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English Summary and Conclusion



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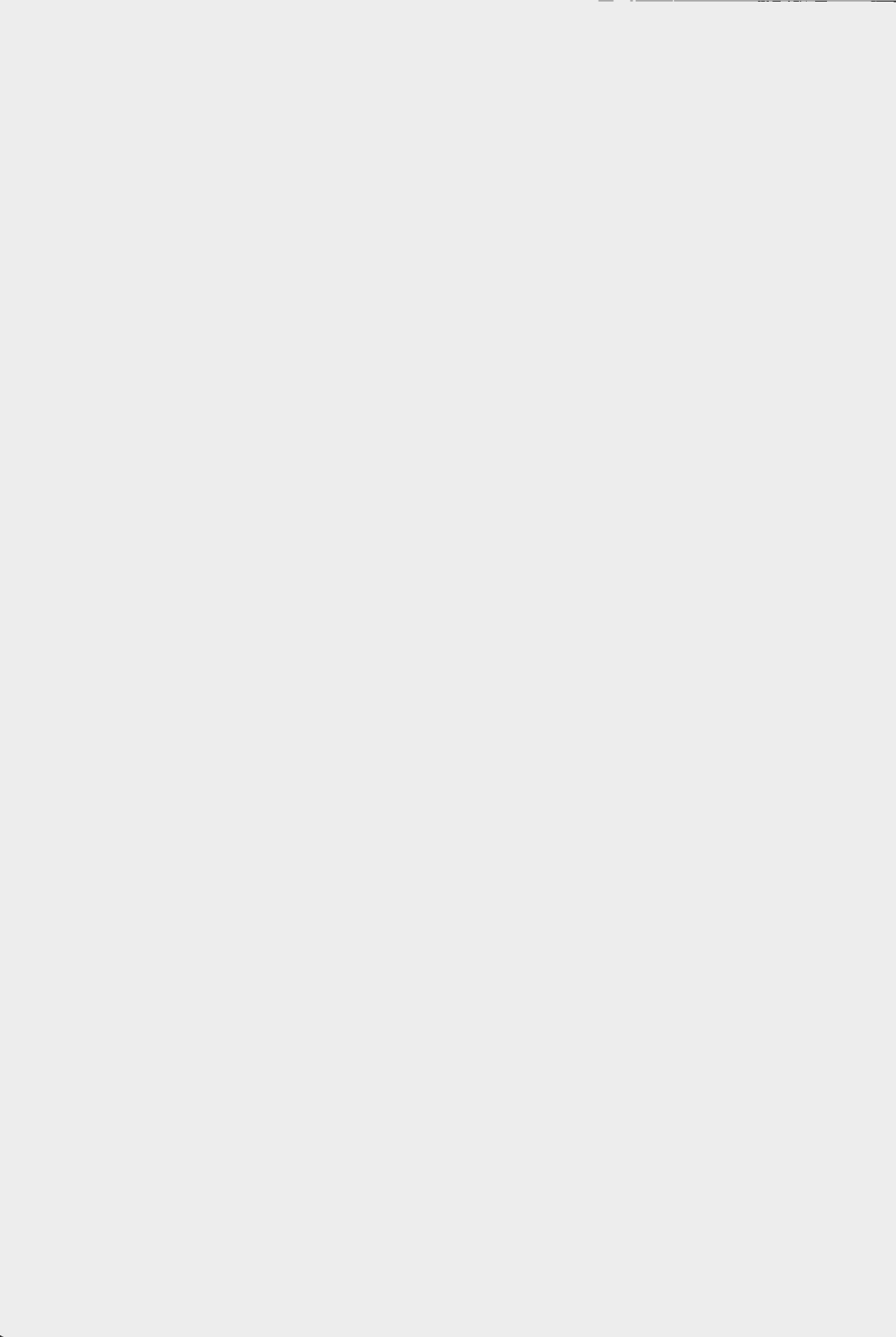
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English Summary and Conclusion

*Utbredningen om tekniska förutsättningar
för utökade sändningar av radio och television
till allmänheten*



Foreword

On the 8th of June 1995, the Swedish Government decided to appoint a Commission to investigate the possibilities of digitising the network for terrestrial broadcasting in Sweden (Appendix 1). The Commission's terms of reference were to present a basis for making a decision on the transition to digital technology for broadcasting terrestrial TV.

On this basis I was appointed to carry out the work of the Commission.

In the work of the Commission there have been representatives participating from inter alia the following organisations – Expert group for studies on Public Finances (ESO), The Swedish Institute for Economic Research, The Swedish Post Board and the Swedish Board of Telecommunications, Swedish Television Company AB, Telia AB, Telia Research AB, and Teracom Swedish Radio Broadcasting AB.

In accordance with this task, I submitted on November 13th 1995 to the Minister of Culture, and Head of the Ministry an interim report.

I now submit the report (SOU 1996:25) "From Massmedia to Multimedia – Digitalisation of Swedish Television."

My task is thereby completed.

Stockholm February 1996

Lars Jeding

Director General
Special Commissioner

Summary

Issues

The general debate over television in Sweden has largely concerned what is being broadcast and what should be broadcast. It has focused on rules governing the content of violence, sex and pornography in broadcasting. It has also focused on individual programmes that entertain, provoke and stimulate debate. The debate has also been about whether to have commercials or not on TV.

Public debate over television has in addition focused on the performance of those who are currently broadcasting and the criteria for determining new entrants to this area. The favourable position of SVT, a new channel – TV4 – with the same number of viewers and broadly equivalent to the public service channels, Kinnevik, Nethold and the other players.

To-day the issues focus on how TV programmes should be broadcast. Over a terrestrial network, via satellite, or by cable? Answers to these questions also affect the answers to the questions concerning what should be broadcast and who should be able to broadcast.

Above all, this debate concerns the power of the general public, the consumer and the individual viewer, and the extent to which they can independently choose from a much large number of programmes. In the digital scenario of the future, it will not be the programming schedules that determine mass viewing behaviour. The individual through interactive services has the opportunity of deciding when to look at a specific programme and perhaps also even choose the viewing angle.

