significant infrastructures, and implementing painful reorganisations.

The failure to take advantage of new technologies such as IT may also often reflect the fact that their applications need advanced competence in the technical area concerned, as well as ability to develop creative approaches to the adoption and adaptation of the new technological systems. Such effective concentrations of competence and creativity have usually not been achieved in areas where the relevance of IT-based solutions has been recognized only recently.

These deficiencies may even extend to government IT-related purchases, whose focus now tends to shift from data-processing to networking at national and regional levels. This may have an enormous impact on the overall demand for intelligent IT systems, but will require more even distribution of competence among public bodies and regions.

Although these new demands are important for OECD Member countries, they may be even more crucial for non-Member countries in Eastern Europe, Asia, Africa and Latin America, where in view of difficult climatic conditions, enormous distances and the lack of efficient infrastructures (such as roads, railways or even classical mail systems) Information Technology would appear to be almost a prerequisite for the durable development of democratic governments.

It is not only the competence of the agencies and firms concerned which is at stake. The successful deployment of IT will ultimately reflect even more directly the extent to which users themselves can confidently select technologies which fully meet their requirements under conditions that will ensure that their special interests and rights are safeguarded, and will continue to be so in the future.

Session 3: Strategic Applications for Global Problems

Many of the new demands which call for special IT contributions are in fact global demands:

-- they reflect problems which have emerged worldwide and will call for globally co-ordinated responses, as in the case of major environmental concerns;

-- they will require the use of global infrastructures such as IT networks and international data bases, which may provide new instruments to identify threats to human life and develop early warning systems in a number of areas such as epidemiology, weather and natural disaster predictions;

-- they may simply reflect the common ills and growth pains of industrial societies -- as in the case of traffic and urban congestion problems -- but solutions may have such major structural implications for industry that concerted action will prove necessary.

No one will challenge the notion that IT contributions can be of benefit in all such cases. However, these benefits may not be readily realized for lack of an explicit chain of communication which will i) translate environmental, health or traffic problems into a specific demand addressed to the appropriate IT community; ii) reformulate such a demand in terms which will inspire new IT developments taking account of all the technological options; iii) ensure that there is adequate feedback at a more political level; and iv) foster an adequate level of coherence between the solutions adopted in different sectors, for example to ensure that the provision of efficient means of transport of goods and people will also meet environmental requirements.

From an IT policy perspective, it has become increasingly apparent that the new technologies cannot merely be viewed as potential instruments for the control of environmental trends. Their broad application in all industrial areas holds the promise of reduced energy and raw material consumption, thus addressing the very sources of environmental deterioration. Systematic progress along these lines, however, will require a new "environmental awareness" in the formulation of IT-related demand and policies.

For all these reasons, it seems that the mobilization of IT resources for the solution of global problems may require the organization of joint strategic efforts by governments, users/consumers and industry.

General considerations on the potential of IT policies in these two sectors will be found in the Annexes.

Session 4: Future International Co-operation

Developments in IT have already had a major impact on international relations, in a wide range of fields extending from cultural to economic exchanges, and including areas of concern affected by the new technologies (such as the legal issues mentioned above, connected to privacy protection, transborder data flows, security, etc.). IT has played, and continues to play, an essential role in world trade and the current development of "globalisation". This is not only due to the rapid expansion of IT-related trade (11), but also reflects the strategic role increasingly played by computer-to-computer relations as a basic infrastructure for international exchanges of all types. National IT policies cannot ignore this worldwide dimension: there are global problems to be addressed by IT, and new challenges resulting from the development of an IT-based world market.

The global nature of many problems that call for IT-based adjustments and responses, provides a powerful stimulus to international co-operation:

-- because of the need to avoid costly duplication of R&D efforts that could be more effective if undertaken under multilateral co-operation schemes;

-- because the greater integration of national economies, resulting in new trade patterns and the emergence of transnational industrial alliances, may call for the formulation of new international understandings and rules of the game;

-- because international efforts will also be needed to involve late-industrialising countries in the development of new world IT infrastructures, and allow them to benefit from the resulting growth opportunities.

As already mentioned above in the discussion of policies at national level, new trends in IT networks development call for adaptations internationally to facilitate horizontal approaches. This is likely to require many changes and adjustments. For example, there are new needs for co-ordination between international government and non-government organisations and between public and private actors.

For all these reasons, and because many new requirements will only gradually become apparent, step-by-step approaches will be necessary to ensure that an evolving international environment develops fully in tune with technological advances. International co-operation will thus appear more than ever as one of the conditions for the establishment of a world market-based system, implementing fair and transparent principles.

Annex 1

Information Technology and the Environment

The notion of "sustainable development" has been on the agenda of many international conferences and was the subject of many books and articles since "Our Common Future", known as the Brundtland Report, was published four(?) years ago. While in the past technological development too often caused environmental degradation, there is now a new spirit and desire to use technology to improve the degraded environment, make technical processes and products more environment-friendly, and to conserve resources as much as possible.

This also applies to information technology. However, the potential of IT to contribute to sustainable development has not yet been fully recognised by policy-makers. Two major reasons may explain this lack of awareness:

1) The diffuse nature of many IT applications: advanced computer systems for air traffic control, simple control devices for home heating and cooling, microelectronics in car engines, or intelligent manufacturing systems are all very different and do not easily lend themselves to a unified policy approach.

2) It is still unclear who will pay for many potential new applications: for example, new driver information systems on highways and cities will be partly paid for by users; but do cities, generally debt-laden, have the necessary funds to provide the infrastructure for such driver information systems? Is developing better traffic control systems such a high priority for cities compared to funding social services?

Another very important factor in the relationship IT -- Environment is the growing role of telecommunications. A critical factor for many new IT applications is the cost of telecommunications. The combination of computing and telecommunications holds a powerful potential to reduce business routine travel, not only daily commuting ("tele-work"), but also long-distance air travel. It is telling that in 1991, during and after the Gulf War, when many American executives were not allowed to travel, a US plane-maker ran an advertising campaign with the theme: "Fly, don't fax." Information technology may well contribute reducing fuel consumption and Co2 production over the long run by providing new ways of doing routine business.

Another still untapped potential of IT is to delocate many "back-office" service activities, such as in public administration, banking, insurance from large cities to more sparsely populated areas, and thus make an important contribution to spread economic activities and jobs more evenly over a country. Information technology provides probably one of the few technological opportunities to deconcentrate our modern megalopoles and to help in regional and rural development. However, telecommunications tariffs for applications such as video-conferencing are still far too high and beyond the reach of most users. An important policy goal for the coming years for telecommunications

regulators is to ensure that the cost-savings which modern telecommunications technology makes possible (fibre-optic links, satellites, mobile communications, etc.) are passed on by telecommunications operators to users without delay. Only when telecommunications will have become really inexpensive, can they truly be called a "green technology".

A real challenge for policy-makers over the next years is to evaluate the potential of IT to preserve the environment and to make possible new ways of work, and to take the necessary steps to accelerate, in close co-operation with industry and the social partners, the introduction of such new applications of IT to contribute to sustainable development.

Annex 2

IT Innovations and Applications: The Transport Sector

Distribution and transport in the new economic context

Major socio-economic forces are remoulding the world economy, and OECD countries are particularly concerned. Changes in demand, production technologies, regulation schemes and environmental concerns increasingly determine production processes, the structure of industry, and the national and international division of labour. The forces driving these processes include the shift from seller to buyer markets (customisation), new production processes (just-in-time, outsourcing, etc.) and concerns about the deteriorating quality of life (the environment).

