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INFORMATION INFRASTRUCTURE POLICIES IN OECD COUNTRIES

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

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FOREWORD

Modern society relies heavily on information and communications. New advanced information technologies are being developed and exploited on an increasing scale by both the private and public sectors, providing new business opportunities for supplying industries as well as user industries.

Governments realise that adequate action is needed to facilitate and accelerate this transition in order to benefit fully from the economic and social opportunities. Their conviction is that information infrastructures are expected to stimulate economic growth, increase productivity, create jobs, and improve the quality of life. Therefore, governments view that the developments in information infrastructures must be encouraged and supported, and existing or foreseen obstacles need to be removed. Governments themselves have an important role in adjusting the legal and regulatory frameworks. These frameworks cover a range of policy areas (employment, culture, legal, etc.), usually addressed by separate ministries and agencies. In addition, as information infrastructures are not limited by national boundaries, governments have begun to co-operate to discuss a set of common rules in order to build a global information society. Such co-operation began at the G-7 Information Society Conference, in Brussels (February 1995), and continued at the Information Society and Development Conference in South Africa (May 1996).

This paper aims to provide an outline of positions adopted by, or proposed for adoption by governments on the issues of information infrastructures, as of May 1996. Reports from the following OECD countries have been examined: Australia, Canada, Denmark, Finland, France, Germany, Japan, the Netherlands, Norway, Sweden, the United Kingdom and the United States. The EU initiatives are expected to provide an integrated vision for the European Union countries.

1. INTRODUCTION

Modern society relies heavily on information and communications. New advanced information technologies are being developed and exploited on an increasing scale by both the private and public sector, providing new business opportunities for supplying industries as well as user industries. New information services like home-shopping and video-on-demand are being developed to serve residential customers as well. The transition towards an information age is taking place.

Governments realise that adequate action is needed to facilitate and accelerate this transition in order to benefit fully from the opportunities. Most OECD countries are now in the process of developing policies to build the so-called information society. Their general conviction is that information society will result in economic and social benefits: information infrastructures are expected to stimulate economic growth, increase productivity, create jobs, and improve the quality of life. Facing the opportunities provided by the new technologies, governments are asked to react positively to economic and social challenges. In order to obtain the full benefits, governments view that the developments must be encouraged and supported, and existing or foreseen obstacles need to be removed. They see an important role in adjusting the legal and regulatory framework.

Information infrastructures cannot be limited by national boundaries, but are global in scope. Many issues therefore need to be treated in an international context. Aware of the fact that information technologies are not limited by national boundaries, governments have also begun to co-operate to discuss a set of common rules in order to build the global information society.

This paper aims to provide an outline of positions adopted by, or proposed for adoption by governments on the issues of information infrastructures, as of May 1996. Reports from the following OECD countries have been examined: Australia, Canada, Denmark, Finland, France, Germany, Japan, the Netherlands, Norway, Sweden, the United Kingdom and the United States. The programme of the EU is also expected to provide an integrated vision to the European Union countries. G-7 countries examined the possibilities of undertaking co-ordinated actions to stimulate applications and the creation of global information infrastructures at the G-7 Information Society Conference, in Brussels, February 1995. Finally, the initiatives of Korea, which has applied for OECD membership, have been examined. The sources used are mentioned in Appendix A.

It should be noted that the decision-making process in many countries is still on-going. As information infrastructures develop, governments and their advisors are likely to integrate new insights in their policies, and additional reports are being prepared to address specific aspects of information infrastructures. This paper must be viewed as a provisional overview of national initiatives, policies and reflections of the country in question. The recommendations of many of the earlier policy documents noted in this paper are at the stage of implementation.

In general, information infrastructures have become an issue of significant importance which is being addressed, discussed and decided upon at the highest political level, both nationally and internationally. As well, issues raised by the development and diffusion of information infrastructures

cover a range of areas (employment, culture, legal, etc.) usually addressed by separate ministries and agencies. The necessity of co-operation, co-ordination of positions and policies might be the biggest challenge for governments for the coming years.

Besides similarities in views among governments, there are also differences. First, programmes adopt different priorities for the development of information infrastructures. Some focus mainly on services and applications while others primarily discuss networks and physical infrastructures. Second, the programmes take the specific economic, cultural and social situation of the country in question as a starting point.

Defining the subject

Underlying the concept of 'information infrastructures', 'information highway', 'information society' etc. is the common concept of the need to develop and diffuse broadband communication technologies. This infrastructure based on recent technological developments will allow rapid transmission of large quantities of information, which integrate data, video, text and voice traffic at low cost.

The context in which information infrastructures is discussed clearly emphasises the economic aspects, in addition to the pure technology aspects. National reports are addressing the potential impact these technological innovations have on modern society and the economic and social benefits. In this sense, information infrastructures refer to the ability of new technologies to transform the way we work, play, learn and live. Information infrastructures become a requisite for building the information society.

It is clear that foreseen changes are viewed as being evolutionary rather then revolutionary, even if they are often described as an information revolution. As the supply-side continues to develop and innovate, by means such as digitalisation, new transmission and switching techniques, users are continuously searching for ways to implement and exploit the possibilities offered by these new information services. Existing social and economic structures at the macro, meso and micro level are gradually changing.

2. WHAT IS TO BE ACHIEVED

2.1 Economic growth and productivity

All national programmes stress the economic benefits of information infrastructures. Their development is expected to stimulate economic growth, create jobs which require various kinds of skills, and increase productivity, both in the private and public sector.

In Japan, it has been estimated that by building a nation-wide fibre optic network for broadband (fibre-to-the-home), the multimedia market plus the regular telecom market will attain a level of approximately 123 trillion yen (US$ 1 230 billion) in 2010, the year in which the construction of the network is proposed for completion (Japan MPT p. 13-14). Estimates for the United States indicate that the National Information Infrastructure will create as much as US$ 300 billion annually in new sales across a range of industries (US p. 13). Other national programmes forecast economic growth, however, without giving estimates of its magnitude.

