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The Long, Hard Road to Digital Television in Europe

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Although the main platform for analogue television has historically been terrestrial, the transition to digital in Europe has so far been driven by satellite and, to a lesser extent, cable. The take-up of digital terrestrial television (DTTV) has been poor and below official predictions in each European country where DTTV transmissions have commenced. The market-based introduction of DTTV appears to be failing. There are indications that market forces alone may not bring about sufficient consumer take-up of DTTV to allow the analogue networks to be closed down.

Introduction

Digital technology for the production, transmission and reception of television is clearly superior to analogue, and the eventual complete transition from analogue to digital throughout Europe, and indeed the world, seems inevitable. The main issues relating to digital television (DTV) do not concern whether or not to make the switch to digital, but when and how.

Digital simplifies, streamlines and reduces the costs involved with the production, editing, storage and transmission of television programmes and services. DTV transmissions generally provide improved picture and sound quality, and are much less susceptible to distortion and atmospheric interference. Because less power is required for digital transmissions, the energy consumption and broadcast cost for each television service is lower than for analogue. Digital is also more versatile. It facilitates 'enhanced' programming (multiple camera angles, additional information to complement programming etc.) and interactive services. The development of digital compression techniques has reduced the amount of spectrum required for television transmission, and thus provides scope for a substantial increase in the number of television signals available to viewers. Digital terrestrial television (DTTV) creates the potential to reassign part of the spectrum released by the eventual termination of analogue transmissions to other communications uses, and provides the opportunity for national governments to generate revenue from the sale of part or all of this released spectrum capacity.

For European countries, the transition from analogue to digital needs to be seen within the context of the massive changes to which the television industry has been subjected to over the past

twenty-five years. Most notable of these changes have been the introduction of multichannel television in the form of satellite and cable services, and the licensing of commercial, advertiser-supported terrestrial channels. These commercial services have provided strong competition to, and substantially reduced the audiences of, the incumbent public service broadcasters, many of which previously held monopoly positions in their national markets.

Another technical feature of DTV is that it allows choice of picture quality. In very general terms the choices vary from low strength signals which provide 'standard definition' (SDTV) pictures (about the same quality as current analogue PAL) to high strength signals providing 'high definition' (HDTV) images. Although the choice of digital signal strength is a decision for individual national governments and/or broadcasters, to date all DTV transmissions throughout Europe are in SDTV. Part of the reason for the uniform adoption of SDTV relates to the costly and unsuccessful attempt in the 1980s to develop a common European standard for analogue HDTV – the so-called 'MAC' initiative. The European approach to digital picture quality contrasts with that of some other countries (for example, the United States, Japan and Australia), which have provided for HDTV transmissions in their DTV systems. The significance of the SDTV/HDTV issue is that, because the transmission of HDTV requires much more spectrum than SDTV, a trade-off is involved for any DTV system between a greater number of SDTV channels and a smaller number of HDTV channels (currently 4 to 6 SDTV channels can be transmitted within the amount of spectrum required for one HDTV channel). This is of particular significance for DTTV where spectrum capacity, and therefore channel numbers, is much more restricted than for satellite and cable (Forrester, 2002).

Not surprisingly, a major difficulty in the transition to DTV across Europe has been the tension between the jurisdiction and powers of the European Commission (EC) and those of the national governments and regulatory authorities. One of the main issues relating to the European regulation of DTV concerns the unwillingness of the EC to impose uniform standards across the various DTV 'platforms' for digital transmission and reception equipment. This has resulted in the determination of different transmission standards for each of satellite (DVB-S), cable (DVB-C) and terrestrial (DVB-T), and the need for viewers to acquire separate set-top boxes (STBs) for each platform. This problem has been exacerbated by digital satellite operators employing proprietary and non-interoperable standards in order to 'lock in' their existing subscribers, rather than allow the market to be opened to new competitors by means of uniform standards. The experiences of France and the United Kingdom (UK) demonstrate that national regulators have been inconsistent in their implementation of Commission directives regarding digital STBs. The lack of uniform standards has been at least partly responsible for confusion and uncertainty in the minds of viewers throughout Europe, and has significantly impeded the development and take-up of DTV services. As noted by Nolan (1997: 610): "Standardization, compatibility, interoperability and application portability are essential pillars in the erection of a successful and competitive European digital television system".