In particular, the changes in demand and enhanced international competition, and their implications for new production techniques and patterns, significantly alter the relationships between manufacturers, subcontractors, wholesalers, retailers and clients. Taken together, these developments are making new demands on the transport sector, the just-in-time link between supply and demand.

These developments impact on a sector which already faces a capacity crisis in most countries. Transport is indeed at a crossroads. The increasing division of labour and its implications for production patterns and locations is resulting in a further tightening of the natural interdependence between transport, production, distribution and related economic activities, often dispersed over different regions, countries and continents. This means that bottlenecks in one place of this network and/or in one transport mode in one region (or country) will affect other transport modes, as well as production, wholesalers and retailers, and hence employment and economic performance in general.

The objective: not more but "better" transport and related services

In order to meet the new challenges and at the same time overcome the capacity limits of this sector, a straightforward expansion of existing capacities (i.e. more roads, rail tracks, and related investment) is neither possible nor desirable for socio-economic, environmental or related reasons in many countries. What is needed instead are qualitative changes and new solutions to remove existing constraints on the transport sector with a view to allowing further economic development.

Information technology: new management tools for the transport sector

A more innovative approach for coping with this new demand, and the costs involved in co-ordinating and re-integrating complex systems, implies developing a new market intelligence for economic actors in transport and associated sectors. Information technology (IT), more precisely its capacity power to make available, process and "act upon" information at the right time and place, indeed makes the provision of this greater market intelligence

possible. IT, in particular through the configuration and application of advanced computer networks, has the potential to provide new solutions in this key sector. The logic is clear: the distribution and transport sector such as information systems, functions in terms of networks. The movement of goods (and people) in firms, between firms and final delivery to clients requires co-ordinated transaction between a chain of suppliers, buyers and distributors. In addition, the delivery of components, intermediate and final products can be over great distances and across borders, it may involve switching between different transport modes (rail, road, air, maritime). Hence, the physical interchange of goods takes place within a supporting web of transportation related information transactions. It is in the integration of both functions in real time that appropriate IT equipment and systems become instrumental. IT systems such as bar codes and computer controlled manufacturing and inventory management, for example, permit demand responsive manufacturing and lower inventories. More integrated systems merged with terrestrial and mobile telecommunications facilities enable the exchange of "dispositive, i.e. immediately usable" information concerning:

- -- cargo, vehicle and driver identification and status;
- -- vehicle location;
- -- current traffic conditions;
- -- optimal routing, taking into consideration the availability of loads and appropriate equipment to move them, traffic and weather conditions, the nature of the cargo being transported, using routing algorithms or "artificial intelligence" (so-called "real-time routing");
- -- optimal routing of cargo (package or whole shipments);
- -- optimal routing of load units (trailers, containers, swap bodies, etc.);
- -- optimal routing of and scheduling of manpower.

Integrated and interconnected to build intelligent information networks for the different transport modes and agents involved in the provision of transport functions will lead to new forms of "real-time-routing" that is automating door-to-door delivery of freight. Ultimately, these information infrastructures may allow near optimal transport flows and traffic management, better use of existing physical transport infrastructures and thus contribute to reconciling economic and environmental objectives.

The policy challenge

However, given the dichotomy of the transport sector (strong public planning in the supply of transport infrastructures and severe competition in the supply of and demand for transport services), there is nothing automatic about the market responses to these IT-based opportunities. This process actually requires both; the development of appropriate and economic viable systems and their broad implementation. Delayed and suboptimal IT use in this strategic sector entails a concrete danger for lost growth opportunities for the transportation sector and the economy as a whole, including the economic perspectives of the IT and associated industry.

These threats and opportunities thus present a great challenge and responsibility for policy-makers to realise the microeconomic and macroeconomic benefits (capacity extension, increased safety, reduced pollution and environmental damage, etc.) associated with advanced and integrated IT systems.

NOTES

1. Illustrations of these differences will be found in: OECD, Change in Focus in Information Technology Policies during the 1980s: A Comparison of Changing Public Policies in Austria, Germany and Japan, OECD/GD(1991)62, Feb. 1991; and: OECD, A Comparison of Changing Public Policies for Information Technology in Canada, the Netherlands and Sweden, Paris, 1992; See also: OECD, Reviews of National Information and Communications Technology Policies: Finland, Paris, 1992.

2. See: OECD (1987), Information Technology and Economic Prospects, Paris, and: OECD, Information Technology and New Growth Opportunities, Paris, 1989.

3. See: OECD, Guidelines for the Protection of Privacy and Transborder Data Flows, Paris, 1981. OECD Proposed guidelines on the security of information systems are also now under discussion by the ICCP Committee.

4. See: OECD, Major R&D Programmes for Information Technology, Paris, 1989.

5. OECD, Information Technology Outlook, Paris, 1992.

6. OECD, Information Technology Standards: The Economic Dimension, Paris 1991.

7. OECD, Software Egineering: The Policy Challenge, Paris, 1991.

8. OECD, Information Networks and New Technology: Opportunities and Policy Implications for the 1990s, Paris, 1992 (in preparation).

9. OECD, IT-Usage Indicators: A New Foundation for Policy Formulation, Paris, 1992 (in preparation).

10. OECD, Technology and the Economy: The Key Relationships, Paris, 1992.

11. OECD, Trade in Information, Communication and Computer Services, Paris 1990.

3. Information Technology Policies: Government Organisational Structure in Member Countries Synthesis of a Survey

Summary

1. Overview

Some general trends were observed in information technology (IT) policy developments in OECD Member countries over the past ten years. A number of countries commenced the development of national IT programmes stimulated by a certain sense of "competition" at the beginning of the 1980s. These countries intended to enhance competitiveness of national industry by using IT as an instrument for innovation in both production processes and products.

IT application increased in its importance as a policy goal from the mid-1980s. While the importance of the promotion of creation and development of IT-based equipment and systems remained to be the same, a wide range of user support policy initiatives began to be undertaken. The number of Ministries and government agencies involved in policy domains related to IT increased at the same time.

Governmental response to ever increasing IT use have varied widely. Member countries have developed different policies for IT, corresponding to the level of IT use in industry and general public, and policy goals in each country.

The IT expenditure data indicates great diversity in the backgrounds for policies for IT. Although IT spending per Gross Domestic Product (GDP) correlates to IT spending per capita, several patterns are observed in the relationships between IT spending per GDP and its compound annual growth rate.

Coverage of policies for IT is wide and ever extending, as the opportunities of IT use increase in society. "Policies for IT", under such circumstances, have a horizontal dimension. IT policies include many factors, when they are seen from a viewpoint of the organisational structure in the governments. They commonly include industrial, S&T, telecommunications, education, trade and legal policy elements. Some other horizontal policies, such as regional economic development, are often merged with policies for IT.

The structure of policies for IT inevitably involves many Ministries (and/or public authorities) in the policy-making arena. This sometimes makes it difficult to develop coherence between various policies related to IT. This absence of coherence may result, on the one hand, in inappropriate allocations of resources. On the other hand, however, the development of coherence may have to wait until policy priorities in IT become clearer. The answer is not a simple one. Different countries may have different answers corresponding to their policy priorities, social and economic backgrounds and history.