However, the question of how programmes should be broadcast is bigger than the TV media and the TV market. The new digital broadcasting systems bring to the very forefront the debate on the wider issues concerning the information and multimedia society. The development of the digital network for TV broadcasting can be regarded as a step on the road towards an expansion of the electronic super-highway.

The Task of the Commission

My task is to provide a basis for decisions on a possible to the use of digital technology for the terrestrial broadcasting of TV as a substitute for the analogue broadcasting systems currently being used. Nearly all Swedish households will be able to receive programmes via terrestrial broadcasting. This report looks at alternatives to the current situation, where terrestrial broadcasting is limited to a smaller number of analogue channels, while other channels are broadcast via satellite and cable. Other possible trends will also be described.

My task has been to describe technical and frequency preconditions, the opportunities for broadcasting local and regional TV, estimate costs for society, the general public and companies in the TV area, draw up time perspectives for the transition to the new technology, as well as provide proposals to the Government for decisions on these issues. In addition, issues concerning industrial-commercial policy consequences and processes will be dealt with. The degree of uncertainty in the assessments will be made explicit.

Swedish Television – History and Present Situation

The history of Swedish television in terms of events:

The 1950s TV broadcasting starts.

The 1960s: TVs are in many Swedish homes. Two TV channels.

The 1970s: Colour TV and regional broadcasting.

The 1980s: Cable and satellite broadcasting.

The 1990s. A third terrestrial TV channel.

The Broadcasting Network

To-day nearly all Swedish households are able to receive broadcasts from the publicly owned terrestrial network directly or via cable TV. In Sweden there are three national channels broadcasting via the terrestrial network, SVT1, SVT2 and TV4. Programmes are broadcast on both a national and regional basis.

Government licensing to use the network is subject to certain demands on the programmes, geographical range, regional and local production, measures concerning stand-by for national emergency situations etc. These so called public service requirements apply in the first instance to SVT channels, but also to some extent to TV4.

Approximately 100 satellite channels can be received in Sweden. Eleven of these aim specifically at Swedish viewers. Around 600,000 Swedish households have satellite dishes for the direct reception of satellite broadcasting, however, most broadcasting is distributed to households via the cable network.

A licence is not required for broadcasting programmes via satellite, and thus no demands are imposed on programme content in addition to those arising from EU quotas and regulations on advertising.

More than half of all TV households are connected to the cable TV network where capacity is normally between 30–40 channels. Terrestrial and satellite broadcasting may also be transmitted via cable in the last loop to households. 1.4 million households receive TV1, TV2 and TV4 direct from the terrestrial network, while 2.2 million households receive these via cable.

TV broadcasting via cable does not require a licence. According to the "must carry" principle, the cable TV companies are obliged to carry the terrestrial channels without additional payment .

Approximately 3.4 million households pay a TV licence, which is used to finance public service companies. At present SVT is also allowed to finance programmes through sponsoring. TV4 is financed mainly through commercials and sponsoring. Satellite channels are financed through commercials, subscriptions and/or charges for programmes.

The Viewers

On an average day around four out of five Swedes will look at TV. Viewers spend around two hours per day watching TV. The consumption of TV has not increased significantly despite a substantial increase in the supply of programmes.

Half the population watch TV4, i.e. slightly more than the number looking at the public service channels SVT1 and SVT2. The commer-

cial channels TV3 and Channel Five have substantially lower viewing figures, whilst the other TV channels cater for around approximately 9 % of all viewers.

Public surveys on TV viewing lead me to the following reflections.

Public service TV has great value for the general public, and will continue to do so even after the total supply of programmes increases significantly as a result of new channels

In addition when Swedes have greater access to foreign TV channels, there will still be a large demand for Swedish produced TV programmes on domestic, especially the public service channels.

The Surrounding World

A review of TV broadcasting developments in neighbouring countries, in other leading European countries as well as in USA and Japan, shows that digital TV (see below) is making rapid progress. In my Commission I have been principally interested in the development of digital terrestrial TV broadcasting, an issue which many other countries are currently dealing with.

Digital TV Technology

TV programmes can either be sent in analogue or digital form. Today almost without exception, all TV is sent via analogue technology. Regular digital broadcasting has started and digital terrestrial broadcasting on a test basis was carried out in Sweden for the first time in November 1995. Before TV sets with digital reception become available in the stores, viewers will need an additional device on their TV receivers, a set-top box to be able to receive digital broadcasts.

The Characteristics of Digital TV Technology

The most important characteristics of digital TV distribution technology:

- Large transfer capacity i.e. many channels and additional information within a given frequency wave band.
- Makes possible locally independent reception of terrestrial broadcasting, as well as portable reception within and outdoors with simple or built-in aerials.
- Increased capacity to withstand noise, echo, and interference from other radio signals.
- Flexibility concerning a varied supply of TV programmes and new types of services, including those with a high degree of interaction.
- Encodability for different types of pay TV or for copyright reasons.
- Lower energy and distribution costs.

Other Usage Areas of Digital TV Distribution

The technology of digital distribution makes it possible to send a number of different TV programmes in the same transmission and broadcast a wider supply of quality levels of the same programme.

Digital technology can also facilitate interactive TV services such as pay TV, educational programmes, quizzes, information searching etc. This type of technology opens the doors to new types of TV e.g. high definition TV (HDTV), alternative scheduling and time flexible broadcasting, different viewing angles and contents.

Standardisation of Digital TV

A prerequisite for complex technical co-operation involving a number of players to function, is that all of these to a certain extent "do the same" i.e. apply common standards. Standards are also the precondition for large volume production as well as low costs for equipment that is a part of the system e.g. set-top boxes in TV-households.

Decision on international standards for the compression of picture and sound as well as multiplexing was made during 1994. Decision on European standards for broadcasting technology for satellite and cable was made in 1994. Decision on a proposal for a European standard for terrestrial digital TV was made in 1995. Decision on adopting a formal standard is expected to be made in 1996.