Satellite and Cable

In Europe, as elsewhere, satellite and cable television platforms have generally been converted to digital before terrestrial. One reason for this is that the broadcasting standards for DTTV were defined later than those for satellite and cable. The world's first DTV broadcasts commenced in the United States (US) in 1994 with the launch by DirecTV of its pay-TV satellite service. DTV was introduced in Europe in 1996 when three pay-TV operators launched digital satellite services – Canal Plus in France, Telepiù in Italy and the Kirch group in Germany. By 2002 all European satellite operators were providing services in digital and most cable networks in European Union (EU) countries had been partly or entirely upgraded to carry digital.

The UK was the first European country to introduce digital terrestrial transmissions. DTTV commenced there in November 1998 (the same month as in the US). Then followed Sweden in April 1999, Spain in May 2000, Finland in August 2001 and Germany in November 2002. France and Denmark plan to commence DTTV transmissions in 2004, and several other European countries by 2010.

Digital subscriber line (DSL) has been developed to distribute broadband communications over the telecommunications copper wire network. To date, its use has been mainly confined to high speed internet access. Research is underway to develop technical solutions to facilitate the transmission of DTV over DSL. However, this work is still in its infancy, and the eventual technical and economic viability of DSL for television transmission remains uncertain.

The proportion of European viewers receiving digital signals varies substantially across platforms and among countries. Although the main platform for analogue television has historically been terrestrial, the transition to digital has so far been driven by satellite and, to a lesser extent, cable. The take-up of DTV in EU countries as a whole at the end of 2002 was:

- satellite, 13.9 per cent of total television households;
- cable, 5.2 per cent; and
- terrestrial, 1.7 per cent.

Significantly, at the end of 2002 the proportion of television households in EU countries receiving *digital or analogue* television by satellite was 21.7 per cent, and by cable 31.7 per cent (CEC, 2002). This means that approximately 64 per cent of European satellite subscribers had digital STBs, but only around 16 per cent of cable subscribers. With the introduction of digital, some satellite broadcasters and most cable operators started to ‘simulcast’ in both analogue and digital. However, a much higher proportion of satellite households have migrated to digital than cable households. One reason for this is that most satellite households were subscribing to multichannel analogue pay-TV services, and migrated to digital via proprietary STBs subsidised by satellite operators (in many cases given to them free of charge). However, a much higher proportion of cable households subscribe to basic (‘free-to-air’) services only. Many of these cable households are not willing to pay a higher subscription fee for premium pay channels. In turn, cable operators consider it economically viable to provide digital STBs to high revenue premium subscribers, but not to low revenue basic subscribers who continue to receive their cable service by analogue. (In Germany, with a particularly high proportion of basic cable subscribers, at the end of 2002 only 7.9 per cent of cable households received digital signals.)

Another reason for the higher digital take-up by satellite is that digital conversion by satellite is a much speedier and less costly process than for cable. As soon as transponders are converted, digital signals can be immediately transmitted over the entire area of a satellite’s ‘footprint’. In contrast, the digital upgrade of cable networks tends to be carried out incrementally, with the sparsely populated and economically marginal areas converted only after the densely populated, more profitable areas. The slow pace of cable upgrade has been notable in each of Denmark, France and Germany.

The highest digital take-up rate across all platforms is in the UK with 41.4 per cent of television households receiving digital signals at the end of 2002 – 28.0 per cent by satellite, 8.1 per cent cable and 5.3 per cent DTTV. This can be largely explained by the history of television broadcasting in the UK where the availability to viewers of only a small number of analogue free-to-air (FTA) terrestrial channels eventually led to a strong take-up of BSkyB’s (analogue) multichannel satellite pay-TV service which commenced operations in 1989. Most Sky viewers migrated to digital when the service converted to digital in 1998. A similar history of restricted analogue offerings contributing to a relatively high take-up of digital satellite services is evident in Spain, Sweden and Denmark.

DTTV

Whereas arrangements for the commencement of digital transmissions by satellite and cable services are mainly determined by commercial operators, the transition to digital for terrestrial broadcasting primarily involves government decision making, and raises a wider range of issues and options. With DTTV national governments need to determine, among other things, the timing of the commencement of digital transmissions, the means to ensure that viewers can receive terrestrial FTA programming with their existing analogue receivers, the digital role for public service broadcasters (PSBs), the licensing of new

commercial digital services, provision for digital interactive television (iTV) services, and arrangements for the eventual ‘switch off’ of the analogue transmission system. In general, commercial forces drive satellite and cable DTV, while DTTV is driven by the policies of national governments.

