



**COUNCIL OF
THE EUROPEAN UNION**

Brussels, 14 January 2004

5305/04

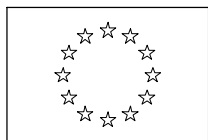
**TELECOM 6
AUDIO 5**

COVER NOTE

origine :	the Secretary-General of the European Commission signed by Ms Patricia BUGNOT, Director
date of receipt :	14 January 2004
to :	Mr Javier SOLANA, Secretary-General/High Representative
Subject :	COMMISSION STAFF WORKING PAPER: The contribution of wide-screen and high definition to the global roll-out of digital television

Delegations will find attached Commission document SEC(2004) 46.

Encl.: SEC(2004) 46



COMMISSION OF THE EUROPEAN COMMUNITIES

Brussels, 13.1.2004
SEC(2004) 46

COMMISSION STAFF WORKING PAPER

**The contribution of wide-screen and high definition
to the global roll-out of digital television**

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EXECUTIVE SUMMARY

The purpose of this document is to trigger a final round of debate at Member State level and among market players about the contribution that the wide-screen format (16:9) can make to the roll-out of digital television. This will complete a policy cycle that began ten years ago with the launch of the Union's wide-screen television Action Plan (1993-7). A number of considerations motivate its appearance at this time.

The *ex post* evaluation study on the Action Plan recommended some follow up to spread good practice for implementing wide-screen between Member States, as few had followed up on it, despite substantial funding of broadcasters and programme producers. Digital switchover means that policy makers and market players are keen to identify ways of attracting consumers to digital television in order to speed up the process. Some have already noticed that the combination of wide-screen and DVD is driving the roll-out of digital video more rapidly than digital broadcasting itself. Finally, sales of wide-screen television sets are very healthy, accounting for 22% of TV sets sold in the EU and more than 40% by value. Penetration could reach around 60% of households in the current EU 15 Member States by 2009.

The document assesses the different service possibilities in digital television in order to identify benefits for consumers. It suggests that a combination of multi-channel, interactive and high quality video will be necessary in order to address all population segments and achieve digital service diversity, rather than just offering multi-channel as the sole digital service. Despite initial promises, digital broadcasting has not systematically delivered higher quality pictures than analogue, because broadcasters seek to maximise the number of services in the available radio spectrum. Conventional industry wisdom is that customers prefer quantity of services to picture quality. Broadcasters do not therefore consider quality to offer consumer benefits or to be a differentiating factor for consumers. However, DVD publishers are using wide-screen to differentiate the new format from the analogue VHS videocassette. Digital broadcasting could draw on this example; in particular, it needs better differentiation from analogue TV. Experiences from Member States where wide-screen is part of digital broadcasting – whether pay television or free-to-air - show that it can play this role of differentiator and contribute to the roll-out of digital television.

The document also outlines the market trajectory of wide-screen television, from its early days to the present day and beyond. The Action Plan was a catalyst that helped overcome the initial market failure, whereby absence of services meant that there were no sets on sale anywhere in Europe, and vice-versa. However, it would be counter-productive to exaggerate the Action Plan's role in achieving sustainability of the format as this would detract from the subsequent achievements of many market players involved in wide-screen.

Home Cinema is now a strong driver for wide-screen, notably through DVD. Some broadcasters believe Home Cinema and broadcasting are separate markets. However, for the foreseeable future both will share the main TV in the household. Manufacturers are targeting the replacement of the main household TV set with a Home Cinema-equipped TV set or display. This is likely to be wide-screen. Digital and analogue broadcasting will increasingly share the main TV receiver with better quality, wide-screen DVD pictures. If broadcasters do not provide programmes in wide-screen format, at an equivalent quality to DVD, broadcast programming will look increasingly inferior, particularly as take-up of big, digital flat-panel displays increases, all in wide-screen format.

Screen formats like wide-screen are hard to launch because there are co-ordination problems between broadcasters and between broadcasters and manufacturers. Co-ordination is necessary in order to ensure that all broadcasters transmit an increasing quantity of

programming in wide-screen. This provides certainty for the consumer, who has to invest his own resources in the purchase of a wide-screen display. This is a major difference from other service options like interactive or multi-channel TV which do not require a new display, and where network operators frequently provide a receiver on favourable financial terms. It is harder to harvest the market potential of new screen formats. That is the key difference. As demand for more easily-achieved service options saturates, it is important for market maturity and switchover that more difficult options are addressed.

The document offers examples of where market players have spontaneously co-ordinated among themselves in order to implement digital broadcasting in wide-screen. Public policy may have a role in contributing to co-ordination between market players. Improved co-ordination at national level – however achieved - would ensure that wide-screen could fulfil its potential as a differentiator for digital quality compared with analogue television.

Finally, the document offers a section on the related issue of high definition television (HDTV). Some European broadcasters are starting to reconsider HDTV as a digital service possibility. HDTV maximises differentiation between analogue and digital television on bigger displays. The benefit is a substantial increase in impact and realism for consumers.

HDTV raises similar co-ordination difficulties as wide-screen and, unlike wide-screen, carries significant extra costs. However, high definition video is trickling into programme production, both in cinema and television. Major European broadcasters have started to produce some programmes with a long commercial life in HD. In the United States, the migration of prime time drama series production towards HDTV is already underway. Digital HDTV transmissions are already available in USA, Japan and Australia. In Japan, government guidelines state that digital terrestrial broadcasters should transmit more than half their output in HDTV.