Building new networks and expanding existing ones is also seen as a major stimulus for the national economy. In the United States, expenditures between US$ 50 and US$ 100 billion are expected to upgrade telecommunication facilities for the National Information Infrastructure, while in Japan it is

estimated that it is necessary to spend an annual average of about 1 trillion yen (US$ 10 billion) to build an information infrastructure before the year 2010 (Japan MPT p. 46). In France, to build a fibre network to every household by the year 2015, is estimated to cost between FF 150 billion and FF 200 billion (between US$ 30 billion and US$ 40 billion) (France p. 102). In the case of Korea, building the Korean Information Infrastructure, planned to be completed by the year 2015, is estimated to cost 45 trillion Korean Won (US$ 60 billion) (Korea p. 15).

Apart from the above impacts on the macro level, we can specify economic growth in the following three sectors. They are telecommunications operators, terminal equipment producing industries, and content industry.

-- Firstly, the OECD public telecommunication service sector generated revenues of US$ 395 billion in 1992, amounting to some 2 per cent of GDP. Investment by public operators has averaged around 3 per cent of gross fixed capital investment for OECD countries, amounting to some US$ 102 billion in 1992 (OECD Communications Outlook 1995, page 25). The development of information infrastructures will stimulate this market and is expected to increase the share of these industries, according to some estimates, to between 10-15 per cent of GDP.

-- To access the information and communication services, interactive terminal equipment, like Pcs or network computers, will be needed. In 1993, OECD total computing and datacommunications hardware expenditure was US$ 132 billion (OECD IT Outlook 1994, p. 22). Although no estimates have been made by the different countries for expenditures in this area, it is most likely the market for terminal equipment will grow on a steady basis as the information society develops. Indications of these developments were already present in 1994: in this year the world-wide personal computer market grew 20 per cent, driven by a vibrant market and competitive pricing.

-- The content industry will probably be one of the most dynamic sectors. Services like video-on-demand and interactive games are expected to boost the entertainment and audio-visual industry. Publishers and information providers are able to develop new products and services not only on a stand-alone basis but also on networks including internet. In sectors such as education, training and health care, there are also some opportunities provided by the progress in content technology.

Information infrastructures can have an impact on almost all user industries, such as automobile distributors, by providing possibilities to rationalise production and service delivery and increase productivity. Estimates made in the United States indicate an increase in total productivity of the US economy by 20 to 40 per cent by the year 2007 (US p. 13).

The health care sector is frequently mentioned in national programmes, especially the ability to use information infrastructures to reduce costs while increasing the quality of service if no action is taken. Costs in this sector have been increasing constantly and are expected to continue to increase in the future. Information infrastructures are viewed as providing the possibility to alter this trend. For instance, by using Electronic Data Interchange (EDI) to manage information flows between clinics, practitioners and insurance companies, dramatic cost reductions are foreseen. Potential cost reductions are also expected from Telemedicine and Personal Health Information Systems (US p. 14, 15).

The impact of information infrastructures will be dependent on demand. In the past, some new technologies have developed mass-markets in a relatively short time, whereas others have taken decades or have not really taken off. In general, preconditions for the successful introduction of new technologies are related to user-friendliness of both hardware and software, cost, the extent to which these technologies meet customers' needs and the existence of substitutes. Given the scope and complexity of the issues involved in information infrastructures, some analysts believe that it will take at least one generation before the information society can be considered mature. This may imply that estimates concerning economic growth might at this stage be rather optimistic.

A related issue concerns the expansion of communications networks. Ambitious network expansion schemes are being currently undertaken because there will be potential need, and at the same time, there are some indications that current network capacity already exceeds demand. With the ambitious network expansion schemes undertaken or underway, over-capacity becomes a serious risk. To what extent over-capacity will occur depends on how we can recognise the quantitative and qualitative development of demand in the communications market.

2.2   *Job creation*

Several national programmes mention that a positive effect on employment can be brought about by the development of information infrastructures and related applications. Japan, for instance, expects employment in the multimedia sector to exceed that in its automobile industry and reach 2 430 000 jobs by the year 2010 (Japan MPT p. 13-14). The United States expects as many as 300 000 jobs in the next 10-15 years to be created in the Personal Communications Services Industry (US p. 13). Estimates made in France envision the number of employees in the information services sector to double by the year 2005 up to 600 000 (France p. 57). Other national programmes also predict job creation as a result of the development of information infrastructures, especially in new content industries, although estimates are not provided.

National reports do not specify to what extent estimates of job creation constitute a net increase in jobs, taking into account any negative impacts information infrastructures may have on employment. However, countries realise that the transition towards an information society will have negative effects such as job reduction in some sectors and therefore special attention is needed to accompany the transition (Denmark II p. 9, EU p. 13, Japan MPT p. 15).

2.3   *Building on national strength and international competition*

Most countries have identified their national strengths and have based their action plans on them. The existing telecommunication infrastructure is considered to be a valuable asset on which the future information society can be built. Other pillars mentioned include: medico-technical industries (Denmark), publishing sector (the Netherlands, the United Kingdom), IT industry (Canada, Finland, US), financial sector (Denmark, the Netherlands), electronics sector (US).

Some countries view that their strength can also lie in their policy structure -- Finland, Sweden and the United Kingdom consider their regulatory and policy framework, which put privatisation and liberalisation in place, as a competitive advantage. Other national strengths include a high-skilled and highly educated labour force (Australia, the Netherlands), and the widespread use and knowledge of information technology (Denmark, Finland).