One option for governments is to decide not to introduce DTTV at all, but to migrate all television transmissions within their national territories to satellite and cable platforms. This option has spectrum efficiency advantages, and was (unsuccessfully) advocated in Sweden by interests opposed to the introduction of DTTV in that country. To date, however, no country in Europe or elsewhere has indicated serious interest in abandoning terrestrial television broadcasting.

National governments in Europe have advanced various rationale for their decisions to introduce DTTV. Reasons common to most governments have been: to allow their populations to participate in the ‘Information Society’; to expand opportunities for domestic manufacturing and programme production industries; to provide for a greater number of terrestrial television channels; and to bring about the eventual switch-off of analogue transmission networks to release spectrum for alternative uses. Another major motivation for introducing DTTV has been to facilitate increased competition, both by the terrestrial platform vis-à-vis satellite and cable, and among terrestrial broadcasters themselves (but see below). In Sweden and Finland the governments saw DTTV as a means to help prevent further loss of market share by terrestrial broadcasters to satellite operators (which are mainly foreign owned and transmit mainly foreign programming). The potential to generate increased competition in the respective national television broadcasting markets was cited as important in the decisions to adopt DTTV in each of Spain, France and Italy. Other reasons for DTTV adoption have included the enhancement of cultural sovereignty by strengthening programming regulation (in Sweden), and the promotion of regional and special interest programming (in Germany).

With the introduction of DTTV most European countries have made additional spectrum available to existing terrestrial broadcasters and have required them to simulcast their programming in both analogue and digital during an interim period until analogue switch-off. Due to spectrum shortage, however, the simulcast model has not been adopted in Germany and Italy, where the transition to digital is planned on a region-by-region basis with the analogue network to be shut down progressively as each region is converted.

Traditionally, with terrestrial analogue, governments have issued television licences on a channel-by-channel basis. With digital, however, it is possible for governments to issue licences for *multiplexes* consisting of a number of channels. In practice, both methods have so far been adopted in European countries: on a channel-by-channel basis in Sweden and Finland; in the UK licences have been granted for multiplexes; and in Spain both schemes have been implemented – one multiplex licence plus a number of licences for individual channels.

Consumer Take-Up

As mentioned above, DTTV penetration in the UK at the end of 2002 was 5.3 per cent of total television households. Although a very modest level, this represented the highest take-up rate for DTTV in Europe (and indeed the world). The corresponding take-up rates for the other European countries to have commenced DTTV transmissions are 3.5 per cent in Sweden, 1.5 per cent in Spain, 1.4 per cent in Finland and 0.6 per cent in Germany (Berlin only). The reasons for these very low levels of DTTV take-up by European households include:

- limited consumer knowledge of DTTV;
- ‘technology fatigue’ by consumers;
- high costs of DTTV reception equipment;
- consumer and industry uncertainty due to incompatible DTV technical standards;
- widespread consumer uncertainty and scepticism resulting from the failure of DTTV performance to live up to expectations and predictions; and

- restrictions on the development of DTTV services due to its uncertain business potential, high financial risks and limitations on capital availability.

A further reason for the poor take-up is the perception by consumers that DTTV provides few benefits by way of additional services. A major factor affecting the demand for new television services is the diminishing marginal utility of additional channels, that is, each additional channel or programming choice is less valuable to viewers than the last. DTTV is thus likely to have limited appeal to a viewer who has chosen not to subscribe to multichannel satellite and cable services, and is satisfied with the current range programming available on analogue terrestrial channels (the so-called 'Aunt Emily'). Only about half of European viewers subscribe to satellite and cable services, and only about one-quarter to premium services.

Similar to digital television in general, there has been to date a slow development and poor consumer acceptance of digital interactive services in Europe. Reasons for this include concerns about the ability and willingness of consumers to accept these new services (the 'chicken and egg' problem), and difficulties in integrating interactive advertising and sales processes. While interactive television has been subject to several false starts over the past few decades, many analysts and observers now expect that interactive digital television will experience a breakthrough in the near future.