2. Challenge to policy-makers

A common challenge facing IT policy-makers is how to ensure that the greatest possible benefits of IT continue to serve the needs of all sectors of society. Moreover, because the social and economic fabric of each nation is increasingly interwoven with that of other countries on a global scale, national policies for IT have major international implications. There are many subjects of international rules to share. International dialogue on common issues related to IT is more important today than ever.

{1) National dimension}

One aspect of the common challenge facing all countries is how to organise the IT policy-making arena efficiently, while accommodating various interests of society. Two key questions that need to be continually addressed are: "How do we ensure coherence between policy goals and organisational structure in IT-related issues?" and "How do we organise the policy-making arena to maximise benefits from IT-related policies undertaken in different areas?".

The organisational structure of policies for IT is shaped by the diverse policy context of each individual Member country. This fact needs to be fully taken into account in developing international dialogue on policies for IT. One must avoid the danger of making simplistic comparisons and categories when analysing national organisational structures. Although "IT policy" subjects are often discussed using a common vocabulary -- "IT use" in industry, "IT R&D", "IT trade", "information systems" -- what is actually meant by such terms may differ in different countries.

Nevertheless, given their different IT policy contexts and organisational structures, Member countries have many valuable experiences to share. Variations among policies for IT in Member countries present a wealth of experience for all countries to learn from and do not give rise to confusion in international dialogue.

{2) International dimension}

The importance of international factors in the development of national policies for IT are growing, not receding. Policies for IT at the EC level are being incorporated into the policies of its Member states. This development has an impact on IT policy-formulation in neighbouring EFTA countries. Similarly, the Free Trade Agreement (FTA) initiated by Canada and the US in 1991 is likely to impact on IT-related policies in each country. In the private sector, activities of multinational enterprises (MNEs) in the IT sector need to be taken into account in the formulation of national policies because of the impacts by MNEs on such issues as IT R&D, industry and employment. Thus, the very concept of national policies for IT may have to be reconsidered in light of an ever-changing international environment.

Synthesis Report

I. Introduction

The purpose of this report is to compare and analyse organisational structure of policies for information technology (IT) in OECD Member countries. By "organisational structure", we refer to the manner by which the governments formulate and undertake policies on IT-related issues. Thus, the focus of this study is on "Who does what in IT" at the national governmental level.

Over the last ten years, many Member countries have seen the need to develop policies in response to ever-increasing impacts of IT. The rapid increase in cost performance of IT equipments, such as personal computers (PCs), and components, such as integrated circuits (ICs) has fostered widespread IT use and integration in office administration, manufacturing systems and products. At the same time, the liberalisation in telecommunication policies stimulated the development of expanded opportunities for using computer network systems to link different firms and sectors of economy. These are but some of the phenomena behind the increased impacts that IT use has had in the economy and society of OECD Member countries.

This report focuses on how governments have sought to react to these IT-related issues is the subject of this report. To a large extent, the response to date has been incremental; that is no OECD Member country has devised a unified, comprehensive "IT policy" or established a single ministerial or agency responsibility for "IT policy" as a whole. Rather, what does exist is a set of policies related to IT use in many other existing governmental policy areas. Thus, the terms "policies for IT" and "IT policy" are employed interchangeably to mean a loosely-defined set of policies governing IT use across a broad range of governmental policy concerns.

The high level of diversity between national policy contexts needs to be considered when examining and comparing organisational structure of policies for IT. Although IT-related policies are commonly found in Member country industrial policies and in policies for science and technology (S&T), this fact does not allow a useful and simple dichotomy, such as "industry-oriented IT" versus "S&T-oriented IT" policies. In addition, whereas two countries may share the same IT policy goal, such as national economic growth through industrial development, they may take quite different approaches. One country may pursue this goal by promoting IT take-up in all industrial sectors, whereas the other may seek the same goal through pre-eminence in just one industrial sector, such as leading-edge IT development. Yet in other countries, another policy goal, such as regional development, may overlap with the industrial development goal. Examples of this latter case are found in Canada, France, Ireland, Norway, and SwedenF

•For the detailed analysis of policies for IT in Canada and Sweden, refer to OECD (1992a).

F.

II. General Background for the Analysis of the Organisational Structure

1. Evolution of policies for IT over the past ten years

IT policy developments in OECD Member countries have followed the general trends as summarised below:

{a. Same motivation}

A major motivation behind national efforts to establish IT programmes was a certain sense of "competition" felt by some of governments of Member countries. This was manifest in the so called "high-tech race" inaugurated by countries with competitive IT sectors, such as Japan and the US, and later joined by France, the UK and Germany. Once the impacts and potential of IT were felt and perceived, especially in the use of microelectronics (ME) in manufacturing and end products, other countries quickly sought policy interventions in various forms. Many national programmes for IT promotion sought to stimulate processes of structural adjustment of existing industry by using IT as an instrument for innovation in both production processes and products.

{b. From IT creation to application}

As policies for IT evolved during the 1980s, IT application became increasingly important. At the beginning of the decade, the priority goal of IT policy was to create and develop IT-based equipment and systems in industry. From the mid-1980s onwards, policy concerns on the development of IT users increased in its importance. A wide range of new user support policy initiatives were undertaken to promote IT use, from the promotion of the IT take-up by small- and medium-sized enterprises (SMEs) to R&D efforts for the improvement of human interface of IT-based systems. Examples include Japan’s FRIEND 21 project and Sweden’s MDA and DUP programmes.

{c. Policy convergence}

The number of Ministries and agencies involved in IT have greatly increased over the past five years. Back in the early 1980s, it was usually only the Ministry (or agency) responsible for science and technology that was most often involved with IT. As IT use became more widespread, the number of Ministries and agencies involved in IT-related areas increased substantially. Issues such as infrastructure and the need for common IT user rules became increasingly important policy concerns. Other examples of these evolving IT policy concerns include: education and training for IT skill enhancement, data protection in electronic retrieval systems, and rules for sharing responsibilities between users of the same computerised information systems.

Today, the promotion of IT is becoming less of a policy goal in and of itself, but is increasingly viewed as being instrumental to the achievement of other existing policy goals. In promoting the growth of SMEs, for example, the

governments in many countries today consider the use of microelectronics as a way to achieve this end. The same is true for regional development; IT promotion is viewed as a means to an end, not as an end in itself. Other examples include the promotion of computerised farm management systems by farmers as a part of agricultural policy, in the Netherlands, and the use of electronic networks for health information services as a function of social policy, in Canada.

{d. Different responses}

Over the past decade, governmental responses to ever increasing applications of IT innovation have varied widely. Some illustrations of the responses are found in some OECD country studies of the past two yearsF
•OECD (1991) and OECD(1992a).
F. In
Austria, the development of social conditions for IT users was initially well pursued, followed by the promotion of IT use as a means for promoting industrial development. IT promotion for industrial development is also an instrumental policy concern in Canada and the Netherlands. In Sweden, where IT expenditure per capita is high and where the IT manufacturing sector is competitive, maintaining national pre-eminence in leading-edge IT is a major priority for national IT R&D policy, as are the development of rules for the protection of privacy and R&D in improving human interface of IT. The promotion of leading-edge IT R&D is also of strategic importance in the Netherlands, although the government has pursued its IT R&D policy goals through involvement with other European countries in such international R&D initiatives as EUREKA and RACE. Policies for IT in Germany were developed to comprise a comprehensive framework announced in 1988, in which the need for inter-ministerial co-ordination was advocated for the enhancement of collective efficiency of the policies.