The general trend towards liberalisation of the communications market, mainly telecommunications, is quite evident throughout the OECD area. Countries which are relatively in the forefront in opening up their telecommunication market emphasise the potential benefits of open markets (Finland II p. 11, 19, UK p. 22, US p. 11). The effect of liberalisation in communications markets is recognised by all countries. Their national economies will benefit if the potential of information infrastructures is exploited, and they will lose international competitiveness if they lag behind in its development.

The United States points out that information infrastructures will help United States businesses remain competitive (US p. 5). The EU's Bangemann report states in this context that the first countries to enter the information society will reap the greatest rewards and will set the agenda for the counties who must follow. The report also stresses that countries which temporise, or favour half-hearted solutions are likely to face disastrous declines in investment and a squeeze on jobs (Bangemann p. 5).

A similar statement is made by Australia where it is argued that the development of broadband services and networks needs to be encouraged to maintain that country's international competitiveness (Australia I p. 5). Canada also states that to succeed in a global economy based on information, the national communication networks must be knitted into a seamless and powerful information infrastructure serving all Canadians. If Canada does not match the efforts of its competitors in accelerating infrastructure development, opportunities for network, product and service development -- and the resulting economic growth and new jobs -- will be seized by firms in other countries (Canada I p. 5).

2.4   *The geographical impact*

Traditional production of goods and delivery of services have been tied to certain areas because of their need for skilled labour, access to certain information, and to customer markets. For this reason most economic activity is centred in and around urban areas. Information infrastructures provide development opportunities in rural areas while at the same time providing opportunities to reduce or reverse over-concentration in urban areas.

Scandinavian countries, for instance, with their sparse populations and considerable distances, envision new opportunities for rural areas by exploiting information technologies (Finland II p. 8, Norway, Sweden p. 24). Japan has mentioned creating new opportunities in regional areas, which might take some pressure off the Greater Tokyo Metropolitan Area (Japan MPT p. 8). Korea also envisions benefits for its rural areas from the development of information infrastructures, as it fills the regional information gap and revitalises the regional economy (Korea p. 17).

2.5   *Social and cultural objectives*

As discussed earlier, information infrastructures are considered to provide potential benefits to the economy. But the promises of information infrastructures go beyond this, since they are also viewed as providing opportunities to address social challenges. For instance, information infrastructures may enable a certain level of service to be maintained in rural and sparsely populated areas through using remote delivery of services such as distance education or telemedicine (US p. 14, Japan MPT p. 8, Korea p. 17, Norway). People with special needs such as the elderly and the disabled, will have more possibilities to participate in society (Japan MPT p. 7, Denmark I 97, Germany p. 4, Norway).

Information infrastructures provide a tool to reduce environmental damage by reducing the use of paper (Japan MPT p. 12), reduce traffic by using teleworking (Bangemann p. 25), and increase efficiency of traffic flows through the use of information systems (Japan MPT p. 10, Denmark I p. 77, Bangemann p. 27).

As a consequence of the development of information infrastructures, the working environment in many firms is expected to become flexible. This affects skills required from employees, the content of jobs or the location from where work is done. In this changing working environment, constant updating of knowledge and skills, such as life-long learning, is required. Working time arrangements can be made more flexible using information infrastructures.

For governments to support the transformation toward the information society, it is essential to have a clear insight in the social and societal as well as economic impacts of information infrastructures. Existing statistics, data and methodology, however, are often inadequate to measure the effects. National reports do not analyse this issue.

3.   THE LEADING PRINCIPLES

Although many of the developments in information infrastructures are already recognised, the real take-off of information society is yet to come. Governments are now in a position to facilitate and accelerate developments, as well as to anticipate and counter any undesirable side-effects. To guide their strategies and objectives, most countries have launched a set of principles, and eight core principles were adopted at the G-7 Ministerial Conference on the Information Society in February 1995. They are:

- promoting dynamic competition;

- encouraging private investment;

- defining an adaptable regulatory framework;

- providing open access to networks;

- ensuring universal provision of and access to services;

- promoting equality of opportunity to the citizen;

- promoting diversity of content; including cultural and linguistic diversity;

- recognising the necessity of world-wide co-operation with particular attention to less developed countries.

3.1   *Promoting dynamic competition*

3.1.1   *Competitive telecommunication market*

It is widely agreed in the national programmes that information infrastructures are being developed by promoting competition in various communication services. (UK p. 1, 4, Finland II p. 10-11, Sweden p. 18, US p. 8, EU p. 3, Bangemann p.8, 12, Canada I p. 13-14, Netherlands p. 12-15, Australia I p. 10, Japan MPT p. 47, 50 , Denmark I p. 86-87, Germany p. 11).

In many OECD countries, competition in the telecommunication market has been chosen as a leading principle. For this reason, countries with partly liberalised telecommunication markets are expanding competition in areas which were up to now reserved to monopolies. The United States, for example, is reforming communication legislation to allow competition in cable television and local telephony markets (US p. 8). Japan will review its current regulatory framework, which already allows competition in all fields of the telecommunication industry, to further promote private sector activities (Japan MPT p. 49). Canada will apply pro-competitive policies, to the greatest extent possible, in all aspects of the information highway (Canada I p. 13). Australia also promotes competition wherever appropriate (Australia I p. 10).

Apart from the United Kingdom, Sweden and Finland -- who have already liberalised telecommunication markets -- European Union members will adopt a regulatory framework which allows for competition in telecommunication services and infrastructures as from 1 January 1998. Some countries have an additional transition period. The Netherlands has decided to partly open its telecommunication market earlier by allowing a second fixed link operator to enter the market as from the end of 1995 (Netherlands p. 12-13). Norway is planning to follow the European Union's timetable for liberalising its telecommunication market (NII Norway).

3.1.2   Pricing

As experience has shown, competition is effective in reducing prices. However, existing telecommunication tariff structures for access and use of information infrastructures, especially in monopoly markets, hinder rather than stimulate the development of a dynamic market. Even in many markets that have recently been liberalised, prices may be insufficiently low to stimulate new applications.