Pay-TV or Free-to-Air?

For viewers who do value multiple channels, both satellite and cable will retain a substantial advantage over terrestrial for the foreseeable future in terms of channel numbers. Moreover, because multichannel television was available on satellite and cable before terrestrial, they have a significant 'first mover advantage' over terrestrial. This has enabled them to gain long-term access to strategic programming, especially movies and sport, that is key to acquiring and maintaining pay-TV subscriptions. Most viewers are likely to be more interested in the programming they can receive than in the form of transmission. Thus the difficulty for commercial terrestrial pay-TV broadcasters is to convince viewers to pay for programming on DTTV, but not the greater variety and possibly more popular offerings available on satellite and cable (Humphries & Lang, 1998).

This raises the issue of the suitability of DTTV for pay-TV services. The most notable occurrences in the short history to date of DTTV have been the collapses, both in April 2002, of ITV Digital in the UK and Quiero TV in Spain. There were certain financial and marketing circumstances relating specifically to each of these corporate failures. What they had in common, however, was that they were both DTTV pay-TV operations, and were unable to overcome the incumbency advantages of their established satellite and cable rivals, and attract sufficient subscribers to become economically viable services. In Finland all five of the licensed DTTV pay-TV channels experienced serious problems during the first year of digital terrestrial transmissions, and three of them had their licences withdrawn by the government. Furthermore, in Sweden a contributing factor to the low consumer take-up of DTTV was the requirement (until it was lifted in January 2003) that viewers pay a subscription fee for DTTV even if they wanted to receive only 'free-to-air' channels.

DTTV was relaunched in the UK in October 2002 as an all-FTA service, appropriately named 'Freeview'. At the end of 2002 it seemed likely that Spain would follow suit. And in France it is government policy to favour FTA over pay in the licensing of new DTTV channels. There are thus strong indications that, following the disastrous experiences of the UK and Spain, Europe is witnessing a swing away from pay-TV towards a primarily free-to-air model for DTTV.

DTTV Broadcasters

Public Service Broadcasters

European PSBers have traditionally broadcast terrestrially and FTA. Therefore, as technology, the choice of DTTV represents for European PSBers the continuation of FTA broadcast television. In this sense, DTTV is a logical and the most natural choice for PSBers when switching from analogue to digital

technology. In European countries PSBers have generally been strong supporters of DTTV. They have had two related motives for this: to expand the size and scope of their operations by providing additional programming channels; and to maintain and increase their share of the television audience which has been eroded by the advent of commercial FTA and pay-TV satellite and cable services.

The extent of participation by PSBers in DTTV is constrained by the amount of funding available to them. This perennial problem for public service broadcasting (PSB) has been exacerbated since the 1980s by the combined effect of the loss of audience share to commercial television, and the provision on commercial satellite and cable channels of many of the types of 'public interest' or 'merit' programming – news, current affairs, documentaries, children's, arts, culture – traditionally the preserve of PSBers. After experiencing great difficulty over the past two decades in trying to convince governments to maintain their funding levels, PSBers are now seeking yet further resources to finance new DTTV channels.

This raises the issues of the amount of funding required by PSBers to set up and operate new channels, and the 'quality' of PSB programming with the transition to digital. In Finland (a small EU country) digitisation means pressure towards more cost effectiveness and continued reduction in average funding per programme hour. In the UK (a large EU country) the strategy of the BBC has been to avoid low-budget production for its digital channels, but this approach has come at the cost of restricted broadcasting hours (6 to 8 hours a day) and repeat scheduling of programmes (within individual channels as well as between channels).

To date, the dominant DTTV model adopted by European PSBers has been to maintain their existing, broad mixed-genre channels, and to complement them with new specialist channels. The new channels represent core areas of PSB programming such as news, education, science, arts and culture, and/or are targeted to special audiences such as youth and children. In deciding on the types of new digital channels, PSBers are constrained by their public service mandates. The difficulty they face in trying to maintain and increase their audience shares with new digital channels is that specialist PSB programming may not appeal to large audiences, and at least part of the audience they do attract will be 'cannibalised' from their generalist channels. With limited new funding and the licensing of additional commercial channels in competition for audiences, there is no guarantee with the continued development of DTTV that PSBers will be able to prevent further declines to their audience share.