In the USA, a proposal was put forward in 1995 for a standard for terrestrial TV and HDTV. An American standard is expected to be adopted in 1996.

Models for Digital Distribution of Television

In the Commission's report different models are presented as to how television in digital form could be distributed to the general public.

Digital Broadcasting in the Terrestrial Network

A digital terrestrial scenario encompasses a total of six digital networks covering at least 90 % of all households. It is estimated that four networks will provide at least 98 per cent coverage. The networks can be subdivided into regions and thus make possible local independent reception. Up to 24 nation-wide digital channels can be distributed via these networks. If any of these channels were reserved for regional purposes, the total number of TV channels available would be much greater.

If analogue or digital networks in densely populated areas were developed for local broadcasting instead of a nation-wide digital network, the number of nation-wide digital channels would be limited to 15–20 units.

If the present analogue network were phased out, an additional 4–6 digital networks could be developed. As a result, there would be a total of 10–12 nation-wide digital networks with scope for a total of some 50 channels as well as scope for local, digital broadcasting.

High definition TV could also be broadcast. At present, this would require a network that is totally digital, and the same capacity as four digital channels of normal quality.

Satellite Broadcasting

The capacity required for broadcasting an analogue channel via satellite could be used to broadcast instead around six TV programme

services. Satellite broadcasting provides good coverage at a low cost, but can not be geographically localised.

Satellite reception requires an obstacle-free path towards the south. In towns and built-up areas etc. there could be difficulties connected with achieving this. Access to cable networks is thus often a necessary complement.

Being entirely reliant on satellites as the only distribution form, or this in combination with cable TV networks, would from the point of view of society be less appropriate for national security reasons.

If the coverage of the terrestrial network provides, for example, 98 % coverage of all households, the remaining households could be reached by satellite broadcasting.

Broadcasting via Cable and Telecom Networks

Approximately half of all households receive their TV programmes via cable or equivalent. Cable TV networks usually exist in relatively densely populated areas. Digital terrestrial broadcasting will probably reduce the importance of being linked up to cable networks supplied via terrestrial networks.

For households connected via cable to also benefit from the increase in digitally broadcast programmes, cable companies will have to provide programmes in digital form to the individual subscriber. A cable TV network can easily be equipped for digital broadcasting. A digital channel in a cable network takes up the same frequency space as an analogue channel, and has the capacity to provide 6–8 digital channels of normal technical quality.

As regards interactive services, cable distribution has an advantage in that the return channel is located inside the cable TV network. Cable TV networks have to some extent already been prepared for carrying the return signal.

The Telecom Network

Within a few years it will be technically possible to transmit pictures via the telecom network with quality levels ranging from home video

to studio quality, depending on transfer capacity in the final link to the subscriber. The technology has until now been regarded by almost all households as too expensive to be used .

Transmission of TV programmes via the telecom network to the individual subscriber requires lines suited for high speed digital broadcasting which are also suitable for telephony. This requires inter alia a new generation of exchanges, ATM exchanges that have just started to be used in the telecom network.

From a technical point of view, distribution via the telecom network can be made specific to the level of the individual. Via the telecom network it should be possible to provide services through TV.

Other Network Possibilities

The report also examines future possibilities for distributing TV via copper networks, cellular omnidirectional high frequency transmitters and optical fibres.

Government Involvement

Active public media policy requires long-term planning concerning technical issues, which means that the Government must decide on which strategy to apply to digital television. Decisions and regulations are dependent on decisions made within the EU.

The legislation on the media was not drawn up to take account of the transition to digital broadcasting. Rapid technological development of multimedia could well lead to the need for completely new legislation. Media legislation and agreements with programme suppliers do not take account of the introduction of digital technology or its associated problems. According to the proposed new Radio and TV Act, the Government can, however, make the kind of broadcasting technology used, one of the conditions for granting a licence. The Act on Radio Broadcasting is in principle also applicable to digital technology. Regulations within this area normally require a law since they concern freedom of expression.

The Act on Radio Broadcasting etc

The Act on Radio Communication does not allow the Post Board and the Board of Telecommunications to take the initiative in implementing digital technology. However, the Act makes it possible to deal with these issues after the technology has been introduced.

As a result of digital technology, problems concerning distribution may occur, where the legislation is insufficiently precise and where additional legislation may be needed to solve particular problems, or where a broadcasting licence is issued. When issuing a licence, the Government and The Swedish Radio and Television Authority must thus consider to what extent the licence should be made dependent on specific technical preconditions.

The Law does not contain any procedural regulations for the types of tendering existing internationally within the area of radio broadcasting and which could be of relevance in the future. The lack of international agreements concerning frequency usage for digital TV broadcasting provides an element of uncertainty.

Agreements with Broadcasting Companies

Agreements with broadcasting companies do not take account of issues concerning digital technology. There is inter alia a lack of clarity concerning the initiative to digitalise, the opportunities for broadcasting companies to provide pay TV services, and the use of alternative forms of distribution. Issues concerning digital technology must be dealt with when licences are issued or come up for re-negotiation.

Government Influence over Programme Content

The extent to which Government influence can be exercised over satellite and cable broadcasting is very limited. Formal requirements on broadcasting and programme content are minimal. There are difficulties involved in maintaining existing regulations.

Broadcasting moving pictures in the telecom network may fall outside the scope of media legislation and constitutional laws on freedom of expression. Broadcasting via the telecom network is

difficult to monitor. Developments in digital technology reduce public influence and control over the supply of moving pictures. Development may result in the need for completely new legislation concerning multimedia.

Financial Consequences

The financial consequences of changing over to digital TV broadcasting have been analysed in three econometric models. The zero alternative where the Government does not invest in digital transmission, the second, the main alternative assuming a transition to terrestrial broadcasting, and a third alternative where SVT channels and TV4 are broadcast digitally via satellite and cable.

The estimates are based on a number of assumptions on inter alia the behaviour of households, price changes of receiving equipment etc. For this reason, the results are not a forecast, but rather an econometric model to illustrate the financial consequences of different assumptions.