Various countries analyse the issue of tariffication. For instance, Denmark will establish new tariff principles for telecommunication services and substantially lower prices of broadland connections (Denmark II p. 45). Also the Ministry of Posts and Telecommunications, Japan, will review current tariff structures and examine new structures which will facilitate the development of information infrastructure (Japan MPT p. 51-52). The German report states in this context that the government will address the issue of tariff structures, given the fact that current monopoly and tariff structures create major obstacles for the information and communication market in Germany to develop (Germany p. 11).

3.2   Encouraging private investment

In general, OECD countries consider financing information infrastructures to be primarily the responsibility of the private sector. By introducing or further expanding competition private investment will be stimulated, ensuring cost-effectiveness and lower prices as well as improved and widened services (UK p. 1, US p. 7-8, Netherlands p. 8, 12-13, Sweden p. 18, Australia I p. 10, Canada I p. 13, EU p. 10). The private sector must play the leading role in developing information infrastructures.

Government's role is to encourage private investment by creating a suitable environment: competition and tax incentives are part of this policy (Australia I p. 55, 57, Bangemann p. 8, EU p. 3, Canada I p. 13-14, Finland II p. 19, Germany p. 19, Japan MPT p. 46, 50, US p. 7-8, Sweden p. 7, UK p.15). Governments can stimulate private investment by providing tax incentives and loan guarantees (US p.8, Japan MPT p. 46, EU p. 10, Germany p. ii).

In some cases, governments consider additional funding to ensure all its citizens are being served (Canada I p. 13, Netherlands p. 24, Denmark I p. 24). Commercially non-attractive projects, for instance in rural areas or specific facilities for the disabled and the elderly, might have difficulty in obtaining private investment funds. In these cases OECD countries consider additional public funding or provide grants for non-profit institutions (Canada I p. 13, Australia I p. 57-58, Netherlands p. 24, US p. 23).

3.3 *Defining an adaptable regulatory framework*

Governments must provide an effective regulatory framework which stimulates the development of information infrastructures. Regulations must be effective in the sense that they provide an environment in which information infrastructures can fully develop. Important issues in this respect are the convergence of telecommunication and broadcasting, the security of information systems, the protection of personal data and the privacy of individuals, and intellectual property rights (Australia I p. 10, Canada I p. 13, Finland II p. 18, Germany p. ii, Korea p. 14, UK p. 11, 20, Norway, Sweden p. 13-14, Netherlands p. 11, 15, Japan MPT p. 49, 53, US p. 9, France p. 48).

As a result of technological developments, historical distinctions between the characteristics of the telecommunication, broadcasting and computing industries are gradually disappearing. This enables cable television companies to provide telephony services and public telecommunication operators to provide services like interactive television and video-on-demand. Separate regulation of telecommunication and broadcasting, however, hinders the convergence of these sectors. In order to promote an integrated services market many OECD countries are in the process of reviewing their regulatory framework (Japan MPT p. 51, Netherlands p. 15, Denmark I p. 71, Finland II p. 11, US p. 8, Australia I p. 51, Sweden p. 14). Although many OECD countries underscore the importance of safeguarding their culture and language, existing regulations in the field of broadcasting, including entertainment, will probably be adjusted to meet the requirements of the new information services.

Issues related to ownership can be expected to play an essential role in the review process. First, there is the issue of cross-sectoral ownership. Governments have to decide whether or not they maintain or impose such restrictions and, if so, for which sectors this applies.

In the United Kingdom, for instance, the government announced in the 1991 White Paper that it will not review existing restrictions on PTOs concerning delivery of cable entertainment services on a national basis to retail customers before 2001 (UK p. 12). The Broadband Services Expert Group notes that ownership and control of broadcasting and telecommunication are subject to considerable regulation in Australia. This issue was also addressed by the European Commission in its Green Paper "Pluralism and media concentration in the internal market". In the near future the European Commission will take a position on the different options regarding the need and the appropriate level of intervention (EU p. 7).

Another important item deals with foreign ownership. With only a few exceptions, most countries currently have some sort of restriction on non-national ownership applicable for sectors like telecommunication and broadcasting (Communications Outlook 1995). The Information Highway Advisory Council of Canada, for instance, advises maintaining Canadian ownership requirements for communication industries (Canada II p. 10).

Countries recognise the importance of establishing a flexible regulatory framework which can keep pace with constant change. In order to benefit from the potential of information infrastructures in the short term, it is essential that the framework is reviewed and/or adjusted in a timely manner. This means that the decision-making process must be accelerated compared to current general practice.

3.4   *Providing open access to networks*

In order to realise the economic and social objectives, full access to networks and the information transmitted over these networks is necessary for both service providers and users. Specific regulatory and technical conditions, among which standards, to enable interconnection of networks and interoperability of services at the national and international level is essential (EU p.4, Japan MPT p. 52, US p. 9, Sweden p. 18, Canada I p. 13, Denmark I p. 25, Finland II p. 12, Norway).

3.5   *Ensuring universal provision of and access to services*

All countries believe that participation in the information society must be ensured through the availability of information infrastructures to all at affordable prices. To achieve this, the current concept of universal service can be reviewed, including the expansion of the coverage of universal services (US p. 8, Australia I p. 10, Canada I p. 13, Japan MPT p. 51, Norway, Sweden p. 18, EU p. 5, Finland II p. 7, Denmark I p. 24, Germany p. 10, UK p. 18, France p. 117).

Access to information is a basic right for every citizen. To safeguard this right, OECD countries are expected to expand the universal service concept, currently applicable to telephone services only, to access and usage of information infrastructures. However, national reports do not go into detail as to the scope of an expanded universal service concept or the type of financing mechanism envisaged.