A combination of new technologies - flat-screen displays, more powerful compression systems and new DVD technologies – and related market trends may alter European broadcasters' perceived incentives away from emphasising the quantity of digital TV services, towards quality. This could culminate with HDTV services being offered to the European public. Given past experience, a policy-driven approach to HDTV would be counter-productive; however having prematurely over-estimated the role of HDTV in the past, the Union should not overlook its future potential.

1. INTRODUCTION

1.1. Context of the Paper

Between 1993 and 1997, the European Union undertook an Action Plan¹ to kick-start the market for wide-screen television receivers. Over four years, the Action Plan committed some €206m.² These funds were allocated as contributions towards the temporary additional costs incurred by broadcasters and producers wanting to introduce the wide-screen format. The intention was to establish the format in the market so that it could contribute to the roll-out of digital television by providing a new, differentiating feature, replacing the 4:3 screen format inherited from pre-1950s cinema.³

By the end of 2002, penetration of wide-screen television sets across the 15 Member States of the EU and neighbouring countries was an estimated 11%⁴ and the wide-screen TV market grew by 23% during the year. Owners of wide-screen sets benefit from extensive digital programming in wide-screen format. Both DVD and pay television services offer films in wide-screen format. Digital free-to-air services in wide-screen have been slower to develop, but there are promising signs in several Member States. However, penetration of wide-screen television is uneven across Member States. There is very limited awareness of wide-screen's current role in digital markets among public authorities in the Member States. The Action Plan's *ex post* evaluation study noted that most Member States had not followed up.⁵

For a variety of reasons, this is a suitable point in time to review the role of wide-screen in today's markets, as the transition to digital television gathers pace and achieves a higher political profile.

- The independent evaluation of the wide-screen Action Plan recommended some limited follow-up actions in order to spread good practice implementation across Member States and thereby facilitate an elegant closure of this policy line at EU level.
- The expansion of the Union provides further reinforcement for the good practice rationale. Accession countries did not participate in the Action Plan. A final reflection on the role of wide-screen at EU level would therefore enable accession countries to participate and build it into their digital broadcasting strategies.
- Member States are seeking to promote the take-up of digital television, with the ultimate objective of terminating analogue terrestrial services and recovering the spectrum. There is also interest in promoting digital television as an alternative vector for Information Society services. Anything that might contribute to penetration should be examined.

The Commission itself has launched important initiatives in support of digital television; this is a continuing process.

¹ Council Decision 93/424/EEC on an Action Plan for the introduction of advanced television services in Europe, OJ L 196, 5.8.93, p.48.

² €206.8m, of which €116m was devoted to wide-screen programming and €90.6m to supporting broadcasting of wide-screen services. See Table 5.3.2 of *Final Evaluation of the 16:9 Action Plan*, IDATE, November 2000. <http://europa.eu.int/ISPO/infosoc/telecompolicy/en/Study-en.htm>

³ Annex 2, section 4 provides background on the 4:3 format.

⁴ Source: multi-client study by OMSYC, *The World Audiovisual Market 2002* edition, discussed in section 3.1.

⁵ See IDATE, cited in footnote 2, p.10.

- Digital broadcasting networks and associated facilities are included in the new Communications Regulatory Framework.
This will complement the role of competition law, helping to ensure that the market-led roll-out of digital television services benefits from fair competition and access remedies where necessary.
- The Communication on Barriers to widespread access to new services and applications of the information society through open platforms in digital television and third generation mobile communications) explores issues related to interoperability in digital television and 3G networks.
- The e-Europe Action Plan requires *inter alia* Member States to clarify their plans for digital switchover by September 2003.
- The Communication on the transition from analogue to digital broadcasting (from digital ‘switchover’ to analogue ‘switch-off’)

The primary purpose of this paper is therefore to initiate a final EU level reflection at on the role of wide-screen in digital television, in order to help promote debate and follow-up at Member State level.

In pursuit of this objective, the paper:

- reviews the European Union’s role in promoting the wide-screen format;
- describes the current role of wide-screen television in digital TV markets, and notably how it already contributes to the further roll-out of digital television technologies, both through broadcasting and digital versatile disk (DVD);
- suggests how wide-screen could further contribute to accelerating the take-up of digital television across the Member States.
- offers a re-considered view of the role of high definition television – a high resolution variant of wide-screen - in digital markets for longer term reflection.

1.2. Active and potential drivers in digital video broadcasting

First it is necessary to situate wide-screen within the broader context of digital television by describing the different service categories and benefits that DTV can offer.

1.2.1. Multi-channel television

Multi-channel television has been the main driver during the first phase of roll-out, primarily led by satellite pay television operators. Consumer benefits include greater programme choice, due to digital compression, which allows a greater number of programmes to be transmitted simultaneously in a given bandwidth.

So far most broadcasters have paid little attention to improving picture quality alongside increased choice, given the trade-off between picture quality and the ability to offer programming. Services are offered with “PAL reference quality” meaning the pictures appear similar to those of analogue television, and may even be of worse quality. Conventional industry wisdom is that customers prefer quantity of services to picture quality. Many policy-makers have also accepted this assumption, notably for digital terrestrial television.⁶ For

⁶ BMWI, (Federal Ministry of Economics and Technology), Documentation No. 481, *Status report and recommendations by the "Digital Broadcasting" Initiative on the digitisation of radio and television taking account of the cable, satellite and terrestrial transmission paths*, English version, Sections 3.2 & 3.2.1.
<http://www.bmwi.de/Homepage/English%20pages/Publications/Publications.jsp>

them, multi-channel facilitates market entry into the restricted terrestrial market and potentially contributes towards other public policy objectives, notably media pluralism.