In the first instance, the transition to digital TV broadcasting calls for considerable investments in receiving equipment on the part of households. In the zero alternative, these investments are estimated as being SEK 5.6 billion over the period 1996-2007, i.e. an average of SEK 500 million per year.

The transition to digital terrestrial broadcasting increases the need for investment, since all households will need receiving equipment to view SVT channels and TV4 when analogue broadcasting stops after the year 2007. Investments are estimated to approach SEK 9 billion if the set-top boxes are open, and SEK 9.7 billion if they are closed.

In the satellite/cable alternative with analogue broadcasting closed down after 2007, household investments are estimated at between SEK 9 and 10 billion if the set-top boxes are open, and between SEK 9.8 and 10.8 billion for closed set-top boxes.

If the digital terrestrial broadcasting network is fully expanded to 24 digital channels from year 2001 onwards, the transmission costs for the SVT channels and TV4 are estimated at SEK 780 million per year during the period 1997-2007, and SEK 170 million per year

when analogue broadcasting has ceased. If terrestrial broadcasting only covers three channels, the transmission costs for each of these channels will be higher, since total costs will not be distributed among as many channels. The transmission costs in this case are estimated at SEK 900 million per year 1996–2007, and thereafter at SEK 380 million per year.

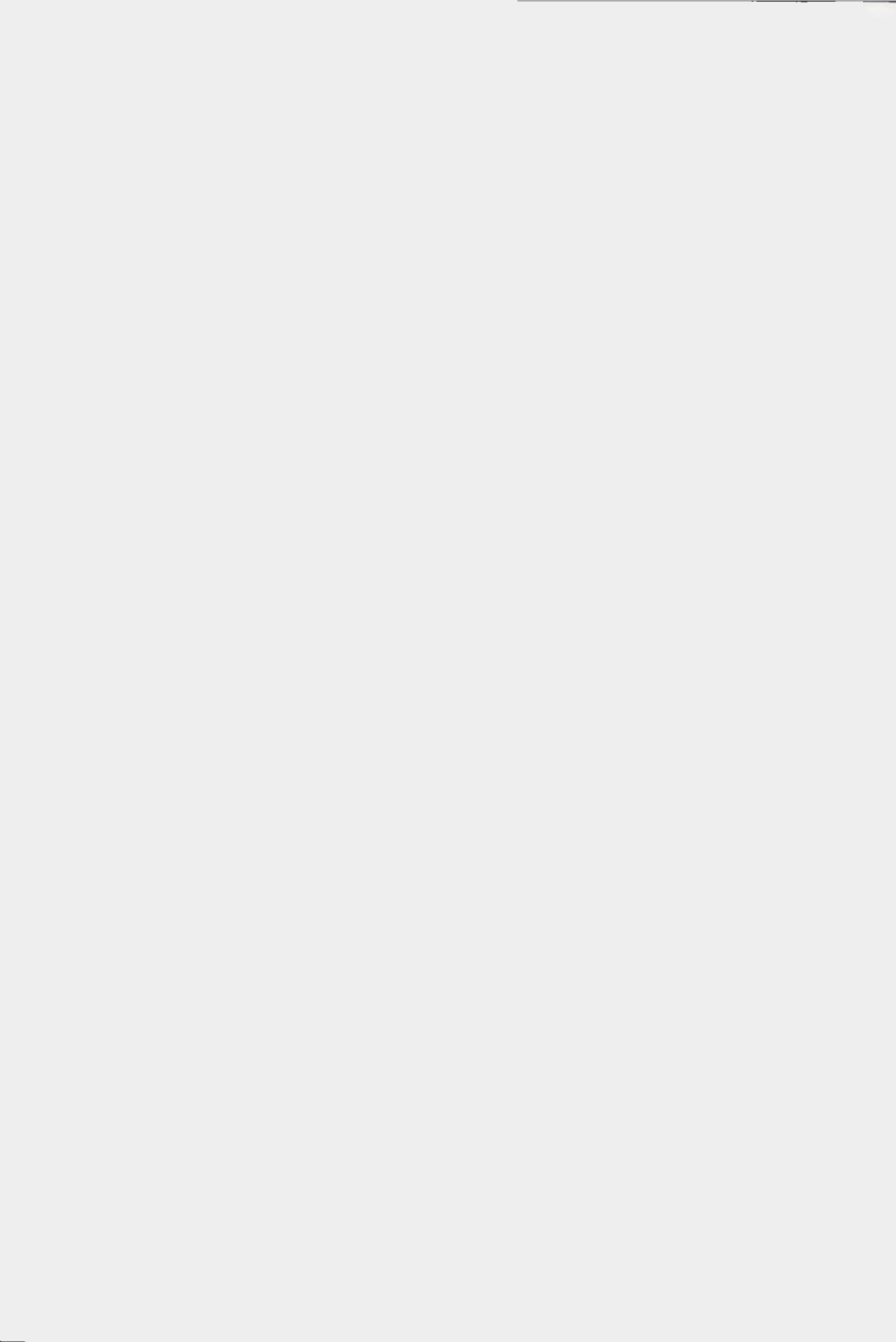
In the alternative where SVT channels and TV4 are transmitted via satellite/cable, the costs of satellite transmission are added to the costs of analogue terrestrial transmission. For national security reasons, this presupposes both link and satellite broadcasting to ground-based transmission stations. Over the period 1997–2007, total transmission costs are estimated to approach SEK 790 million per year. When analogue broadcasting is discontinued, the only remaining transmission costs are those for broadcasting via satellite, and these are estimated to amount to SEK 70 million per year.

Digital Television from an Industrial-commercial Policy Perspective

Digital TV gives us a taste of what to expect in the multimedia society of the future. Different media, different markets and different players will tend to converge in a multimedia mix.

Digital information processing technology requires an advanced infrastructure to be developed, whilst this very infrastructure itself when established provides opportunities for new applications that can hardly be anticipated to-day.