Defining an expanded universal service concept is not possible at present nor is it desirable given the current stage of development of information infrastructures. Although addressing the issue is legitimate, a premature definition of a new universal service concept may endanger the development of information infrastructures.

3.6   *Promoting equality of opportunity to the citizen*

Specific attention is given in national reports and policy papers to the potential threat of a two-tier society of "haves" and "have-nots": those familiar with the use of information technology and who therefore are able to participate in and benefit from the information society, and those not familiar with the technology or unable to obtain access to it (Denmark I p. 16, 29, Bangemann p. 6, Finland II p. 11, Germany p. 10, Norway, US p. 8, Japan MPT). To avoid this threat, countries want to ensure that information infrastructures are available to all by reviewing the concept of universal service including the possibility of its expansion, as is mentioned in the previous item. Education and training is another fundamental element in preparing people for the information society.

3.7   *Promoting diversity of content, including cultural and linguistic diversity*

One of the main characteristics of the information society is globalisation: markets integrate towards a global economy as goods, services and information flow from one country to another, and from one continent to another. These flows provide opportunities for cultures to meet and learn from each other (Japan MPT p. 3). New information technologies give more opportunities for expression of the multiplicity of cultures and languages (EU p. 11). Information infrastructures can be exploited to make a country better known world-wide (Finland II p. 19). Culture in itself can be exported, contributing to economic growth and job creation (Australia I p. 43, Canada I p. 20).

When it comes to importing these cultural products, however, there are some countries that regard this as a threat. Countries have emphasised the need to protect their culture and language (Canada I p. 11-12, Denmark I p. 73, France p. 46, 120, Germany p. 18, Sweden p. 7, 25).

4.   HOW TO GET THERE

Governments are currently preparing to implement their strategies based on the principles above. Given the enormous scope and complexity of the task ahead, most OECD countries have established special groups to help in implementation or delineation of policy, to give advice and/or focus on specific issues. This section is also arranged taking into account the chairman's conclusions at the G-7 Ministerial conference on the information society.

4.1   Promotion of interconnectivity and interoperability

The potential provided by information infrastructures can be maximised when interconnection of networks and interoperability of services are assured, both at a national and an international level. The standardisation process, including what we call 'forum' activities, is essential to achieve interconnection and interoperability. Being aware that setting standards can provide a competitive advantage, governments want to co-operate more closely with industry and standardisation agencies (US p. 9, Sweden p. 19, Japan MPT p. 54-55, Canada I p. 24, Australia I p. 54, Denmark I p. 83, Germany p. 1, Norway).

4.2   Developing global markets for networks, services and applications

4.2.1.   Networks

Information infrastructures are largely based on broadband communication technologies. Unlike existing networks which are restricted as to the datastreams they can carry, broadband networks can carry integrated data, video, text and voice traffic, and therefore have the capability to carry multimedia service and allow interactivity.

There is still insufficient consensus as to whether information infrastructures require fibre to the home, fibre to the curb, or whether other network architectures are appropriate. Rapid technological developments in transmission technologies (compression techniques) suggest that a sufficiently high data rate may be obtained to satisfy many requirements using existing infrastructure without immediately investing in fibre-to-the-home. This, together with the existing costs of investing in fibre and uncertainty about residential demand, is a major reason why private investors are cautious and often choose to upgrade existing networks rather than investing in fibre-to-the-home on a mass scale.

Most OECD countries discuss the appropriate technologies for the delivery of applications over information infrastructures only in terms of developments, and some leave the decision on specifics in the hands of industry. For example, the United Kingdom's report stresses the fact that: "The government considers efficient infrastructure is best developed by competing providers, rather than by promoting a single all purpose switched two-way infrastructure. A competitive environment tends to reduce the gap between the development and the deployment of new technologies, products and services, thereby rapidly increasing the products and services available to customers. It is worth noting that there is a good deal of debate -- and disagreement -- as to how highly developed communications networks will need to be, and how fast new, interactive services will be taken up. A key advantage of competition in infrastructure and services is that market pressures promote innovation, investment, and experimentation." (UK p. 4-5).

On the other hand, proposals have been made for active support and stimulation by governments in the extension of broadband networks. The most far-reaching proposals have been made in Japan, France, and Korea where it has been recommended to the government to invest in fibre-to-the-home to be completed, respectively, by 2010 and by 2015 in both France and Korea (Japan MPT p. 27, France p. 108,

Korea p. 7). Both France and Japan are stimulating the development of cable television networks (MPT News, October 31, 1994). The European Commission has proposed a series of guidelines as well as a multi-year action plan for the development of ISDN as a trans-European network. In addition, the concept of a European Integrated Broadband Communications Infrastructure is being promoted.

4.2.2.   *Applications*

In regard to the development of information and communication applications, governments in general see their role as facilitating and stimulating the development and use of applications by putting in place the appropriate regulatory frameworks which are based on a competitive market.

Many governments also see a need to establish general frameworks or visions for the development of applications. Following the recommendations of the Bangemann Group, the Commission is setting up a European Broadband Steering Committee involving all relevant actors to develop a common vision and to monitor and facilitate the realisation of overall concepts through, in particular, demonstrations, and choice and definition of standards (Bangemann p. 21, EU p. 8).

In the United States, the National Telecommunications and Information Administration has held hearings around the country to get the views of interested parties on the National Information Infrastructure initiative, and the United States Government has established the Information Infrastructure Task Force and Advisory Committee to obtain and co-ordinate the views of government agencies and the private sector (US, p. 19). Australia established a Broadband Services Expert Group and the Communications Futures Project to define the impact of developments in information and communications infrastructures and applications for Australian business and society.

Governments promote the use of information infrastructures and raise awareness of the possible benefits (Bangeman p. 26, Denmark I p. 80, Norway, UK p. 16). Governments also have constant dialogue with, among others, the private sector to exchange visions and positions (Canada I p. 13, Germany p. 14, UK p. 10, US p. 7).