However, the appeal of multi-channel may already have reached saturation in many markets. There are indications that multi-channel appeals more to younger consumers, whereas improvements to picture and audio quality attract the 35+ age group even in markets where multi-channel has been very successful as a pay TV service.⁷ Moreover, in markets where analogue multi-channel is already well-developed,⁸ digital multi-channel digital television has no unique selling point to differentiate it from analogue multi-channel offerings. In smaller countries, limited and inelastic domestic programme production capacity may further reduce the role of multi-channel as a driver, given the importance of national and local programming for TV audiences.⁹

Multi-channel is the key service offering of most national digital terrestrial television implementations. However, spectrum limitations reduce the number of services which terrestrial can carry compared with satellite and cable. Digital terrestrial multi-channel services cannot compete successfully with the quantity of services available by satellite or cable. It is possible that the mobile and in-car reception possibilities of multi-channel services via digital terrestrial television could extend its market appeal, but this proposition has yet to be proved.

1.2.2. *Interactive television*

Benefits are evolving and have yet to be fully realised. Interactivity can increase consumer involvement in conventional TV programmes through voting or by adding options, like a different commentary track or another camera angle. This type of interactivity does not require a return channel and is known as enhanced broadcasting. The Electronic Programme Guide is the most important application, as it offers consumers greater control and management of their multi-channel TV offerings. Interactive television can also offer bi-directional services, when receivers are equipped with a return channel. Some Information Society services like e-mail or home banking are already reaching the home and there is potential for further growth. The role of interactive television is discussed in more detail elsewhere; but it is not yet a driver for the roll-out of digital television.¹⁰

The underlying technical facility for interactive television is the Applications Programme Interface, a software facility; it offers other possibilities apart from interactive television. APIs can for instance support a hard disk, replacing the separate videorecorder, and offering new functionality notably the possibility to “pause” live television and fast-forward through television commercials. Some market players consider that this enhanced version of the

⁷ For instance, according to Continental Research (UK) “The appeal of having more channels declines with age and the appeal of better picture quality appeals with age. This suggests that the marketing of digital TV may need to be more segmented with different messages being developed to appeal to different age groups”, cited in trade press. F. Thorne in *Pushing ahead with a new strategy*, New TV Strategies Vol 3, Number 10, November 2001.

⁸ Typically in Member States with extensive cable TV penetration.

⁹ For instance, a Belgian cable operator, Telenet Vlaanderen, indicates that the top 3 Flemish broadcasters have an 85% viewing share on its network, and that 20 of the 30 channels available on the network only generate a 5% viewing share.

¹⁰ See BIPE Consulting, Study for DG Information Society of the European Commission, *Digital Switchover in Broadcasting*, April 2002, pp.27, 42-46. Available at: www.europa.eu.int/information_society/topics/telecoms/regulatory/studies/index_en.htm

See also ConTeSt Consultancy for CENELEC, *Strategy and Recommendations for a standardisation policy supporting the effective implementation of the Framework Directive and the establishment of required interoperability levels in digital interactive television*, report available at: www.cenelec.org

familiar audiovisual recording application will be a stronger market driver than interactive television in the short to medium term.

1.2.3. Improved visual and audio quality

The main consumer benefits are to improve the impact and realism of the programming. This includes a number of features, notably multi-track audio, marketed as surround sound. Transmitting programmes with higher bit-rates will deliver improved pictures, leading to greater impact and enhanced realism on bigger television displays, compared with lower bit-rates. Use of the 16:9 aspect ratio widens the viewing angle so that it matches the human visual field better and ensures that films can be viewed at full video resolution, in the appropriate aspect ratio. Combining these two techniques with more picture information is called high definition television, high-resolution pictures intended for viewing on big displays. HDTV offers a viewing angle of 32 degrees, compared with 10 degrees for standard definition television in 4:3 format. The increased viewing angle is optimal for the human visual field. HDTV services are available in USA, Australia and Japan but not in Europe.

Although digital television technologies were widely expected to provide improved quality and were promoted as such, the quality gains have largely failed to materialise through digital broadcasting, even for standard definition television. Broadcasters do not consider picture quality *per se* to be a driver or to provide differentiation from analogue TV. Additional bandwidth necessary for increased quality increases transmission costs. However, another group of players has taken a different view of quality: DVD publishers. They have found a way of differentiating digital quality and turning it into a driver, in particular by using the wide-screen format. Digital broadcasters' and DVD publishers' contrasting attitudes towards quality are very marked. DVD uses the same video compression technologies as digital television and was launched at about the same time. It has achieved a faster take-up in major Member States than digital television. The success of DVD cannot be attributed exclusively to content since the same catalogue is available at lower prices on VHS cassettes. This paper will explore the differing approaches to quality in section 3 and explain why these is an issue for digital broadcasting and policy makers concerned with it.

2. THE EUROPEAN UNION AND WIDE-SCREEN TELEVISION

Prior to reviewing the role of wide-screen in today's markets, this section analyses the earlier phase, including EU involvement in helping to launch the wide-screen television receiver market through the Wide-screen Television Action Plan, and the results of the evaluation study delivered in November 2000.

2.1. The wide-screen television Action Plan: rationale

In 1993, the Union launched a four year Action Plan to ensure that wide-screen television reached the market.¹¹

The Action Plan was intended to overcome the market failure of the "chicken and the egg". Broadcasters would wait for wide-screen TV sets to appear before launching services; manufacturers would wait for services before launching sets. Replicated across the Union, this would have prevented manufacturers from achieving economies of scale across the Single Market.¹² One specific barrier was that broadcasters and programme producers also faced

¹¹ Cited under footnote 1 above.