The interest in new areas of application is primarily connected to the opportunities that information technology opens up for us as consumers and citizens in terms of access to new services in the home. From a different perspective, information technology may also be described as a breakthrough technology providing the foundation for completely new products and services, as well as influencing the production and consumption of existing products and services. In the future, great expectations are connected to information technology from an industrial-commercial perspective.



Considerations and Proposals

Considerations

Introduction

In a number of respects important issues on the technological prerequisites for increasing television broadcasting have crystallised recently. In contrast to the situation a couple of years ago, there are to-day standards for digital TV. Another factor helping to clarify the situation is the progress within the EU on co-operation concerning common approaches to the development of digital TV. As a result, it is now opportune to put forward proposals on issues that earlier were left open by various Commissions on television.

The task of my Commission concerns the technological prerequisites for TV broadcasting. In the course of the Commission's work, it has become evident that this issue in itself transcends the purely technological aspects of television, and that it affects areas other than television.

Strategic choices between different broadcasting alternatives are dependent on the answers to the question why the Government should involve itself in this "technical" area. I regard it as vital to focus on both the media policy and industrial-commercial policy aspects of increasing broadcasting opportunities.

It should be emphasised that my proposals are intended to chart a route for the strategic decisions to be made by the Government. In this respect the report is thus not a final action plan for the digitalisation of television in Sweden.

Considerations over Media Policy

The Government's actions on questions concerning radio broadcasting are based on the view that radio, and especially TV, are powerful instruments for exercising influence. The Government has, since tele-

vision was first introduced, emphasised the importance of TV media serving the general public and democratic interests.

The description of Swedish media policy in my interim report (1995-11-08) can be summarised as follows.

The conditions for permitting TV broadcasting are based on freedom of expression and information in its broadest sense. Everyone should be able to receive the programmes broadcast, irrespective of place of residence. Programmes should give expression to the basic idea of democracy, the principle that all persons are of equal value, as well as the freedom and dignity of the individual. Programmes should be impartial and objective. By means of plurality and quality, TV should meet and satisfy differing needs and interests. Programmes should supply news and comment, provide comprehensive information, stimulate debate, lead to an exchange of experience and stimulate the imagination. Television should provide a fora for public debate where different views may be expressed in balanced programmes. Television should safeguard the Swedish language and programmes produced by Swedish authors. Persecution of minorities, child pornography, unlawful violence as well as slander (offence against freedom of speech) should all be vigorously resisted and counteracted.

Will the Government also in the future maintain a media policy having these key characteristics? If not, could the introduction of new technology for TV broadcasting be completely transferred to market forces without the involvement of the Government ?

I assume that the contrary will apply i.e. that the Government will henceforth wish to assert public, civil interests concerning television. This assumption is of crucial importance for my considerations and proposals.

In order to implement media policy within the area of television, the Government uses three "instruments". Access to and control over distribution networks, legislation and other forms of regulation for TV broadcasting, as well as providing support and promotion for various types of programmes to be shown through public service companies.

The effectiveness of regulations have decreased as a result of satellite TV and increasing internationalisation. A breakthrough in digital transmission will change the extent to which the Government is able to run media policy with the same instruments as before.

Surveys on media viewing habits of the general public and the TV audience's choice of channel and types of programmes mean that public service activities do not have the same significance in terms of media policy as they did a decade ago.

This increases the relative importance of what public control can and cannot do as regards distribution. This leads on to the following technical considerations.

Technological Considerations

Developments concerning TV broadcasting and other technological facts on which my proposals are based have been extensively dealt with.

A decision was made in 1994 on international standards for the compression of pictures and sound as well as multiplexing. The following year a European standard was established for satellite and cable broadcasting technology. A proposal on standards for digital terrestrial TV was formally adopted this year. An American standard for terrestrial TV broadcasting and high definition TV (HDTV) is also expected to be adopted this year.

Digital TV broadcasting is continuing on a regular experimental basis in a number of countries. In Sweden regular digital satellite broadcasting has been started. Experimental tests using terrestrial broadcasting were implemented for the first time in November 1995 . In a number of other countries, including the UK and the USA, some definitive steps have been taken to develop the terrestrial network for digital broadcasting.

It is thus evident that digital television stands on the verge of a breakthrough. The arrival of standards accelerates development on a broad front. The issue for the authorities in this area is not whether to adopt the new broadcasting technology or not. The issue is whether digital development should be steered by market forces, or whether the authorities should influence the "where", "how" and the purpose for which the technology has been developed.

Digital broadcasting in comparison to analogue broadcasting, means the following for TV viewers:

- A greater supply of programmes since a larger number of TV channels can be broadcast within the frequency range required for broadcasting a single channel using current analogue technology.
- Better picture and sound quality.
- The opportunity for individuals to choose programmes and products, choose viewing angles, take part in quizzes, and quickly navigate between numerous channels.
- Interactive possibilities.
- Better conditions for developing multimedia terminals in the home for TV, radio, computer and telephony.

The transition from analogue to digital television assumes that households in the initial stages need what are called set-top boxes for converting digital signals for reception in to-day's analogue TV receivers. The socio-economic costs of this are considered below.

Within the framework of what is technically and economically feasible, my proposals for a system for expanding digital terrestrial broadcasting are based on factors related to the consumer's freedom of choice, breadth in the supply of programmes and the preconditions for public service channels to compete for the viewing public.

Consumer Freedom of Choice

The need for technical equipment in the home can have an influence on the supply of programmes and the viewer's freedom of choice. There is a difference between open and closed set-up boxes .

From a technical viewpoint, an open system is in principle competitively transparent in the sense that consumers are able to choose channels and individual programs as and when convenient. Open systems thus contribute to a more consumer oriented market.

Closed systems on the other hand limit the consumer's freedom of choice. Broadcasting companies and network operators who have succeeded in "placing" their systems in a household, attain a gate-keeper role which gives them the opportunity of determining to a certain extent the conditions for accessing channels, thereby making it more difficult for competing broadcasting companies to enter the market .