There is a range of multimedia products and applications being developed for different markets. It is generally agreed that public assistance needs be minimised and that the private sector already has the experience to exploit various applications in order to improve the goods or services delivered, increase productivity, reduce the 'time-to-market', and enhance flexibility and competitiveness.

The residential market, already an important consumer of information, communication and entertainment services, may become one of the principal driving forces in the development of information infrastructures markets. This would provide the necessary critical mass for new information and communication services (Bangemann p. 9, Japan MPT p. 29). Entertainment applications such as video-on-demand and interactive games are considered to be the most promising areas (Australia I p. 27, Denmark I p. 69-75, 94, Bangemann p. 10). Other applications for this market are, for example, teleshopping and teleworking. Teleworking is an application governments show special interest in, mainly to reduce commuting traffic.

The public sector, as a large potential user of information and communication services, can also stimulate the development of information infrastructures through providing the critical mass for new service applications. By becoming leading-edge users of information infrastructure applications, governments would be able to set an example and show the benefits of these technologies and applications to society as a whole. The use of information infrastructures is viewed as improving public services,

reducing costs, but the potential benefits go beyond economic-driven objectives as they can contribute to a more transparent, responsive public administration with services better accessible for the public (Canada I p. 9, US p. 17, Sweden p. 14, Denmark I p. 33-44, Finland II p. 14, Germany p. 18, Norway, UK p. 17, Japan MPT p. 10, Korea p. 4, 17, Netherlands p. 20, Australia I p. 21-23, Bangemann p. 5).

4.3 *Ensuring privacy and data security, Protecting intellectual property rights*

The main role of governments is to provide an effective regulatory framework which stimulates the development of information infrastructures. It affects specific sectors such as telecommunication and broadcasting as well as specific issues such as privacy, security and intellectual property rights.

With the widespread use of information technologies in modern society, protection of privacy and personal data as well as the security of information systems must be assured in order to maintain public confidence. Another challenge concerns defining intellectual property rights which provide the right balance between protecting right holders of content, on the one hand, and the free flow of information and knowledge, on the other. Realising the development of information infrastructures depends on solutions acceptable to all actors involved, OECD countries consider these issues to be of high priority and address them both on a national level and an international level (UK p. 20, 21, Canada I p. 14, Finland II p. 18, Germany p. 10, US p. 9-10, Australia I p. 73-79, Japan MPT p. 53, Denmark I p. 45-46, Sweden p. 13, Netherlands p. 11, France p. 100-101, Norway).

4.4 *Co-operating in R&D and in the development of new applications*

Research and development has contributed to the development of information infrastructures. At the same time, information infrastructures have enabled scientists to improve and expand their research, often interacting with colleagues all over the world, sharing data and information regardless of geographical location. All OECD countries are aware of the importance of research and development in general, and information infrastructures-related R&D in particular. Governments are supporting this by increasing or reallocating existing funding to information technology-based areas (Denmark I p. 57, Canada I p. 11, Bangemann p. 30, EU p. 10, Finland II p. 16, Germany p. 14-15, Japan MPT p. 47, Norway, US p. 23, UK p. 10).

In various cases governments are participating in pilot projects and testbeds to demonstrate the potential of information infrastructures and stimulate their development by working closely together with all the actors involved. For some years now the European Union has supported the development and deployment of networks and applications, including telematic services for small and medium-sized enterprises, telematic applications for transport in Europe, trans-European public administration networks, and urban information highways (EU p. 12). In order to stimulate the development of information infrastructures, most countries have pilot projects, in some cases assisted through government funding.

In general, the national reports state that no additional public funding will be available to finance the development of information infrastructures in sectors such as education and health care. Experiences, however, indicate that costs for network installation, investments in hardware and software, fixed as well as usage charges, training of staff, etc. are in general too considerable to allow these institutes to fully utilise the possibilities provided by information infrastructures. Additional public funding, at least in the initial phase, may therefore be necessary.

4.5   *Monitoring of the social and societal implications of the information society -- education*

For a number of reasons, education is considered to be important for the implementation of information infrastructures. First of all, by using information infrastructures new and better forms of education and training are possible. These infrastructures enable institutions to support a more diverse range of curricula and to reduce their dependency on local teaching resources. Teachers and students can have access to a greatly expanded range of educational material on the network. Information infrastructures allow for distance education or remote learning regardless of location or time, reducing restrictions on access to education services (Bangemann p. 25, Netherlands p. 19, Australia I p. 23, US p. 17, Denmark I p. 59-60, Canada p. 9, France p. 72-73, Germany p. 4, Norway, Sweden p. 10-11, UK p. 8).

By using information infrastructures in education and training, school children, students and employees become familiar with the technology. For the individual this is important given the need to work and live in a society that is more and more based on information technology: for enterprises it is important to have human resources capable of using and/or developing new information services in order to stay competitive nationally and internationally (Japan MPT p. 53, US p. 16, Norway, Sweden p. 10, Canada I p. 31, Finland II p. 15, Denmark II p. 36-38, Bangemann p. 6).

Most OECD countries have started or will start building networks linking schools, integrating computer-based education material as well as starting pilot projects for various specific educational and training applications. References in national reports to the protection of culture and language applies particularly to education. Several countries emphasise the necessity of developing applications based on the national identity i.e. culture and language (Sweden p. 11, Denmark I p. 29).

Some reports present figures on access to computers in schools:

Denmark: 1 computer per 25 (all PC types) or 40 (advanced PCs) pupils in primary and lower secondary schools in 1992 (Denmark I p. 108)

Goal is to increase the number of PCs in a number of years to 5-10 pupils per PC (Denmark II p. 37)

Finland: 1 computer per 43 pupils in primary and lower secondary schools in 1992 (Denmark I p. 108)

Norway: 1 computer per 21 (all PC types) or 56 (advanced PCs) pupils in primary and lower secondary schools in 1993 (Denmark I p.108)

Sweden: 1 computer per 38 pupils in compulsory schools (9 year); 1 computer per 20 pupils in upper secondary schools (Sweden p. 41).