¹² The market failure was analysed in a study undertaken for the Commission by KPMG, *The Business Case for an Action Plan*, September 1992.

additional, transitional costs to introduce wide-screen, which they argued would benefit manufacturers more than broadcasters in the short term.

In order to overcome this start-up failure, and to create a sustainable market for wide-screen television receivers, the Union adopted a four year Action Plan, from 1993-1997. Its operational targets were to achieve (1) a critical mass of TV services in the wide-screen format and (2) a significant and increasing volume of programming in the wide-screen format. The programme was supported by a combination of community funding – to a maximum of ECU228m¹³ at the discretion of the budgetary authority - and matching industry contributions, totalling together a maximum of ECU405m. The Community contribution was intended as a contribution towards the additional transitional costs of broadcasters and programme producers. Funding was distributed following calls for proposal, according to rules set out in the Council Decision. The Action Plan was managed by the Commission.

2.2. The wide-screen television Action Plan: political context

In political terms, this Action Plan was part of the settlement surrounding the reorientation of community policy away from the earlier focus on analogue high definition television, in favour of digital television. This started in 1992 and was completed in 1995 with the adoption of Directive 95/47, the TV Standards Directive.¹⁴

The Union developed a twin-track approach, with the Directive as the primary element. It provided a neutral regulatory framework for the start of digital television services, focusing notably on the regulatory treatment of conditional access. Decisions on which digital technologies and standards to use were left to industry, by then well-organised into the Digital Video Broadcasting Group (DVB). The second track was the Action Plan in order to launch the wide-screen TV market. This was promotional, only for those market players wishing to participate. The aim of this two-track approach was to ensure separation of regulation and industrial policy, as mixing the two was perceived to have compromised the earlier MAC strategy.

The decision to target wide-screen emerged out of extensive consultations with industry. Broadcasters, manufacturers and other market players wanted to focus on the potential of offering more channels of conventional standard definition television, rather than HDTV. The market players did agree that one element of high definition television would have more immediate commercial relevance, its cinema-style screen format in the ratio of 16:9. Wide-screen services could be digital multi-channel services and would require only incremental additional transmission capacity over services in the traditional 4:3 format, inherited from cinema when television started in the 1930s.

Benefits foreseen for the consumer would include an increased viewing angle and the ability to display films in wide-screen format on the full screen, at full TV resolution, without amputating parts of the picture or inserting black lines¹⁵ in order to fit them into the 4:3 format. Films are premium content. They have a key role in both pay television and the home video market, as well as still playing a significant role in free-to-air broadcasting schedules. Broadcasters and programme producers were attracted by the aesthetic possibilities of wide-screen. The increasing adoption of film-style, single camera shooting techniques for TV drama added to the logic. Some broadcasters also saw potential to differentiate digital

¹³ Of which the budgetary authority granted 90% or ECU206.8m.

¹⁴ Directive 95/47/EC of the European Parliament and of the Council of 24 October 1995 on the use of standards for the transmission of television signals OJ L 281, 23.11.95, p 51.

¹⁵ The industry terms for these techniques are “pan-scan” and “letterbox”, described in Annex 2.

television from analogue by migrating all programming to wide-screen as they moved to digital services.

From a policy perspective, one of the perceived advantages of focusing on the wide-screen format was technological neutrality. Wide-screen television services could be offered in either analogue or digital format. Some broadcasters wanted to start analogue wide-screen transmissions; others argued that a direct move to digital would be better. The final consensus was that choice of transmission technologies should be left to the market players. From a consumer perspective, analogue wide-screen television sets could be upgraded to digital by adding an outboard digital decoder box in due course. Integrated digital television sets would follow, once the digital market was well underway. The priority was to establish the wide-screen format in the market.

2.3. Impact and evaluation of the Action Plan

The Commission described the outputs of the Action Plan in three annual reports published during the Action Plan.¹⁶ During its life, the Action Plan supported a total of nearly 3000 broadcasting or production projects over the period 1993-1997, across all Member States. In November 2000, the Commission published an evaluation of the Action Plan undertaken by independent consultants.¹⁷ The objective of the evaluation was to assess the impact of Action Plan outputs.

The evaluators' findings and recommendations take the form of responses to a series of typical questions that evaluation methodology seeks to answer when assessing the impact of a programme. These are set out in greater detail in Annex 1.

The main finding was that the Plan's primary objectives were only very partially achieved during the life of the Plan. The Action Plan did overcome the initial market failure, by breaking the vicious circle of which would come first, wide-screen services or receivers, but the wide-screen television receiver market reached critical mass only in France, Belgium and the Netherlands during the life of the plan. However, from the perspective of 2000, the combination of the Action Plan's legacy and subsequent activity by market players was bringing tangible results in UK, Denmark, Ireland and Sweden. Wide-screen had become a self-sustaining element in certain Member States. Many market players considered that it started too early and finished too early.

In the view of the Commission services, the early start of the Action Plan helped ensure that there was sufficient awareness of wide-screen for broadcasters to include it as an option in their studio upgrades as they invested heavily prior to the start of digital television services. This has been important for reducing or eliminating the additional costs of producing in wide-screen. There is now a complete range of studio equipment that is switchable between 4:3 and 16:9 formats. When the Plan started, the only wide-screen production equipment available was very costly HDTV equipment.