It would in my view be a great disadvantage for the whole of society and for consumers, if individual players were to establish such a dominating gate-keeper role on the Swedish TV market. It is important that households are offered a system that is open and technically "neutral" from a competition viewpoint. In such a system commercial players should be able to charge for their services over a specific period (subscription) or for individual programmes (pay TV). This is entirely possible. Technically each operator can determine the accessibility of its channel without limiting the consumer's freedom of choice in the overall supply of programmes.

The Supply of Programmes

As stated above, the public should be offered a multifaceted, high quality supply of TV programmes to satisfy varying needs and interests. Digital broadcasting technology by expanding the frequency limits for the number of channels contributes to this development. It is economic factors rather than the availability of frequencies that set the limits to the supply of programmes.

The first precondition for a wide supply of programmes is, of course, that all households in the country can receive the programmes that are broadcast. In practise, the ambition is to achieve a coverage factor equivalent to to-day's analogue channels in the terrestrial ground net, i.e. approximately 98 % of households as SVT1, SVT2 and TV4 have.

The supply of programmes should be financially and technically accessible to the public. It should be possible for viewers to choose programmes at their convenience, i.e. they should not be locked for a lengthy period into an agreement with a network providing limited programme packets. It should be easy for viewers from the convenience of their "arm-chairs" to move between different program channels.

The Position of Public service Channels

It might have been thought that the need for public service TV would decline as a result of the number of different channels more than doubling during the last decade. It might also have been thought that the expansion of broadcasting opportunities as a consequence of digital TV would marginalise the significance of public service programmes.

New commercial channels have in the first instance resulted in an increased supply of entertainment and sports programmes. The goal of media policy to offer the general public a balanced supply of programmes (diversity) emphasises the need for channels which safeguard the supply of news, debates and culture etc, all of which constitute the core of public service TV.

Experience from different countries shows that the conditions for maintaining public service activities are crucial when determining the approach to be taken to the new broadcasting technology. This is true of Finland where the Commissioner emphasised the need for balance between the public service channels and purely commercial channels. This is also true of the U.K. where the government proposed that the BBC should be offered its own multiplex for its channels. It is also true of many other countries that have a TV and media structure which is comparable to that of Sweden.

Given this, I assume that the Government will also in the future wish to safeguard the special position of public service activities. For this reason, it is in my view desirable that the SVT channels remain in the same technological reception environment as the majority of other programmes. This will help to ensure that viewers will "find" these channels.

Conclusions

An overview of the models for digital distribution of television deals with the conditions for terrestrial broadcasting, broadcasting via satellite and broadcasting via cable and the telecom network. These different models usually assume a certain degree of co-operation between different types of networks feeding each other before the final step of linking into the home. My proposals apply, however,

above all to this last stage which is vital if consumers themselves or the players on the TV market are going to control the choice of channel and individual programmes.

Transfer via cable and the telecom network in the future will correspond to the high demands placed on coverage, supply of programmes, freedom of choice, interactivity, technical reception quality etc. A possible strategy for the Government is thus to stimulate the development of such distribution systems and until otherwise decided continue with both present and additional analogue terrestrial broadcasting systems.

However such distribution systems due to technical and economic factors will not be possible within the next 10–20 years. This would in the meantime leave the field free for the players in the market to develop digital TV on purely commercial grounds. In my view given such a development, it is not possible to ensure consumer freedom of choice, a wide supply of programmes and public service activities.

The main opportunity for the Government to counteract this lies, as I see it in providing the players with alternative broadcasting opportunities in a common network in Sweden i.e. a terrestrial network.

My proposal elaborated on further in section 10.2.1 means that the terrestrial network should be built up for digital broadcasting. This should begin at the latest by 1997, if the first stage is to be completed within two years at the latest. In order to ensure that the requirement of achieving almost total market coverage is fulfilled, analogue broadcasting of present terrestrial channels should proceed during the period households start acquiring the necessary equipment for receiving digital signals. This transitional period should, however, not be more than 10 years.

Financial Considerations

My view is that the aims of to-day's media policy can be maintained in a new technological TV environment, provided the Government decides on a rapid development of the digital terrestrial broadcasting network.

A key question is thus what will be the financial conditions during the transition from analogue to digital broadcasting.

My assessments are based on the three quantitative models presented. I emphasise once again that these examples are based on a number of assumptions, amongst others, the household's willingness to invest and on price changes regarding equipment for receiving programmes.

Household demand is affected by price trends, with the converse being true, that price trends are affected by household demand. In addition household demand is affected by the supply of new TV channels, which in their turn are influenced by the number of viewers the broadcasting companies can be expected to reach through this network. Developments regarding financial results from the broadcasting system are thus difficult to assess.

The transition to digital TV will have cost implications on the production of programmes, broadcasting, and reception. And these will change during the transition from analogue to digital TV, and also when analogue TV has been phased out. In my assessments I have assumed a transition period of around 10 years.

The Government can influence developments by means of different economic stimulation measures that will facilitate the transition to digital TV distribution.

In the report I have not presented any basis for calculating the cost consequences for the broadcasting companies and independent program producers in the production phase.

The views that I have examined show that the new technology should, however, result in significant savings through above all increased accessibility and reusing material produced earlier. In addition, there should be a reduction in costs of processing and finalising (editing) recorded programme material. My calculations do not, however, cover the profits arising from SVTs activities.

The transition to digital TV broadcasting calls for considerable investments in receiving equipment, especially on the part of households. In the alternatives presented, these costs are expected to approach between SEK 9 to 10 billion, irrespective of whether the transition is to digital satellite/cable distribution, or digital, terrestrial TV distribution.

As regards broadcasting costs, which make up a small part of total TV costs, there are, however, some differences between these alternatives. While the costs of a program broadcast via digital

satellite/cable are annually SEK 5–10 million, the costs of such a programme broadcast through a digital terrestrial network are SEK 40–50 million. However, in both cases the broadcasting costs are significantly lower than the distribution costs of analogue TV channels.