2. IT spending in selected countries

{2.1 Introduction}

The IT expenditure data collected reveals great diversity in the background of each country which is manifested in their different policies for IT. These differences should be taken into account in the comparison of organisational structures. This section intends to provide some possible categorisation of IT background in each country.

Data and definition of IT spending adopted in this report are from the results of a 1990 survey undertaken by the International Data Corporation (IDC). IDC data is used because this is the only data source that seems to be reasonably reliable and that allows for the maximum number of international comparison of 17 OECD Member countries (Australia, Austria, Belgium, Canada, Denmark, France, Finland, Germany, Italy, Japan, the Netherlands, Norway, Spain, Sweden, Switzerland, the United Kingdom, and United States). The definition of IT spending is provided in the Annex to this section.

Indexes used are IT spending as a percentage to Gross Domestic Product in 1989 (GDP), IT spending per capita in 1989 and the growth rate of IT spending from 1989 to 1990. These indexes are selected to compare figures in small-, medium- and large-sized economies without significant distortion. GDP data was used in order to examine correlation between the size of economies and the level of IT spending.

{2.2 Major findings}

Figure II-1 exhibits the cross analysis of the two sets of data; IT spending per capita and IT spending as a percentage of GDP. There is a positive correlation between these two indexes. This means that in the countries where IT spending per capita is high, IT spending in relation to GDP is high.

The level of IT spending does not necessarily correlate to the size of national economies (Table II-1)F

As for GDP, countries are classified into three groups, i.e. major-, medium- and small-sized economies, according to the OECD classification.
F, as far as data in 1989 is concerned.
Diversity in the level of IT spending exists even between countries whose size of national economy are in the same rank. For example, between the countries that belong to large economies (Column "High" in GDP in Table II-1), the levels of IT spending of some countries are in the medium range (the US, Japan, Germany, France and the UK), while in Canada and Italy they are in the low range. The same applies to those that belong to medium- and small-sized economies.

Cross-analysis of IT spending as a percentage of GDP and IT spending's growth rate between 1989 and 1990 also indicates diversity in IT spending patterns (Figure II-2). The fact that both indexes in Nordic countries (Sweden, Finland, Norway) are relatively high deserves attention.

Some groupings of the countries are possible at least for a short period of time (1989-1990);

{1) Countries where the growth rate was high}

a. Both IT spending as a percentage to GDP and the growth rate was high (Sweden) -- Demand for IT was large in relation to GDP.

b. IT spending as a percentage to GDP is in the medium range, but the growth rate was high (Belgium and Finland, and Japan and Norway, to some extent) -- IT spending was in the rapid growth phase with a relatively high market potential.

c. The level of IT spending relative to GDP is low, but its growth rate was high (Italy) -- Potential of the growth of IT market was large.

{2) Countries where CAGR is medium}

a. IT spending as a percentage to GDP is low, but the growth rate was medium (Austria and Spain) -- The growth potential of IT market was relatively high but its current growth is moderate.

{3) Countries where the growth rate was low}

a. IT spending as a percentage to GDP is medium but the growth rate was low (the Netherlands, the UK and the USA) -- The growth of IT spending was saturated in 1989, but there was a potential of further market growth.

b. Both IT spending as a percentage to GDP and the growth rate was low (Canada) -- There was a possibility of high market growth in IT but some breakthrough may be needed to activate the IT market.

{2.3 IT policy implications}

In those countries where IT spending relative to GDP and population and its growth rate are low, such as Austria, Canada and Spain, policy measures may be necessary to stimulate IT use. Measures to increase the awareness and promotion with regard to IT use are an example of this.

In those countries where IT spending relative to GDP and population and its growth rate are high, such as Sweden, Norway, Denmark and the Netherlands, they are regarded to have a relatively high penetration level of IT use. Policies for IT use for these countries would have to focus on efficient use of IT, rather than the promotion of the use itself. Development and management of information systems that connect inter-related sectors of economy are examples of such use, since stand-alone use of IT is already widely diffused in these countries.

III. Review and Comparison of Organisational Structure of Policies for IT -- Synthesis of the Responses from Member Countries

1. Introduction

The comparative analysis of a Member country's organisational structure of policies for IT is based upon three sets of source material: Member countries' responses to the OECD questionnaireF

Member countries responding as of 15 July 1992 included: Austria, Canada, Denmark, Finland, Germany, Greece, Ireland, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, Sweden, Switzerland, the UK and the US (17 countries).
F; prior OECD reports on national policies for ITF

In-depth analysis will be found in the following reports: OECD (1991), OECD (1992a), and OECD (1992b).
F; and several additional studies carried out in connection with the recent survey questionnaire.

The OECD questionnaire focused on government policies for the promotion of IT use outside government. Government actions that have an effect on IT use in industry, education and other purposes are all regarded to be "policies for IT". IT, in this context, was defined as meaning both hardware and software, physical components and systems (e.g. IT-based information systems). The use of IT in governmental administration, whether for office automation systems or information resource management (IRM) was excluded.

2. Ministries and government agencies involved in IT-related policies

{2.1 Width of "IT policy"}

Among the various policy subjects related to IT, nine areas have been identified based on the prior OECD studiesF
•OECD(1991) and OECD(1992a).
F as being especially pertinent.
These include: science and technology (S&T); IT use in industry; IT producing sectors in industry; data communication and IT-based networking; education and training; labour; legal matters; trade and international co-operation (Figure III-1). This listing is a reflection of how IT development and application (i.e. IT use) is interwoven in the economic, industrial, social and technological fabric of Member country societies.

Member countries' responses to the questionnaire reveal a considerable variety in both the type and number of governmental Ministries agencies involved in the IT-related policy areas. None of the Member country respondents indicated the existence of a single "master Ministry" responsible for "IT policy" as a whole. In fact, "IT policy" in Member countries refers

rather, to a group of existing policies that are relevant to IT. These encompass the nine categories listed above. For this reason, we hereafter employ the term "policies for IT" rather than "IT policy" in this report.

Nevertheless, some areas have more policy relevance to IT than others. Four areas -- S&T, industry (including both IT and non-IT sectors), IT-based networking and legal issues -- are of priority concern among Member countries. In the country responses it was observed that a number of policy areas and the level of their intensity tend to increase in those countries that place higher importance on roles of IT in its broader policy. The four policy areas referenced above are the minimum coverage of national policies for IT.

{2.2 Possible categorisation of policy-making structure}

Member country policy-making structures may be categorised in two ways in terms of the level of concentration of IT-related policy issues; (1) those where only one or two Ministries are heavily involved in IT-related issues and (2) those where a much larger number of Ministries are involved in such issues. The level of involvement can be indicated by the frequency with which a given Ministry is cited. Care should be taken, however, in assigning quantitative significance to frequency of citation as a measure of a Ministry's level of involvement in IT issues, owing to considerable variations in the level of detail provided in the country responses to the OECD questionnaire. Nevertheless, it may be safely assumed that those Ministries involved in IT-related areas more often than others do tend to assume more responsibility. For example, in Canada, The Department of Communications (DOC) and Industry, Science and Technology Canada (ISTC) are more directly involved in more number of IT-related policy areas than other Ministries and agencies. The same is true for Germany (Ministry for Research and Technology and Ministry for Economics), Japan (Ministry of International Trade and Industry, or MITI, and Ministry of Posts and Telecommunications, or MPT), the Netherlands (Ministry of Economic Affairs), Sweden (Ministry of Industry, or MIND), the UK (Department of Trade and Industry, or DTI), and the US (Department of Commerce, and the National Science Foundation, or NSF). In several other countries, it is more difficult to identify major Ministries. In these latter countries, such as Denmark, Finland, Italy and Portugal, IT-related issues are undertaken by many different Ministries that exercise the same or similar level of responsibility.