The Action Plan phase ensured that there were wide-screen TV receivers in homes for the early stages of the digital television market, dominated by pay TV and outboard digital

¹⁶ Three Reports from the Commission to the Council, the European Parliament and the Economic and Social Committee: (1) First Annual Report on progress in implementing the Action Plan for the Introduction of advanced television services in Europe, Brussels, 16.6.1995, COM (95) 263 final; (2) Second Annual Report on progress in implementing the Action Plan for the Introduction of advanced television services in Europe, Brussels, 26.7.1996, COM (96) 346 final; (3) Final Annual Report on progress in implementing the Action Plan for the Introduction of advanced television services in Europe, Brussels, 13.7.1998, COM (1998) 441 final.

¹⁷ See IDATE, cited in footnote 2 above.

decoders.¹⁸ Without any wide-screen TV receivers in people's homes, pay TV operators would have had limited incentives to transmit in digital wide-screen. The market did not have to await the availability of integrated digital TV sets, tied to the later roll-out of digital terrestrial television. A similar argument applies to DVD, where the extra disk capacity used to support wide-screen could have been used for additional programming, if the wide-screen TV market had not already existed.

It is also possible that a number of benefits were not felt during the life of the Plan but sprang from it. Comparable stimulation measures at macroeconomic level often have a substantial lag between their application and their impact on the market. The evaluators did not assess this type of effect.

The Action Plan evaluators noted that Member States had not in general followed up on the Action Plan with their own supporting activities, despite the substantial sums spent across the Member States. Table 2.1 lists the amounts distributed to broadcasters and programme producers in each Member State, in descending order.

¹⁸ See Final Annual Report cited in footnote 16(3); p.7; pp 23-25.

Table 2.1 – *Total Action Plan financial commitments over the 1993-1997 period broken down by Member States in Million Euro.*

France	64,1
Germany	36,5
Netherlands	18,9
Spain	18,5
Belgium	13,7
Greece	13,7
Italy	13,4
United-Kingdom	9,6
Sweden	4,9
Ireland	3,5
Austria	3,3
Finland	2,7
Portugal	2,2
Denmark	1,7

(Source: Graph 6 in IDATE, Final evaluation of the 16:9 Action Plan, Main Report, p.62)

The evaluators' key recommendation is to disseminate best practice for the consolidation of wide-screen in Member States where it is under-developed, and to ensure that adhesion countries are aware of its benefits. Other recommendations support this strategic recommendation.

2.4. Section summary

The combination of the Action Plan legacy and subsequent market activity ensured the sustainability of wide-screen within the Union. The Action Plan was a catalyst that helped overcome the initial market failure. However, it would be counter-productive to exaggerate its role in achieving sustainability of the format as this would detract from the subsequent achievements of many market players involved in wide-screen. These achievements are examined in the next section. Understanding them will be important for the dissemination of best practice implementation, as suggested by the evaluators.

3. THE ROLE OF WIDE-SCREEN IN DIGITAL TELEVISION AND VIDEO MARKETS.

Figure 3.1 – *Main Drivers for the development of wide-screen 1993 -2002*

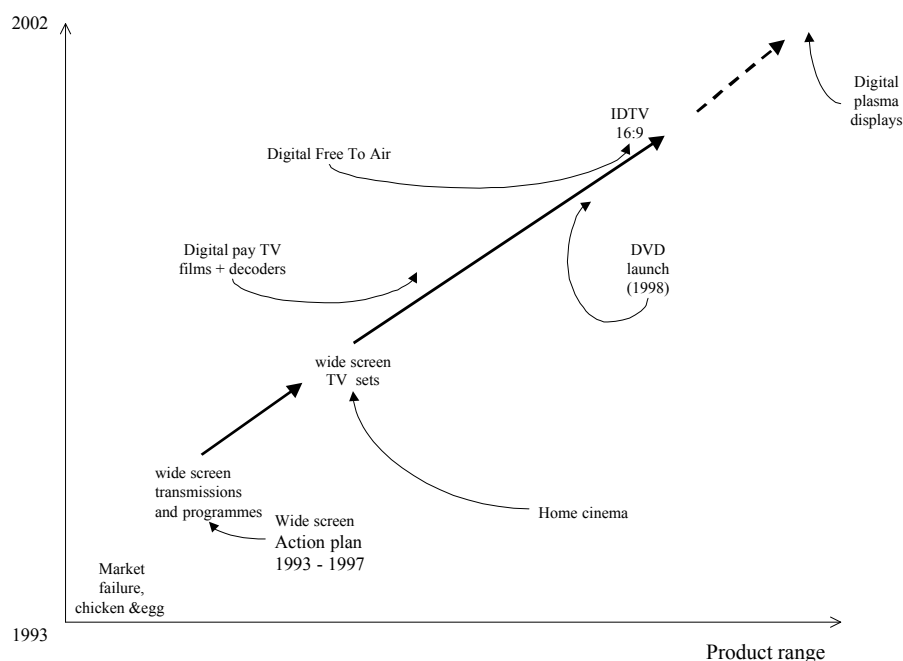


Figure 3.1 is a graphical overview of how the main market drivers have fed the development of wide-screen over the past few years. Digital pay television initially, the subsequent emergence of Home Cinema and latterly the extraordinarily rapid roll-out of DVD have been the main drivers. More recently, the potential of wide-screen in digital free-to-air television has become evident. These will all be discussed in greater detail below, following the next section, which provides an overview of penetration across Member States and accession countries.