Commercial Broadcasters

Whereas European PSBers have been strong supporters of DTTV, incumbent commercial terrestrial broadcasters have generally been reluctant adopters of digital. Opposition to the introduction of DTTV by commercial broadcasters has been particularly hostile in Sweden. In the conversion to digital both public service and commercial terrestrial broadcasters are required to meet the cost of new production and transmission equipment and, in most countries, the expense of simulcasting in both analogue and digital until analogue switch-off. The major financial concern for commercial broadcasters, however, relates to *audience fragmentation*. With an increase in the number of competitors brought about by the licensing of new digital channels, the average size of audiences for individual programmes is likely to decline. Advertising revenue per programme hour will tend to fall, while per hour cost of programming to channels will tend to remain constant, thus squeezing the profitability of commercial broadcasters.

The extent of this threat to incumbent terrestrial commercial operators largely depends on the decisions of national governments, in particular, the number of new commercial DTTV channels they decide to license, and to whom they license them. The granting of new DTTV licences to *existing* commercial broadcasters will enable them to operate differentiated channels and aggregate audiences across those channels, thus mitigating the potential financial harm of digital transition. Alternatively, the licensing of channels to *new* broadcasters will introduce new rivals, increase competition for revenues, and pose a greater financial threat to existing broadcasters.

To date, DTTV policies and licensing decisions of European national governments have generally favoured incumbent commercial terrestrial broadcasters. New DTTV licences have been granted to existing terrestrial broadcasters in the UK, Sweden, Finland and France. In Spain, each of the

three commercial terrestrial broadcasters were given a digital licence to enable them to simulcast their channels, although the main shareholder in the multichannel DTTV operation was the owner of a major cable network. (As we have seen, the multichannel DTTV licensees in both the UK and Spain became insolvent in April 2002.) In Italy the incumbent terrestrial broadcasters seem likely to be assigned a prominent role in DTTV.

A parallel development has been the granting of licences for the terrestrial distribution of existing commercial satellite and cable services. Among the Freeview DTTV offerings in the UK are a number of satellite channels, including those of BSkyB. In the third round of allocations in Sweden in 2001 most of the DTTV licences went to (non-Swedish) companies for channels already available on satellite and cable. In Finland, all three licences issued in 2003 to replace those previously cancelled were granted to Canal Plus, again for channels already available on satellite. Similarly, in France the majority of DTTV licences granted were for channels already offered on either satellite or cable.

The implication of this pattern of licensing decisions in the early years of DTTV is that, while in theory DTTV has the potential to enhance diversity of broadcasting ownership throughout Europe, in practice it is mainly consolidating the position of existing commercial operators – terrestrial, satellite and cable. The main reason for governments and regulatory authorities granting new DTTV licences to existing broadcasters is the high cost of providing television programming and the uncertainty surrounding the financial viability of new commercial outlets in an already highly competitive multichannel environment. The advantage of existing satellite and cable channels as candidates for new terrestrial licences is that their marginal cost of operating on DTTV is very low.

The transmission of individual channels on more than one platform has been common practice in Europe since the introduction of cable television. Cable networks redistribute the signals of satellite channels, and in many countries are required by ‘must carry’ rules to carry the signals of local terrestrial channels. The granting of new DTTV licences for the terrestrial transmission of satellite and cable channels increases the ability of broadcasters to have their programmes distributed over multiple platforms and is leading towards an ‘all platforms’ approach to digital television. Nor is this phenomenon confined to commercial broadcasters. An ‘all platforms’ approach is consistent with the traditional universal service obligation for public service broadcasters, and for some countries it may be more economical to provide universal coverage of PSB channels by multiple platforms rather than by the terrestrial network alone. Since the introduction of DTTV in Sweden in 1999 the public service television broadcaster, SVT, has transmitted all of its channels by satellite and cable as well as terrestrially. And in Denmark PSB channels are now available in satellite packages, without ‘must carry’ regulations.

Analogue Switch-Off

As already mentioned, the simulcasting policy for the introduction of DTTV provides for the transmission by terrestrial broadcasters of their programming in both analogue and digital during an *interim period* until the analogue terrestrial network is switched off. The key issue is what is the optimum duration of the interim period? The difficulty for national governments is that it is not politically feasible to switch off analogue transmissions unless and until a substantial proportion of viewers has digital receivers. (In the US, Congress has directed that analogue switch-off not take place until at least 85 per cent of households have access to digital television signals [Pepper & Levy, 1999]). To date no European government has stipulated a minimum required take-up rate for DTV. The problem is further compounded by the issue of many households having second and third television sets, each requiring its own STB to achieve a complete transition to digital.