In some countriesm differences in institutional organisation result in the involvement of certain Ministries that are not specifically involved in industry or S&T. The Ministry of Foreign Affairs in Sweden is involved in issues on trade in IT goods and services. The Ministry of Finance in Denmark and Sweden has IT-policy relevance through its responsibility for the security of information systems and for computer misuse.

{2.3 Industry and S&T policies in the IT policy context}

Industry and S&T policies are often inseparably linked in policy domains related to IT. Most Member countries accord a high level of IT relevance to these two major policy areas. Innovation and the development of application have a close and mutual influence on IT. This fact is reflected in the policy-making process. IT R&D, when undertaken as a part of publicly-sponsored S&T programmes, should in principle be limited to pre-competitive subjects. While this is true, it is also a fact that R&D and application phases are, in

practice, very close to each other in IT. In addition, IT is often regarded as a "strategic" technology accounting for considerable industrial and economic development of a country. As a consequence, public authorities seek to orient IT R&D programmes towards the promotion of industrial applications, while still avoiding direct subsidies to industry. Under such circumstances, it is also natural, that the Ministry in charge of industry, not S&T, is responsible for such policies. In fact, R&D in IT and its transfer to industry are often supported co-operatively by Ministries (and agencies) responsible for industry and S&T. This may be an especially pragmatic solution in these countries where responsibility for industry and for S&T resides in separated institutions. Germany, the Netherlands, New Zealand, Spain and the UK provide such examples.

The same applies to policies for IT at the level of the European Communities (EC), although we cannot regard the EC as a country. R&D programmes initiated by the Commission of European Communities (CEC), such as ESPRIT and RACE, are intended to enhance R&D capability through international co-operation of firms to represent in Member States. These programmes are instrumental for the improvement of competitiveness of the European IT sector. They support the implementation of EC industrial policy, which is aimed at promoting free market competition Community-wide, regardless of the nationality of individual industrial firms.

Public policy responses to multinational enterprises (MNEs) in the IT sector are most frequently seen in the context of industry and S&T policies. Many IT MNEs are developing global approaches to R&D, manufacturing production, marketing and sales. Some countries, such as Canada, Germany, Ireland and the UK, have adopted positive attitudes towards these MNEs. They consider the foreign-based firms a resource for the development of IT R&D and industry in their host countries. They both expect and accept the transfer of capital and technology capability from the MNEs. Foreign firms in these countries are allowed to participate in publicly supported R&D programmes, as long as certain conditions are met, such as the establishment of R&D functions in the host country and a certain level of employment of local workforce.

{2.4 Roles of telecommunications policy in policies for IT}

Policy roles for the telecommunications sector, including both equipment production and service provision, in the formulation of policies for IT bear some attention. In some countries, the Ministry originally in charge of telecommunications sector is widely involved in policies for IT.

With respect to telecommunication services, telecommunications policy has increased its influence in helping to shape the environment favourable for users of IT-based information network systems. In Japan and the US, for example, policies to promote competition in telecommunications and liberalise the usage of leased circuits have resulted in a great variety of telecommunications services interconnected with computing systems (i.e. so-called value added network services, or VAN).

With respect to telecommunications equipment, IT, in industrial and S&T terms, is of increasing relevance to the telecommunications sector, due to the merger of IT with communications technologies. IT development is crucial for the telecommunications equipment sector. Standardisation also provides a substantial bridge between IT and telecommunications. The number of possible

and real subjects for co-operation is increasing between IT and telecommunications standards making bodies, as is seen between the International Standards Organisation (ISO) and International Telephone and Telegraph Consultative Committee (CCITT).

One distinctive feature of policies for IT in Canada is their close inter-relationship with policies for telecommunications sector, both service and manufacturing. Telecommunications historically played substantial roles in the communication and integration of communities across Canada, and the country has developed telecommunications network systems over its vast geographical area. This development is supported by the telecommunications equipment manufacturing sector and its high level of R&D capabilities in the country.

The strength of Canada's telecommunications sector was one of the major reasons why the Department of Communications (DOC) became involved in policies for communications and IT-related sectors (IT service industry). In DOC's policy, considerable importance is placed upon information (not necessarily technology {per se}) as a resource for the economic development and for improvement of public welfare. In this sense, communications policy in Canada comprises a substantial element of policies for IT, on a par with policies for the Ministry in charge of industry and S&T, Industry, Science and Technology Canada (ISTC), that seek to promote the development of the nation's IT industry, IT R&D and technology transfer.

Japan also regards IT-based communications systems as instrumental for economic development, but in a different context from that of Canada. Public interest in information network systems (which heavily utilise computing and telecommunications technologies) is high in Japan. Extensive use of information systems, such as banking and order-entry systems, is considered critical to improvement of the competitive edge of firms. Reflecting such background in the national industry, policies for IT use, IT industry and IT-based information systems are considered inseparable building blocks of policies for IT.

The telecommunications sector is a driving force behind IT R&D in countries, such as Spain and Sweden. To some extent, the same applies to the IT R&D at the State governments in the US. In the situation in which the computer sector is not highly competitive, IT R&D activities tend to address the application in telecommunications systems. This comes from the nature of IT, i.e. information processing systems, which provides a common basis for computing and communications systems.

{2.5 IT in legal issues}

Some countries place relatively heavy emphasis on IT legal issues, compared to issues related to IT industry and S&T. In Austria, Denmark, and Sweden, for example, emphasis placed on legal issues is as high as or even higher than the emphasis given to industry and S&T. As is noted in Sweden's response to the OECD questionnaire, "privacy and security are related to public confidence and trust in a technological oriented society" receive priority concern relative to other policy concerns related to IT.

{2.6 Policy convergence}

The discussion above reflects a wide applicability of IT to many social and economic purposes. IT is felt across all sectors of the economy. This in turn necessitates the involvement of many Ministries in policy subjects related to IT. A width of IT issues also resulted in the gradual convergence of formerly separated policy areas. IT R&D resides in the interface between the tasks of Ministries for industry and S&T, as is discussed above. Ministries for telecommunications are also often involved in IT R&D. This calls for a new categorisation of policy areas when discussing "IT policy".

3. IT policy co-ordination

Most of the Member countries have one or more bodies responsible for co-ordination of IT-related policies. The responses indicated a wide variation between the countries in the status, tasks and budget influence assigned to these bodies.

In many countries, IT-related policy co-ordination is most often the responsibility of Ministries principally in charge of the subject of co-ordination. Such co-ordination is, by its nature, spontaneous or ad hoc. Relevant examples are: Canada (mainly by DOC and ISTC), the Netherlands (by several Ministries), Denmark (mainly by Ministry of Justice for legal issues), and Sweden (by several Ministries).