Wide-screen has an important role in the market, seen from European level, recalling the statistics from the introductory section of this document. By the end of 2002, wide-screen television sets accounted for 22% of television sets sold in the European Union and more than 40% in terms of value. The wide-screen TV market grew by 23% during 2002 and total penetration across the EU and neighbouring countries was an estimated 11%.¹⁹ However, penetration varies considerably between Member States.

¹⁹ Sources: referenced in footnotes 3 and 4 above.

3.1. Wide-screen penetration in the Member States

Table 3.1 below shows the growth of wide-screen television set penetration in the Member States. Member States are listed by 2002 estimated penetration, in descending order.

Table 3.1 – *Wide-screen penetration in Western Europe as a percentage of TV Households*

	1996	1997	1998	1999	2000	2001	2002(E)	AAG96-01%
Member States								
The Netherlands	1,4	3,1	5,9	9,3	14,1	17,1	20,9	48,8
United-Kingdom	0,2	0,5	1,9	5,5	11,2	15,2	20,6	53,2
Belgium	1,1	2,7	4,8	7,6	10,5	14,4	19,3	72,5
Luxembourg	1,2	2,6	4,9	8	10	14,5	19,2	73,9
France	1,6	2,3	3,6	5,4	8,5	11,3	15	39,2
Austria	0,5	1,2	2	2,9	4,2	5,9	7,7	70,6
Germany	0,7	1,4	2,1	2,8	4	5,5	7,3	66,3
Spain	0,2	0,5	1,1	2	3,6	5,3	7,3	66,3
Portugal	0,2	0,3	0,6	1,9	3,3	5,1	7,1	51,5
Finland	0,1	0,3	0,6	1,3	1,9	3,1	4,8	78,7
Sweden	0,1	0,2	0,8	1,5	2,5	3,4	4,6	67
Ireland	0,1	0,3	0,6	1,2	2,1	2,9	4,2	52,3
Italy	0,1	0,3	0,6	1,1	2	2,8	4	114,9
Denmark	0,1	0,2	0,5	1,1	1,4	2,3	3,3	78,7
Greece	0,1	0,2	0,5	0,9	1,5	2,2	2,9	25,9
European Economic Area								
Norway	0,1	0,2	0,8	1,5	2,5	3,4	4,6	72,7
Other								
Switzerland	2,9	4,8	8,2	6,5	10,2	11,7	13,5	39,8
Western Europe	0,7	1,2	2,1	3,6	6	8	10,7	51,9

AAG – Average annual growth rate E- Estimate

(Source: OMSYC, *The World Audiovisual Market*, 2002 edition, p.134)

There are two groups, Member States with around 15-20% penetration in 2002 and those with less than 10%. It is not surprising that two of the national markets triggered by the Action Plan, Belgium and the Netherlands, have continued sustainable growth, both achieving around 20%. Digital media - DVD and pay television - are almost certainly the main drivers. In Belgium, there are still some free-to-air analogue wide-screen transmissions from broadcaster that participated in the Action Plan such as RTBF and VRT. However, slow progress with the launch of digital services on cable could be a barrier to further wide-screen transmissions. It is much easier to offer wide-screen in digital than in analogue, given that analogue technology offers less scope for optimising the viewing experience for both 4:3 and wide-screen TV sets.

French broadcasters were early adopters of wide-screen television and accounted for a substantial share of the funding. However, neither broadcasters nor public authorities have sought to develop its role since then. Digital media – DVD and pay TV – are the main drivers. Wide-screen TV penetration grew 28% between the third quarter of 2001 and third quarter 2002, with DVD penetration growing by around 25%. DVD was present in around 23% of French households by end-2002.²⁰ Wide-screen is included in the specification for digital terrestrial receivers, but it is not so far a major feature of planning for digital terrestrial television services.

The fastest growing market is the UK, burgeoning from 2% in 1998 to 27% household penetration by end 2002.²¹ This has been achieved purely on the basis of digital media. It is however likely that the UK drew some benefit from the extensive range of competitively-

²⁰ Source: www.Mediametrie.fr, cited in Screen Digest, October 2002; DVD penetration cited in Screen Digest, February 2003.

²¹ Source: Intellect (UK). This trade association forecasts 50% penetration by end-2004.

priced wide-screen receivers generated by wide-screen market activity and the Action Plan in other Member States. The decision of the major free-to-air broadcasters to lead a full migration to wide-screen is the unique feature, reinforced by the very rapid take-up of DVD, estimated to have achieved 25% household penetration by end-2002. This example will be discussed in greater detail in the free-to-air section below.

Germany is the largest consumer electronics market in Europe, but still has a very low penetration of wide-screen sets. At the 2001 IFA²² consumer electronics fair, manufacturers' stands were dominated by an impressive range of wide-screen products at all price points, embracing television sets and the latest flat panel displays together with a massive promotion of DVD. However, manufacturers indicated that the lack of wide-screen broadcasting was a barrier to roll-out of the format. The current focus in Germany is on interactive television and in-car reception of digital terrestrial television. In-car mobile television is a promising prospect, but even here there may be some wide-screen tendencies.²³ German DVD player penetration had reached around 19% of TV households by end-2002, providing a good basis for developing the wide-screen format in digital broadcasting.

A more recent forecast suggests that wide-screen television sets and displays will achieve around 60% household penetration by 2009 within the current EU 15 Member States.²⁴

3.2. Wide-screen penetration in Accession States and outside the EU

Table 3.2 shows that no accession country has more than 3% wide-screen TV penetration and the market only started in 1997 in several of these markets. Given this lag and generally slower roll-out of digital media in these countries, this is not surprising. There is obvious market potential for wide-screen in the accession countries.