US: 1 computer (mainly obsolete) per 9 students/pupils, estimate (Teachers and technology: making the connection, US Congress, Office of Technology Assessment, 1 March 1995).

4.6   *Timetable*

Many countries have published a time schedule for the completion of various proposed policy initiatives. The scope of these actions, however, varies.

For instance, the proposals made in France have suggested a goal to finish building the network infrastructure by the year 2015 and the Japanese report recommends completion of the network by the year 2010 (France p. 108, Japan MPT p. 35). The Korean government plans to establish a high-speed government network by the year 2010 and a public information network interconnecting companies and households by the year 2015 (Korea p. 3, 4, 7).

The Australian Expert Group recommends broadband links be provided to all schools, libraries, medical and community centres by the year 2001 (Australia II p. 60). In the United States, the aim is for all classrooms, libraries, hospitals and clinics to be connected to the national information infrastructure by the year 2000 (Administration White Paper on Communications Act Reforms p. 5).

The Danish government wants networks and information services such as electronic mail and EDI operational in both the public and private sector before the year 2000. Various concrete actions, mainly in the public domain, are scheduled for the next few years (Denmark I p. 28-29). Sweden has also published several actions in the public domain to be finished within the next few years (Sweden p. 11, 13, 15,). The Netherlands has published a timetable concerning adjusting and reviewing its legal and regulatory framework in the period 1994-1998 (Netherlands p. 13-17).

Providing a timetable can help making targets explicit. However, given the tempo at which technological developments take place, a constant update and review of these timetables -- especially those over the long-term -- are essential.

5.   GLOBAL INFORMATION INFRASTRUCTURES

Not only on the national level but also on the international level, governments have been stimulating the development of information infrastructures and have been working closely together to reach agreement on a set of common rules to build global information infrastructures. This term was introduced by United States Vice President Al Gore at the World Telecommunications Development Conference at Buenos Aires.

The issues involved are to a large extent similar. Global information infrastructures are envisioned to improve the quality of life of citizens throughout the world as they provide social and economic benefits. For instance, it bears the potential for better social integration; enhances the progress of democratic values; enables sharing as well as preserving cultural traditions and identities; stimulates economic growth; and permits a better balance in economic and social progress between nations.

The development of global information infrastructures is being stimulated through intensive cooperation between, among others, governments, industry, and international organisations such as the OECD, ITU, WTO, ISO and WIPO. As formulated by G-7 countries, collaboration takes place on the eight main principles which were mentioned under 3 above.

The G-7 countries have launched a number of joint pilot projects on a global level to be initially undertaken by the G-7 partners, but which will become open to all countries. The 11 projects include a global inventory of information regarding major national and international projects and studies relevant to the promotion and development of the global information society; facilitating the establishment of international links between the various high speed networks and testbeds supporting advanced

applications; cross-cultural education and training; electronic libraries; electronic museums and galleries; health care applications; and government on-line. The projects aim to demonstrate the potential of global information infrastructures and stimulate its deployment (G-7 conclusions, G-7 pilot projects), (see Appendix B).

In the OECD, a Statement of Policy Recommendations on GII-GIS made by the ICCP Committee was endorsed by the OECD's Council at Ministerial level in May 1996. The Statement endorsed the G-7 principles and suggested policy directions in such areas as regulatory framework, role of government, market competition, electronic commerce, interconnection and open access, interoperability and standards, universal service, global information society issues such as content, cultural and linguistic diversity, security, privacy and IPR. In addition the Statement covered the need for global co-operation to address the needs of developing countries and, not least, drew attention to the need for new statistics and indicators to meet the requirements of a rapidly changing information economy and society.

Within the Asia-Pacific region, specific initiatives are being undertaken to contribute to the development of global information infrastructures. For instance, Japan has suggested its support in building an "Asian Information Infrastructure "(AII) (Japan MPT p. 55). The Asia-Pacific Economic Co-operation (APEC) forum launched an action programme concerning the building of the Asia-Pacific Information Infrastructure (APII). The guiding principles in establishing this information infrastructure for the Asia-Pacific region are similar to the issues mentioned for global information infrastructures.

One of the most important challenges for all governments in order to establish global information infrastructures, is how to deal with current inequality between developed and developing countries. This has already been pointed out in the G-7's chairman's conclusions as one of the eight core principles. For instance, the number of main telephone lines per 100 inhabitants in the OECD area in 1992 was 47.5, the number was 1.5 for Africa. Present trends to freeze or cut down aid funds bear the risk of widening the gap rather than closing it.

After the G-7 Ministerial Conference on the Information Society, South African Executive Deputy President Thabo Mbeki challenged the G-7 and the European Commission to exchange views on such questions as strategy, finance and international co-ordination in confronting the global information and communication challenge. On his proposal, the Information Society and Development Conference was held in South Africa in May 1996.

According to Chair's Conclusions at this conference, after the endorsement of eight main principles at the Brussels conference, they resolved to continue the dialogue and take appropriate action on 13 key policy issues as Common Principles. In addition, they committed to 6 items as Collaborative Actions. They are shown in Appendix C.

APPENDIX A

Australia: Networking Australia's Future (July 1994, Broadband Services Expert Group, Interim report): Australia I.

Networking Australia's Future (December 1994, Broadband Services Expert Group, Final report): Australia II.

Canada: The Canadian Information Highway: Building Canada's Information and communications infrastructure (April 1994, Industry Canada): Canada I.

Providing new dimensions for learning, creativity and entrepreneurship (Progress Report of the Information Highway Advisory Council, November 1994): Canada II.