The tasks of such co-ordination bodies vary widely. Many of them have more than two tasks, such as the formulation of policy guidelines and the monitoring of policy implementation. Eight out of 14 countries responding to the survey indicated that they have a co-ordination body for the development and purchase of information systems inside government. Such co-ordination in many countries includes the formulation of guidelines and programmes for the management, procurement, and utilisation of electronic information processing and telecommunications equipment and systems.

Most of the co-ordination bodies do not have a direct budgetary influence. This may mean that negotiation is a preferred means of co-ordination. For IT-related policy co-ordinations related to specific public actions, such as the provision of financial assistance for the IT development in industry, the lead Ministry taking the programme initiative has control over the budget. Such cases are seen in the Netherlands and Sweden.

Finland and Germany, and to some extent the Netherlands [during the period of the Informatics Stimulating Scheme (INSP) of 1987-1988], have a general co-ordinator for policies for IT. In Finland, the Delegation for Information Technology (TINK) from 1975 to 1991 was a co-ordinator to the major political, economic and social issues generated by the development and diffusion of IT. TINK formulated policy guidelines and made specific proposals on these issues based on its own research. In Germany, the Federal government established three co-ordination bodies in connection with its framework policy for IT, contained in the report "Future Concept of IT, Framework Conditions for the 1990s"F

•Detail of the report is discussed in OECD (1991).

F. These include: the "Inter-Ministerial Working Group of

IT-Policy", the "Federal Government-Länder-Ministerial Working Group for IT-Policy", and the "IT-Round Table Ministries and IT-Industry". Each group is established within the competent Ministry. In the case of the Netherlands, the Ministry of Economic Affairs took the initiative to instigate a formal co-ordination between the co-promotors of INSP; The Ministries of Education and Science, and Agriculture and Fisheries. The government promoted policies for economic development, science and technology, and the development of human resources needed for use and diffusion of IT use under the SchemeF
•For further discussion, refer to OECD (1992 a).
F.

The role and effectiveness of these general IT policy co-ordinating bodies deserve some attention. The Government of the Netherlands terminated the formal co-ordination system after INSP was over. By this time, IT promotion itself had become less important to the Ministries involved, and the government considered IT use should be instrumental in undertaking on-going public actions. What was felt to be needed at this stage was further use of IT and IT-based systems by each Ministry in the implementation of its own goals. TINK in Finland no longer has a general co-ordination function. Only Germany has established a framework for comprehensive policies for IT and co-ordination bodies that cut across different Ministries, Länders and the private sectors. Different experiences in the three countries provide important lessons for other countries as to the necessity and role of IT policy co-ordination on an inter-Ministerial basis.

4. National IT Programmes

All of the respondent countries, except for Denmark reported one or more national IT programmes. The subjects of these programmes reflect the industrial and technological background unique to each country (Major programmes are exhibited in Table III-1). Exhaustive categorisation of these programmes is impossible. Different countries have different problems that require different strategies. Some countries place higher priority on the promotion of the development of leading-edge IT, (e.g. Finland, Japan, Sweden and the US), while others emphasize the promotion of IT use in industry in general through IT integration in production processes and products, (e.g. Austria, Greece and Spain). Member countries, in fact, tend to assign a mixed set of goals to their national IT programmes. Some countries, such as Germany and the UK, have a large-scale programme in which they assign different tasks to different targets. Table III-1, below, presents a tentative attempt to categorise some of the various national IT programmes.

It should be mentioned that the public sectors in some countries play an important role as the largest users of IT-based systems where population of IT users are yet to increase. For example, many programmes involve universities and research institutions. National governments support these programmes for two purposes: to stimulate the use of IT-based systems in the country and to promote the development of educational and R&D infrastructure. The HPCC project in the US and the National Research Education and Information Network in New Zealand are examples of these. In Norway, the government network systems were originally developed for the internal administration but are now being further developed to also link the government sector with the private sector.

Table III-1: Examples of Major National IT Programmes

Category	Country and programmes (Programme period)
A. Leading-edge IT	Finland: Machine Vision (92-96).
	Japan: Fifth Generation Computing System (82-92), The Real World Computing System (92 onward).
	Sweden: IT4 (87-92).
	The US: High Performance Computing & Communications (HPCC) Programme (FY 92/93 onward).
B. IT integration in industries	Austria: Austrian Industrial Research Promotion Fund (FFF) (67 onward), Innovation and Technology Fund (ITF) (88 onward).
	The Netherlands: Programmatic Business Oriented Technology Stimulation (PBTS-IT) (88 onward).
	Norway: IT-Plan for the Industrial Sector (92-95).
C. Promotion of microelectronics (ME)	Canada: ME and System Development Programme (MSDP) (88-93).
	The Netherlands: Grant for stimulating ME applications in products (MiToe) (91 onwards).
	Switzerland: ME Programme (92-97).
D. Pre-competitive R&D	Canada: Strategic Technology Programme (88 onward).
	Finland: Machine Vision (92-96).
	Germany: Promotion Concept IT 93-96).
	Italy: Informatica.
E. Applied R&D	Canada: Industrial Research Assistance Programme (IRAP) (92-96).
	Finland: Graphic Arts (92-95).
F. Science and technology in general	Austria: FFF (67 onward).
	Ireland: R&D Support (ongoing).
G. Promotion of research, industrial, and academic co-operation	Canada: Networks of Centres of Excellence (88-93).
	New Zealand: National Research, Education and Information Network.
	Norway: National Infrastructure for IT (90-92).

H. IT-based networks	• Greece: ATHINA. • Ireland: Information Systems for Education. • Japan: Inter-Industry EDI Pilot Model Development Project. • The US: High Performance Computing & Communications Programme.
I. Telematics	• Finland: TELMO (88-92). • Greece: HELLESTEL (92-93), HELLASCOM (92-93). • Japan: The Frontier Research in Telecommunications (88 onward). • The Netherlands: Programme for Projects in the Field of Telematics (TGP) (91 onward). • New Zealand: World Communications Laboratory
J. Comprehensive IT programme	• Germany: Future Concept for IT (89-93). • Greece: Mediterranean Integrated Programme - IT (86-92). • Portugal: Integrated Programme of IT and Electronics (PITIE) (89-92). • The UK: Joint Framework for IT (JFIT) (88 onward).
K. Software sector	• Ireland: National software Directorate (91-95).
L. Human resources development	• Canada: Canada Scholarships Programme (88 onward). • Ireland: Learning Certificate Vocational Programme (LCVP) (89 onward). • Switzerland: CIM Programme (90-95).

{Source}: Country responses to the OECD questionnaire.

Higher education institutions sometimes play a similar role in promoting IT use by local governments where they are responsible for education policy. Several examples are seen in many of the State governments in the US. The development of IT-based information networks is increasingly coming to be considered as an important means of access to information for higher education institutions in the US. Examples include the New York State Education and Research Network (NYSERNet) in New York and the Texas Education Network (TENET) in Texas. In Tennessee, a university is used as both a testing field for networks and as a centre of knowledge. The State Department of Economic and Community Development started the Telecommunications Applications Partnership (TAP) programme, involving Bell South, the University of Tennessee and state businesses.

5. Goals of policies for IT

{5.1 Current major policy goals.}

A certain level of ambiguity is inevitable in describing policy goals for IT. This is due largely to the fact that IT is often an instrument for the achievement of various existing policy goals and also because policies for IT are not aimed merely at the development of IT industry or the technology itself. All of the countries in their responses to the survey chose more than two options in response to the question on policy goals (Table III-2). This indicates that policies for IT are often directed toward several goals, that may not be described in a simple manner. All the responses need to be, accordingly, interpreted as approximations of policy goals that have a wide variety of meanings, corresponding to the diversity of policy contexts in each country.