Table 3.2 – *Wide-screen penetration in Central Europe as a percentage of TV Households*

Accession Countries	1996	1997	1998	1999	2000	2001	2002(E)	AAG96-01 %
Czech Republic	0,0	0,1	0,3	0,5	1,2	2,0	2,9	92,5
Hungary	0,0	0,1	0,3	0,5	1,2	2,0	2,9	92,5
Poland	0,0	0,0	0,1	0,2	0,3	0,6	1,9	76,3
Slovak Republic	0,0	0,0	0,1	0,2	0,3	0,6	1,9	76,3
Slovenia	0,0	0,1	0,3	0,5	1,2	2,0	2,9	92,5
Other Countries								
Bulgaria	0,0	0,0	0,0	0,1	0,3	0,5	1,1	94,5
Croatia	0,0	0,0	0,1	0,2	0,3	0,6	1,9	76,3
Romania	0,0	0,0	0,0	0,0	0,0	0,0	0,1	-
Yugoslavia	0,0	0,0	0,0	0,1	0,2	0,3	0,6	80,6
Central Europe	0,0	0,0	0,1	0,2	0,5	0,8	1,6	85,3

AAG – Average annual growth rate E- Estimate

(Source: OMSYC, *The World Audiovisual Market*, 2002 edition, p.134)

Outside the EU, the progress of wide-screen has been closely linked to the launch of high definition services – analysed in section 5 below - and DVD, reviewed in section 3.4.3 below.

According to trade association estimates, some 15 million wide-screen TV sets were sold in Japan between 1992 and 2002.²⁵ In the United States, the wide-screen display market only got

²² International Funkausstellung.

²³ In-car and personal DVD playback systems incentivise use of the wide-screen format.

²⁴ 59.1%, including Norway and Switzerland. The European Media Market 1996-2009, www.omsyc.fr;

²⁵ Another estimate, by Omsyc, indicates 21.4% household penetration for Japan in 2002.

under way after the start of HDTV services in 1998. However, American broadcasters have been quick to realise the strategic significance of the wide-screen format, independent of high definition. In October 2002, the US National Academy of Television Arts & Sciences bestowed technical Emmy™ awards on the two European manufacturers Philips and Thomson for their contribution to the development and commercialisation of the 16:9 wide-screen format.²⁶

3.3. Market drivers for wide-screen

3.3.1. Pay television and wide-screen

Films are premium content and a key element in pay television services. Even during the Action Plan, there was a strong overlap between the profile of pay TV customers and early adopters of wide-screen television. Pay TV operators continue to transmit films in wide-screen, but films are the only programmes they transmit in wide-screen, in most cases. However, wide-screen film services have played an important role in helping to expand the niche for wide-screen TV sets in most Member States.²⁷

3.3.2. Wide-screen and Home Cinema

The Home Cinema phenomenon was initiated by pay TV film channels and films published on packaged media – video cassettes and DVDs. This stimulated manufacturers to offer TV receivers which could convey more of the impact of cinema films than traditional TV receivers. So called Home Cinema systems normally combine big displays or TV receivers with audio systems capable of reproducing the multi-channel sound used for feature films and some television drama programmes. The objective is to enhance the realism and impact of these programmes. Wide-screen television and DVD - discussed below – are the flagship products for Home Cinema currently.

Manufacturers have a clear incentive to develop the Home Cinema market because it offers both a chance to add value beyond the standard television receiver and thereby reap higher margins, and to achieve differentiation because there are so many different features that can be included in a Home Cinema system. The concept also offers a least a further decade of potential product upgrades, notably digital flat panel displays and a future high definition DVD product. Continuing growth through technological innovation is therefore guaranteed.

Home Cinema targets the replacement of the main, family TV set with a more highly specified facility. An interesting feature of most Home Cinema systems is therefore dual use. They combine two functions: the principal TV set for viewing broadcast television and systems which are optimised for viewing films. There is considerable overlap between Home Cinema and TV receivers therefore. Broadcasters have shared TV screens for many years with other content providers, home video notably. In the analogue era, broadcast TV always had superior quality to analogue video and defined the key parameters of the TV receiver. In the digital era, consumers will increasingly be watching television on equipment optimised for Home Cinema: big, wide-screen displays with surround-sound audio. Consumers will become more aware of any differences in quality and presentation between broadcast and Home Cinema content. Moreover, one European broadcasting organisation considers that Home Cinema will increasingly set the quality benchmark for broadcasting, rather than the reverse, for reasons described below in section 3.3.4.

²⁶ See Philips, web site: <http://www.press.ce.philips.com/emmy/backgrounder.html>

See Thomson web site: <http://www.thomson.net/gb/06/c02/021003.htm>

²⁷ See Final Annual Report cited in footnote 16 (3), p.23.

3.3.3. *The role of Digital Versatile Disk*

DVD is a digital packaged media format based on the same digital video compression technologies as digital broadcasting systems. It is intended for use with television sets or computers and is therefore a fully convergent platform. Created by a global consortium of film companies, consumer electronics and IT companies, the format was launched in Europe in 1998, following earlier launch in the USA.

DVD offers strong incentives for consumers in all Member States to buy wide-screen sets, as almost all films are offered in wide-screen format. Its flexibility provides the opportunity to view content in wide-screen format or in 4:3, depending on which kind of television a consumer owns. This eliminates the need for retailers to stock a separate inventory of wide-screen content, which was the case with VHS video cassettes. It has been extremely significant for consolidating and extending the market penetration of wide-screen television receivers. Wide-screen and DVD are complementary products. This means retailers will use a DVD sales opportunity to try and sell a wide-screen TV set and vice-versa. The obvious choice of display for Home Cinema is wide-screen, given that films are shot in wide-screen.