A digital terrestrial network with scope for a much larger number of broadcasting companies than there are to-day in the analogue network, provides the network owner, ultimately the state, with new sources of income. For franchise owners, terrestrial broadcasting can lead to better financial results compared to the alternative of broadcasting via satellite, assuming that terrestrial broadcasting covers almost 100% of households.

Financing digitalisation is a political issue that requires more secure underpinning than can be presented at this juncture. Interest amongst prospective franchise holders should be gauged after the Government has taken the first decision in principle to develop the digital terrestrial network. Such a decision can be assumed to create new conditions for preliminary discussions between net owners and the commercial players on the market.

Legal Considerations

Public regulation of television is widespread. Sweden, however differs somewhat from the international pattern. In contrast to the situation in many other countries, TV broadcasting via satellite and cable is regulated to a very limited extent.

Similarly our constitutionally protected Freedom of Expression Act does not permit detailed regulation as can occur in other countries. Relative openness in Swedish society symbolised by and achieved through the principle of public access and the Freedom of Expression Act, also characterise the mass media area.

In Sweden there are also laws on what may and may not be said and shown on TV. In some respects, domestic rules require greater restraint on the part of broadcasting companies and distributors than what is required by the minimum rules laid down in the EU directive.

New distribution forms and an increase in the supply of TV have extended society's influence over programme contents. This influence varies with the licensing requirements of different types of broadcasting networks. The impact is greatest in the control of terrestrial

television, and least in the telephone network and videograms. In broad terms, there are two levels regulating contents. A lower level for broadcasting via satellite, and cable networks not requiring a licence, and then a higher level which is required for terrestrial broadcasting via wireless.

However, not even the fulfilment of the limited requirements imposed on satellite and cable broadcasting can be monitored and maintained satisfactorily. Broadcasting companies can, for example, choose a base elsewhere and link their programmes to satellite broadcasting from countries with low requirements on contents. Another problem is the issue of the relationship between the parties involved in the event of a legal dispute. On occasion it has been difficult to determine who is responsible for specific transmissions since satellite and cable broadcasting does not require a licence.

The new Radio and TV Act should not lead to any major change in this respect. The influence of the Government over TV broadcasting via satellite and cable networks will remain limited.

For society to be able to intervene against violence, pornography, slander etc in TV programmes, totally different measures would be required in the long term. The starting point should be technological development where different media are provided in a common multimedia structure. The basis for such steps should be developed by the expert group on multimedia issues, which I proposed should be established.

In the short-term, the strategy should attempt to increase supply in the terrestrial network and thus reduce the importance of broadcasting by satellite and cable. Broadcasting over the terrestrial network provides better opportunities to determine conditions regulating programme content and to ensure that the rules are applied.

For the digital terrestrial network to be an effective "tool" of media policy, the Government must be able to make strategic exemptions concerning regulations. On the one hand, far-reaching regulation could reduce the interest of programme producing companies and other players in broadcasting over the terrestrial network. On the other hand less regulation might well mean far too great a divergence from media policy. It should be noted that it is very difficult to re-regulate what has once been de-regulated.

In a digital terrestrial network, where there is much greater scope for a much larger number of programmes than in the analogue network, EU legislation sets limits on the extent to which national rules determining content can exceed the minimum levels laid down by the EU Directive. Given this I consider that the principles and conditions for having access to broadcasting in the new network should be drawn up. This would lead to increased interest in broadcasting via the terrestrial network.

Proposal

As a result of the factors mentioned above, I propose the following.

- The Government should in Spring 1996 make a decision in principle on the transition to digital terrestrial TV broadcasting in Sweden.
- Development of the terrestrial network for digital broadcasting should begin by 1997 at the latest, and the first stage should be concluded within two years after this decision. This first phase should provide broadcasting opportunities for eight nation-wide channels, i.e. five new channels, in addition to SVT1, SVT2 and TV4. In the second phase the broadcasting network should be able to accommodate 24 channels. After the analogue network has been closed down, an additional 50 channels could be broadcast.
- Current analogue terrestrial TV broadcasting should cease as soon as possible, however, at the latest within ten years after digital terrestrial broadcasting has been started.
- An expert group should be set up to carry out an in-depth analysis of the issues remaining to be solved. The expert group can also monitor and help contribute to the introduction of digital multi-media technology as well as put forward proposals on regulation, and suggest other relevant measures reflecting the interest of society arising as a result of developments within this area.

Developing the Terrestrial Network

Digital developments mean essentially that previous plans for a fourth and probably a fifth analogue terrestrial network, should be shelved,

and that the frequency wave length thereby relinquished be used instead for digital broadcasting.

The reason for starting digital broadcasting as soon as there is scope for eight nation-wide channels, is to provide the general public with terrestrial digital broadcasting as an alternative to digital broadcasting by satellite or cable. To justify the acquisition of set-top boxes, the alternative must, of course, contain more channels than the three that can currently be received without additional equipment. I consider that eight channels would be sufficient to provide a competitive alternative in the first phase.

The digital network can be gradually expanded. As long as analogue broadcasting continues (see below), the number of channels possible in the view of the Commission is limited to a maximum of 24. If and when the analogue network is phased out, it will be possible to expand the network by an additional 50 channels.

In the very first phase of development, conditions for regional and local broadcasting will be created and after an additional two years further opportunities will exist for greater local usage of the terrestrial network. If any of the nation-wide channels are reserved for regional and local channels, there could well be a hundred or more franchises available within a few years.

Parallel with digital broadcasting of to-day's terrestrial channels, analogue broadcasting should continue as before to provide households who do not acquire in the early phases set-up boxes for digital reception. Given that TV receivers are normally changed within an eight to ten year period, I believe households would have sufficient time to change if analogue broadcasting were to stop within ten years of the start of the terrestrial network. The expert group proposed should be given the task of monitoring developments and making proposals as to when the time would be ripe to discontinue analogue broadcasting.