Table 2: The current major policy goals
(Multi answer)

Goals	Responses
a. To support the national economic development by the enhancement of competitiveness of national industry.	11
b. To support the improvement of national welfare by the use of information networks enabled by IT.	7
c. To encourage better use of IT in economy and society.	13
d. To support the sound development of the national science and technology basis.	9
e. To support the international development of IT.	4
f. Other.	5

{Source}: Country responses to the OECD questionnaire.

It should be noted that Norway and Sweden responded that policies for IT are considered a means for achieving existing policy goals, and that policy goals for IT itself cannot be chosen. In contrast Germany selected all of the the options. Nonetheless, one common point appear to underlay these country responses: IT plays a substantial role in the implementation of existing policies.

{5.2 Why are these goals selected?}

Member countries shared a consensus that IT use is necessary for the enhancement of industrial competitiveness (Table III-3). Fourteen out of the 17 countries responding to the survey included this option in their responses.

Table III-3: Reasons for the selection of the goals
(Multi answer)

Reasons	Responses
a. Information is becoming a resource for the development of the national economy.	11
b. It is recognised that IT use is inevitable for the enhancement of competitiveness of the national industry.	14
c. It is a national consensus that the support of the basis of the development of science is a role of the government.	6
d. Other.	5

{Source}: Country responses to the OECD questionnaire.

Several variations in the reasons for selecting policy goals are observed, although the importance of industrial implications of IT is common. The most popular reason is based on the recognition of the importance of information as an economic resource and IT as a way to enhance industrial competitiveness. This applies to Canada, Denmark, Greece, Ireland, the Netherlands, Portugal, the UK and the US. Norway and Switzerland may also be included in the same category, although the former pointed out only industrial reasons, and the latter included S&T policy support.

Sweden places importance equally on industrial, scientific and social aspects of IT in its emphasis on policy goals. The development of legal measures, such as privacy and security protection, has high priority and is considered helpful to ensuring public confidence and trust in society where advanced technologies are widely used.

Japan has a broader rationale for selecting policy goals. IT is recognised in that country as a resource for enhancing national welfare in general terms.

Austria, Germany and Italy selected all the options. This indicates that, in these countries, IT is important for economic development in general, as well as for industrial and S&T development. Fragmentation of the reasons seems to stem from the relatively weak focus in policies of IT in Austria and Italy. In Germany, by contrast, it is not a fragmentation of the rationale, but rather a result of the coherent policy framework for IT in that country which embraces all the possible policy areas related to IT. Another reason provided by Germany deserves attention: "Information plays a decisive role in international co-operation and understanding." This idea is one of the key elements the basis for the framework policy in the country.

6. IT policy debates

{6.1 High popularity}

IT policy is a highly popular subject of discussion in the Member countries. Fourteen out of 17 countries responded that there has been discussion of IT policies in the past three years. This discussion takes place in a variety of venues. In addition to regular places such as in parliament, relevant Ministries and the media, industrial associations (in Canada, Japan and New Zealand), seminars (in Portugal) and many other venues are employed. In some countries, sub-national governments have substantial roles in IT policy debate, such as Provincial governments in Canada.

{6.2 Major subjects of discussion}

IT policy debate is often connected with industrial policy (Table III-4). IT R&D and IT skills obtained relatively high response rates in the survey. This may be because these subjects are discussed in connection with IT use in industry. Six countries expressed concern over organisation of policies for IT, reflecting the inherent difficulty associated with developing efficient policies on such a wide-ranging subject as IT.

Table III-4: Major subjects of the discussion on IT
(Multi answer)

	Subjects	Responses
a.	Organisation of policies for IT.	6
b.	IT R&D.	8
c.	Enhancement of competitiveness in national industry.	14
d.	Formulation of legal rules for the use of IT-based systems.	4
e.	The development of IT skills in human resources.	7
f.	Other	3

{Source}: Country responses to the OECD questionnaire.

Detailed review of country responses to this question reveals certain characteristics of each respondent country. For example, the social impact of increasing IT-use is a subject of discussion in Germany. The roles of IT for the future of society including communication patterns and behaviour, and labour-market are examples of subjects under discussion.

Japan indicated that major subjects of IT policy debate include the development and implications of Open Systems. This reflects the fact that in Japan IT pertains to IT-based information network systems, including both tools for manufacturing systems, such as Computer Aided Designing and Manufacturing

Systems and computing systems via telecommunications infrastructure, rather than ME components and stand-alone equipment.

For some countries, a subject of IT policy debate includes a specific sector. The development of the software sector is the major subject of debate in Ireland and New Zealand. These countries seem to have taken a policy initiative in IT-related industries to concentrate resource in the promotion of the software sector, rather than to spread it over many IT sectors.

{6.3 IT policy definition}

Table III-5 below lists the number of countries that have chosen each option:

Table III-5: General definition of "IT policy"
(Single answer, N=15)

Definition	Responses
a. Policies for the development of IT manufacturing and service sectors.	2
b. Policies for the development of national industry in general by using IT.	5
c. Part of policies for the development of science and technology.	1
d. "IT policy" indicates a broad policy framework that includes all the policy areas related to IT.	8

{Note}: A multi answer from one country is included.
{Source}: Country responses to the OECD questionnaire.

These country responses above reveal that there are two kinds of definition of "IT policy", i.e. the one that places IT in a broad policy framework, and the other that has a more narrow industrial focus. Eight countries responded that IT issues are considered in a broad framework that embrace industry and economic development (Denmark, Germany, Greece, Ireland, Japan, the Netherlands, the UK, and the US). "IT policy" for the other group is concerned more closely with industrial policy. Those countries that responded in options a. (IT industry) and b. (industry in general) are included in this group; i.e. Canada, Italy, New Zealand, Norway, Sweden and Switzerland.

7. International co-operation

{7.1 Partners of co-operation}

Existing regional organisations provide a forum for international co-operation on IT in Europe. There exist the tradition of exchange of

personnel and knowledge in Science and Technology between the neighbouring countries in Europe. The most well-known examples are the IT R&D programmes initiated by the Commission of European Communities (CEC) such as the European Strategic Programme of Research in Information Technology (ESPRIT) and the Research and Development in Advanced Communications Technologies for Europe (RACE). The attractiveness of these programmes extend beyond the Community. Non-EC Member States, such as Austria, Norway, Sweden and Switzerland, also participate on project-by-project basis, in connection with ESPRIT and RACE. Another European R&D initiative, EUREKA, also provides a major framework for international co-operation in IT in Europe.

International co-operation in IT R&D at the regional level is also undertaken in the Nordic and Pacific countries. The Nordic University Network and Nordic IT Programme (1986-1990) are examples of the former, and the development of automatic translation systems initiated by Japan with Asian countries, such as Thailand and Malaysia, are examples of the latter.

Common pursuit for R&D for leading-edge IT necessitates wider participation in international co-ordination. The EC, Japan and the US jointly undertake R&D projects on advanced manufacturing systems. Japan has involved international participants in the Real World Computing Systems and, with the EC, is carrying out an ISDN interconnection experiment.