It was stated earlier that by 2002 the level of digital take-up in EU countries was only 20.8 per cent of total television households across all three platforms. The take-up of DTTV has been particularly poor and below official predictions in each country where DTTV transmissions have commenced. National governments have nominated ‘target’ dates for analogue switch-off, ranging from 2006 (Finland and Italy) to 2012 (Spain). However, in practically all cases the target date is unlikely to be met and analogue switch-off will have to be deferred. (The sole exception is Germany where, with a region-by-

region system of analogue replacement rather than the simulcast model, the target date for analogue switch-off (2010) expected to be met.)

European national governments do not appear greatly concerned about the prospect of delayed analogue switch-off, partly perhaps because the current demand for spectrum which would be released by the conversion to digital is not as strong as previously estimated. Nevertheless, switch-off should take place sooner rather than later. Simulcasting imposes costs in the form of additional transmission expenses for broadcasters to transmit in both analogue and digital, as well as the loss of revenue (opportunity cost) which national governments could earn from the alternative use of the analogue spectrum (albeit less than originally anticipated).

Although there have been DTTV transmissions in Europe for only a few years, from the low levels of consumer take-up to date, the market-based introduction of DTTV appears to be failing. There is a growing belief that market forces alone may not bring about sufficient consumer take-up of DTTV to allow the analogue networks to be closed down. The longer analogue switch-off is delayed, the greater will be the consequent private and social costs.

The potential exists for analogue switch-off to be deferred for several decades. Television sets are replaced about every eight years, their average life span. However, the significant proportion of viewers currently satisfied with the programming available on analogue FTA channels may replace the old set with a new *analogue* set, especially if it is cheaper than the 'equivalent' digital receiver. Such (rational) consumer behaviour will prolong the demand for analogue transmissions.

Without government intervention some technical innovations take a long time to be adopted by consumers, especially when the innovation is 'backward compatible' (old hardware can continue to be used with new improved software). Significantly, with the introduction of colour television transmissions, it took around 20 years for all European households to acquire a colour set. Without government intervention analogue switch-off could take at least that long (BIPE Consulting, 2002).

There are two main policies that European national governments are considering to facilitate and hasten analogue switch-off. The first is to make it mandatory for manufacturers to install digital tuners in all television sets. This approach has been adopted by the Federal Communications Commission in the US. The second, more radical, form of intervention would be for governments to subsidise consumers in their purchase of digital reception equipment. The Italian government has announced a subsidy of around €75 (approximately \$US90 at early November 2003 exchange rates) per household for the purchase of a DTTV set-top box. However, at an estimated total cost of €1.5 billion (approximately \$US1.75 billion), this policy proposal may be modified. There are also concerns that governments may be in breach of European Commission competition regulations if they use public monies to favour the development of one delivery platform (terrestrial) to the detriment of others (satellite and cable). The Swedish public broadcaster has advanced a subsidy scheme which seems to avoid this potential problem. Consistent with its 'all platforms' approach to DTV, the SVT proposes that all households that have paid their television licence fee be given a voucher equal in value to the price of a basic STB, which could be used as payment for a digital box, regardless of it being terrestrial, satellite or cable.

In Europe, as elsewhere, the transition from analogue to digital broadcasting provides a challenge for all players involved. National governments are primarily responsible for decisions regarding the television transmission system, and changes to current policies may be required to achieve analogue switch-off within a reasonable period. With digital, viewers can receive improved reception as well as an increased number of programme channels, features and services, but most are not yet convinced that the benefits of digital exceed its costs. While public service broadcasters are relying on DTV to maintain their audience share, their capacity to develop new digital offerings appealing to audiences is largely dependent upon the amount of additional funding available to them. Commercial broadcasters are most at risk from the introduction of digital, especially incumbents who face fragmentation of their audiences and reduced profits. The transition to digital brings more efficient transmission, enhanced reception, new services and greater competition, but increased uncertainty to the television broadcasting industry.

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