Denmark: Info-society 2000 (November 1994, Ministry of Research): Denmark I.

From vision to action: info-society 2000 (March 1995, Ministry of Research and Information Technology): Denmark II.

European Union: Europe and the Global Information Society: recommendations to the European Council (Bangemann Group, 26 May 1994): Bangemann.

Europe's way to the information society. An action plan (European Commission, 19 July 1994): EU.

Finland: Finland's way to the information society: the national strategy (1995, Ministry of Finance): Finland I.

Developing a Finnish information society: decision in principle (1995, Council of State): Finland II.

France: Les autoroutes de l'information (Gérard Théry, 1994).

Germany: Multimedia: Chance und Herausforderung (Multimedia: opportunity and challenge) (March 1995, Ministry of Education, Science, Research and Technology).

Japan: Reforms toward the intellectual creative society of the 21st century: program for the establishment of high-performance info-communications infrastructures (31 May 1994, Telecommunications Council, Ministry of Post and Telecommunications): Japan MPT.

Programme for advanced information infrastructure (May 1994, Ministry of International Trade and Industry): Japan MITI.

	For achieving globalisation of an "intellectually creative society": interim report (23 January 1995, Telecommunications Council, Ministry of Post and Telecommunications).
Korea:	Korean information infrastructure: blueprint for implementation (1995, Ministry of Information and Communication): Korea.
The Netherlands:	Actieprogramma Elektronische Snelwegen -- van metafoor naar actie (Action programme Information Superhighway -- from metaphor to action) (December 1994).
Norway:	Norwegian information infrastructures (6 March 1995, Ministry of Government Administration): NII Norway.
	Innspill til norsk bidrag til informasjons-infrastruktur (Proposal for a National Information Network, NIN) (25 January 1995).
Sweden:	Information technology: wings to human ability (August 1994, Government Commission on Information Technology, Prime Minister's Office).
United Kingdom:	Creating the superhighways of the future: developing broadband communications in the UK (November 1994, President of the Board of Trade).
United States:	The national information infrastructure: agenda for action (15 September 1993, NTIA/IITF): US.
	National information infrastructure: progress report September 1993-1994 (NTIA/IITF).
	Global information infrastructure: agenda for co-operation (31 January 1995, Vice president of the United States, NTIA/IITF).
G-7:	G-7 ministerial conference on the information society: theme paper (European Commission, 23 January 1995).
	Full text of the chair's conclusions issued by the G-7 ministers (27 February 1995).
	G-7 information society conference: pilot projects. Executive summaries.
ISAD	Information Society and Development Conference: Chair's Conclusions (13 - 15 May 1996).
APEC	APEC ministerial meeting on telecommunications and information industry: May 29-30 1995 (Ministry of Information and Communication, Republic of Korea, 1995): APEC.
OECD	Global Information Infrastructure -- Global Information Society (GII - GIS): Statement of policy recommendations made by the ICCP Committee.

APPENDIX B: G-7 PILOT PROJECTS

THEME	OBJECTIVE
Global Inventory project	To create and provide an Internet-based multimedia inventory of information regarding national & international projects.
Global Interoperability for Broadband networks	To provide a common basis for the promotion of joint R&D, demonstration and pre-commercial trials of advanced high speed services and applications.
Cross-cultural Education and Training	Network-based intensive cross-cultural education and training.
Bibliotheca Universalis	To advance international co-operation toward the establishment of global electronic library systems.
Multimedia Access to world Cultural heritage	Interoperability of multimedia cultural heritage databases, availability of software products and services on telecommunication networks, & a better appreciation of world cultures.
Environment and Natural Resources Management	To increase the electronic linkage and integration of sources of data and information relevant to the environment and natural resources.
Global Emergency management Information Network Initiative	Develop and implement systems to acquire, process, manage, display and disseminate information to support decision making for natural, technological, biological and humanitarian disaster responses, environmental monitoring and risk management.
Global Healthcare Applications	To facilitate the work of public health institutions to fight against infectious diseases, to help increase efficiency of epidemiological and clinical studies, the establishment of a global teleconsultation system, nomenclature, coding and standards with tools for navigation and access to networks with harmonisation of security standards for patient-related data exchange.
Government On-line	To promote collaboration in the area of best practices and to improve public services through the increased use of on-line systems.
Global Market place for Small and medium-sized Enterprises	To contribute to the development of global electronic environment for the open and non-discriminatory exchange of information for the benefit of SMEs, and to expand electronic data interchange / electronic commerce to enable enterprises to carry out their business.
Maritime Information Systems	To demonstrate the potential and benefits of applications for a broad range of maritime activities in fields of safety, protection of environment, exploitation of marine resources and increased competitiveness of maritime industries.

APPENDIX C: COMMON PRINCIPLES AND COLLABORATIVE ACTIONS

Key policy issues

- universal service;

- clear regulatory framework;

- sustainable socio-economic development;

- employment creation;

- global co-operation and competitiveness;

- diversity of applications and content;

- diversity of language and culture;

- co-operation in technology;

- private investment and competition;

- protection of intellectual property rights;

- privacy and data security;

- narrowing the infrastructure gap;

- co-operation in research and technological development.

Collaborative Actions

- fostering partnerships between the public and private sectors;

- continue or begin a process of national information society planning in each of our countries which is ultimately in concert with the development of a Global Information Society;

- encourage further discussions towards identifying and implementing global Information Society Projects in conjunction with non-governmental organisations and international organisations;

- share information on best practices of development programmes and usage of information and communication technologies;

- call upon international organisations to re-assess and refocus their development tools to give active follow-up to the principles and policies identified at this conference;

- fully utilise various policies and private and public financial instruments available for the development of the Global Information Society.

Source: Chair's Conclusions at the Information Society and Development Conference (May 1996)