{7.2 Purposes}

Countries seek for and support international co-operation to achieve purposes or solve problems which cannot be done by one country alone. International co-operation serves to augment human and financial resources that one country alone cannot afford. Co-operation is also efficient for the common tasks that are applicable to many countries, such as standardisation and IT policy issues.

Pre-competitive R&D is the most popular subject of international co-operation. The development of the technology base is considered to be a major responsibility for governments in many OECD Member Countries. In addition, the costs of leading-edge IT R&D are great and the work involves high-level expertise. An idea to generate the scale merit in R&D is a natural consequence. Development of human resources by taking advantage of mutual strengths is also intended in R&D co-operation. Above-referenced IT R&D programmes based on Europe are examples of such programmes.

Promotion of technology transfer to enhance advanced use of IT in industry is another reason behind international co-operation. This is the case for Canada, for example, where the integration of IT in production processes and products has high priority in the broader policy of the promotion of the "knowledge-based" economy, i.e. the economy that gain profits from values added to products and services.

IT standards is also a major area of international co-operation for Member countries. International co-operation has been inevitable in the development of IT standards. National systems for standardisation are, as a consequence, well-established in both the countries that have competitive IT sector and that mainly use, rather than produce, IT. These national systems

are working closely with international standards organisations, such as CCITT and ISO.

International organisations provide another useful forum for countries to discuss IT issues other than those related to technology itself. Council of Europe and the OECD, for example, serve an important function in policy deliberations over international rules covering legal issues in IT, such as privacy protection and IT network security. The OECD is also active in other policy issues related to IT.

8. IT policy-making at the regional/sub-regional authorities

The roles played by the regional/sub-national authorities differ from one country to another, depending upon the structure of policy-making institutions in each country. It is difficult to draw generalisations about their roles across OECD Member countries (Table III-6).

Table III-6: The roles of Regional/Sub-regional authorities (Single answer, N=15)

	Roles	Responses
a.	The regional/sub-national authorities have independent roles in the planning and implementation of "IT policy" on local level.	7
b.	The regional/sub-national authorities are more involved in the implementation, rather than planning of "IT policy" on the national level.	7
c.	Other.	1

{Source}: Country response to the OECD questionnaire.

The regional/sub-national governments authorities in North America, i.e. Canada and the US, have high degrees of independence in the formulation and implementation of policies for IT. Provincial governments in Canada are influential in the development of regional economies of which the promotion of IT use in industry is a substantial measure.

State governments in the US play yet different roles in IT-related areas. Forty-four States have central IT policy bodies, according to one recent national survey of State information resource management. At the State government level, however, IT more often means information than technology. Policies for IT mainly refer to information systems management for government administration; policies, standards and guidelines for managing IT resources, plans for the acquisition, management and use of IT resources, monitoring implementation of information management plans and review of IT budget requests and priorities.

The State governments have various structures of policy-making systems. In terms of the status of the IT policy bodies, among the States surveyed by the OECD, three States have independent agencies, one is cabinet-level, and the others are attached to the Departments of Administration, Finance, Treasury or Budget Control. Their major functions vary from one State to another. Some have advisory functions, some have regulatory, and others have consultative functions. Eight out of ten bodies surveyed have influence on budget.

There has been a growing trend to separate IT policy functions from information resource operation. Public actions addressed to the recipients outside of the State government, such as IT diffusion and R&D, are becoming increasingly important. Some of these programmes are undertaken in co-operation with those funded and initiated by the Federal government or government agencies. Regional telecommunications companies (such as the Regional Bell Operating Companies or RBOCs) have substantial roles in some States in the promotion of IT sector by the State government.

The regional/sub-national government authorities with high level of autonomy in policy-making thus have similar roles as those at the national level. This also should be taken into consideration in the development of government policies for IT.

9. Private sector involvement

Fifteen out of the 17 countries surveyed consider assessment of private sector needs essential to policy formulation. Subjects of assessment differs from one country to another, reflecting the difference in the economic and industrial background of each country. For example, in Canada, the Netherlands and Japan, the voices of users of IT-based information network systems are heard by IT-policy makers. So, too, are the voices of the IT components sector. IT R&D is a major subject of dialogue in Finland, Germany, Norway, Sweden and the UK. In Germany, Portugal and Sweden, legal issues are also a main subject of assessment.

Institutional systems for this assessment differ greatly between Member countries. The most commonly-adopted system is to organise a forum through which the government obtain private sector inputs to the policy-making arena. Examples include the Canadian Advanced Technology Association (CATA) in Canada, several informal dialogue groups on specific subjects in Germany, government councils in Japan, the Information Technology Advisory Board (ITAB) in the UK (ITAB also includes academics), a number of committees in the US, such as the Industry Sector Policy Advisory Committees for Trade Policy Matters (There are 17 such committees).

Some countries, such as Austria and Sweden, traditionally have a well-established system for incorporating opinions of social representatives (Social partners) in the policy-making process. Corporate managers, workers and academics are all involved in this system. The governments use such systems for the assessment of private sector needs on IT-related issues.

Bibliography

OECD (1991), "Change in Focus in Information Technology Policies during the 1980s: A Comparison of Changing Public Policies in Austria, Germany and Japan", OECD/GD(1991)62, Paris.

OECD (1992a), "A Comparison of Changing Public Policies for Information Technology in Canada, the Netherlands and Sweden", Paris, 1992.

OECD (1992b), "Reviews of National Information and Communications Technology Policies: Finland", Paris, 1992.

Annex

Definition of IT spending

IT spending is the total of expense made in one country in the following items:

Hardware systems include CPU(s) (central processing units) and basic peripherals. The value of systems included add-on processors, memory, and peripherals as well as revenue for new systems added to the installed base.

Software includes both packaged software and professional services, i.e. customised software.

Data communications

{a. Local area network (LAN) hardware}

Restricted to only the cards required to implement a local area network. Value is normally assigned on a per-node basis, and includes both new networks and nodes shipped into existing LANs. Includes both PC LANs and system LANs.

{b. Other data communications equipment, limited to hardware only}

{1) Modems}

Restricted to analogue and short-haul modems, segmented into dial-up and leased line segments and by speed (14.4, 16.8-19.2, 1 200, 4 800 and 9 600bps). No fibre optic, satellite, packet or broadband modems were included nor data-over-voice (DOV) products.

{2) Multiplexors}

This includes time-division multiplexors, point-to-point TDMs, networking T-1 TDMs, and four types of statistical TDMs; not addressed are coaxial, frequency-division, or DS-3 multiplexors, or digital access cross-connect systems.

{3) X.25 Packet-Switching Equipment}

Includes all packet-switch nodes to route data packets via the most efficient available path and packet assemblers/disassemblers (PADs) to convert asynchronous and/or synchronous data to the X.25 protocol format.

{4) Digital Switching Equipment}

Matrix switches and data PBXs used to connect terminals to computer ports.

{5) Communications Processors}

Front-end systems designed and sold exclusively for this purpose.

{6) Channel extenders}

Devices to extend the distance over which an I/O channel on a single IBM mainframe can communicate with an IBM-compatible peripheral or another IBM mainframe.

Services

The repair or replacement of components of computer systems hardware and other hardware services, namely, disaster recovery, site planning, installation, and relocation. Maintenance revenue may be generated by on-site maintenance, time and materials, parts for self-maintenance, and/or depot services, in each case on a service contract or non-contract basis. It specifically excludes all software support.

END-OF-TEXT