It is important to get many channels quickly into the terrestrial network which, it is intended, should become a "super digital highway", supplied by numerous broadcasting companies and which is accessible to the general public via the open set-top box. What should attract commercial players to choose the terrestrial network is nationwide coverage, low broadcasting costs, reasonable rules regarding content, the right to send commercials and the opportunity, in a

technically simple way and without onerous administrative costs, to charge and receive payment for the programmes they broadcast.

In addition to this, there are the opportunities for broadcasting in the same environment as the Swedish public service channels. Domestic programmes in Swedish involving well-known Swedish participants and produced with an understanding of the Swedish "temperament" have until now been successful in competition with foreign TV productions. Commercial suppliers with programmes that are primarily international could also be interested in a technical environment where the majority of households are able to select their programmes.

In the UK reference is increasingly being made to digital terrestrial broadcasting as a "Window of Opportunity". If the state does not take and maintain the initiative in TV broadcasting in this area, it would be forfeiting a major opportunity I consider this is also true of the Swedish TV market.

This is the reason for the proposal that the Government should as early as Spring 1996, make a decision in principle on the development of the network, and that this development should be started the following year and be completed within a two to four year period. A prerequisite for this timetable is that frequencies be co-ordinated on the international level.

Industrial-commercial Policy Consequences

Development of digital TV broadcasting creates preconditions for digital broadcasting within other areas, and would link Sweden into global information superhighways. In a narrower perspective adjusting to international trends is of importance. This should make it easy for the Swedish electronics industry to compete more effectively in new markets where digital broadcasting technologies are in the process of being created.

When the dividing line between different media becomes blurred, players who have earlier been active in separate markets will re-appear on the same playing field. Three main different groups of players together make up the information society. The production and distribution of network based services for information, entertainment

and other purposes involves (1) companies within telecommunications, cable TV and satellite in terms of transfer and distribution, (2) computer companies within the hardware and software areas and (3) media companies for the production of channel content in terms of picture, text and sound.

Integration between these different groups of players depends on a change in technological gear, with digital TV as a starting point and the multimedia society as a more distant destination point. I agree with this view that this shift takes place in three phases.

During the transitional phase now being introduced, TV will be distributed in both analogue and digital form.

In the next phase the majority of all TV programmes will be digital. How long this will take depends very much on the strategies adopted by the Government. My proposal is that in Sweden we should be in this phase within approximately 10 years.

The third phase sometimes referred to as the multimedia phase can be characterised by network communication open to such applications as the Internet. In this phase there will be full interactivity between networks including the fibre optical network.

Difficulties in predicting how digital technology can be exploited when the requisite infrastructural conditions are created depend on the nature of the breakthrough technology. These are the technologies that provide the foundation for innovations and inventions within wide areas of use. The breakthrough technologies are of central importance for maintaining productivity increases and stimulating economic growth with repercussions on the whole of society.

In this area, digital transmission technology promises significantly greater opportunities than purely TV broadcasting. The breakthrough technology should be capable of being an engine of economic growth and thus be of importance for overall societal development. This creates new opportunities for information and development of competence, two essential components for the development of society.

The question of the transition to digital terrestrial TV broadcasting in Sweden is thus of considerably greater importance than whether TV viewers should get better picture quality and a larger number of channels to choose from. I welcome digital TV as a gateway that will allow us to exploit the benefits of a breakthrough technology. Speed

in this context can provide advantages in international goods and service markets.

Sweden is in a position to become a pioneering country in digital services. Swedish households rank at the top in terms of ownership of TV, telephones and home computers. The broadcasting network for the new technology can be constructed rapidly and cover the whole country. We have enterprises with the necessary competence to develop the industrial products required for this technology. At the same time, Sweden is such a limited market that the larger industrial nations can accept us as a pioneering country. There is thus no risk from the viewpoint of these countries that we would develop an unacceptable advantage.

To realise this vision of a digital breakthrough, infrastructural systems that are accessible, consistent with societal interests and open to competition are required for broadcasting and receiving. The converse i.e. a closed, private and monopolised infrastructure would seriously worsen the conditions for benefiting from the new technology on a broad front. The developments that occur concerning society's terrestrial broadcasting network are thus of strategic significance.

Expert group for Multimedia Issues

As pointed out earlier, my proposals are intended to chart a route for the strategic decisions to be taken by the Government. The proposals of the Commission are thus not a final action plan for digitalisation. In a number of areas, further analysis is required. Much work remains before a national action plan can be brought into existence.

I have also stated that the development of digital technology provides great opportunities for a country such as ours, but that no one possesses sufficient knowledge of the future to make totally accurate judgements on possible applications and digital services .

In addition during the investigatory work, I have noted that there is a conflict of interest within this area. This applies not only to the authorities, but also other players within the public sector. Naturally there is a risk that these conflicts of interest could slow development down and make it more difficult. The Government should keep

development within this area under strict observation and maintain a high degree of readiness for changing circumstances which are now beginning to become increasingly clearer. This is especially important since digitalisation overlaps the areas of a number of Ministries and Authorities.

I propose that an expert group for multimedia issues be established as soon as possible to carry out a more detailed analysis of the issues which I have considered from a principle point of view in this Commission. The expert group should on an ongoing basis provide the foundations for the political decisions which development within the multimedia area requires.

To be able to identify at an early stage the directions in which development is going, the expert group should focus explicitly on what is taking place on the technological development front.

I propose that the expert group should in addition be given the following tasks.

- deepening the industrial-commercial analysis of the digitalisation of television in Sweden against a background of the Government's principal positions in this area. It is of particular interest to analyse the socio-economic consequences of different kinds of economic stimuli to households and the industrial and commercial sector which can both facilitate and accelerate development.
- analysing the need for international frequency agreements as a consequence of the position of the Government.
- analysing the need for changing the division of responsibility and organisation of the authorities and state enterprises all of which have tasks in this area.
- making an in-depth analysis of the technical and frequency consequences of a decision to digitalise television.
- facilitating the links between different players within this area.
- connecting the development of digital TV and other media to education, and other areas of central importance for society.
- working out proposals for action plans in the areas presented in this report.



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