DVD offers much higher quality than digital broadcasting today. DVD is already recalibrating consumers' expectations of how digital video should look on TV, just as CD raised the benchmark for potential audio quality. Its huge capacity means that pictures can have bit-rates as high as 8M-bits per second.²⁸ The ability to display films in wide-screen with full resolution on a wide-screen TV set has helped to differentiate DVD from VHS. Wide-screen acts as a differentiator for quality. Film companies and other content owners have a strong incentive to leverage picture quality. Broadcasters interpret their incentives differently. Transmission bandwidth costs money. Conventional industry wisdom is that customers prefer quantity of services to picture quality. Broadcasters do not therefore consider quality to be a differentiating factor for consumers. DVD means that a packaged media format has better quality than broadcasting. This is a significant change from analogue markets, where VHS was inferior to broadcast television. DVD rather than digital broadcasting is therefore the benchmark for digital video quality in the home.

DVD has already passed 35% household penetration in the USA and has already passed 20% in some larger Member States. At global level, take-up of DVD is twice as fast as CD at the same point in the curve and three times the speed of VHS roll-out. Continuing enhancements - including recording capability, internet connectivity and HDTV capability - mean that it will remain a driver for consumer acquisition of digital programming and equipment. DVD drives are also becoming a standard feature on computers. Policy makers should therefore pay attention to its wider market impact.

3.3.4. *The future impact of Flat Panel Displays*

Recent European Broadcasting Union analysis of future evolutions in the receiver and display markets supports the view that DVD will be the flagship for digital video quality in the home.²⁹ DVD pictures achieve a high rating for picture quality on the big wide-screen, flat panel displays that manufacturers want to sell in future. Today's low bit-rate digital television services will look sub-optimal and analogue television looks even worse.

²⁸ Broadcast bit-rates vary from 2-5 Mbits per second according to the type of programming transmitted, with sports programmes requiring a higher bit-rate because of rapid movement.

²⁹ EBU Technical Information 134, June 2002, The Potential Impact of Flat Panel Displays on Broadcast Delivery of Television.

Moreover, consumers with wide-screen flat-panel displays may use aspect ratio conversion in order to convert 4:3 pictures to fit the wide display.³⁰ This would further highlight the poor picture quality of broadcast television. Home Cinema and broadcast TV will frequently use the same display, as argued above. This trend will compound the problem for broadcasters who remain faithful to the traditional 4:3 format.

3.3.5. The opportunity for wide-screen in digital free-to-air broadcasting

The United Kingdom is so far the only Member State where free-to-air broadcasters have used digital television to migrate over to wide-screen. Of those countries that have achieved around 20% penetration, the UK stands out because wide-screen penetration reached 27% household penetration after only 4 years in 2002, driven by digital television and DVD.

The penetration of wide-screen TV sets amongst homes equipped to receive digital television is around double the national rate; 50% of digital homes have wide-screen. Digital wide-screen broadcasting therefore provides a powerful incentive for consumers to buy wide-screen TV sets. The easy availability of digital decoders means consumers have the choice of purchasing an analogue wide-screen set and adding a decoder, or buying an integrated digital TV set, also wide-screen. So far the first option has proved more popular, but as the price differential between an integrated digital television set (IDTV) and an analogue set with a separate set-top box closes so sales of IDTVs are expected to increase.

The wide-screen component is one of the most successful elements in the UK broadcasters' digital strategy. Prime time is mostly in wide-screen on the major channels. Working with manufacturers, they positioned wide-screen as a way of differentiating digital transmissions from analogue in 4:3. All major terrestrial broadcasters adopted wide-screen for digital, including commercial broadcasters.

The UK strategy has several other interesting features. Television commercials have been in wide-screen since 2000. As UK terrestrial channels increasingly have multi-platform distribution strategies, wide-screen impacts cable and satellite, and pay television platforms as well. Programming for analogue and digital services is originated in wide-screen. It is transmitted in a compromise 14:9 format for analogue and can be seen in 16:9 wide-screen in the digital simulcasts. The UK wide-screen implementation has resolved remaining technical implementation issues and influenced broadcasters in other Member States and in Australia.

3.4. Barriers to increased use of wide-screen in digital broadcasting

3.4.1. Barriers in the market

There are still a number of barriers to increased use of wide-screen, particularly in digital free-to-air.

Business model concerns relate to entry barriers: the perceived need for consumers to buy expensive displays if one changes the screen format. Digital network and pay TV operators favour low entry barriers for the consumer and base their business model on providing low cost set-top decoders to consumers. The roll-out of free-to-air broadcasting also depends on low cost set-top units. These are connected to consumers' existing analogue TV sets. This approach ensures that operators and broadcasters achieve critical mass and viable revenue streams as early as possible. New display formats require consumers to buy new TV sets or displays and this lengthens the time necessary to achieve critical mass. This is the received view of most network operators. However, exogenous drivers like DVD are helping to overcome the problem, as argued above.

³⁰ These techniques are discussed in annex 2.

Co-ordination between market parties within the limits of competition law is also essential. A recent study undertaken for the Commission services suggests that the introduction of new display formats raises co-ordination issues between different broadcasters and between broadcasters and manufacturers. Unless there is a critical mass of wide-screen content, consumers will not invest in wide-screen TV sets or displays.³¹ This can only be achieved if all major content providers offer wide-screen content in a co-ordinated fashion. The role of DVD in boosting wide-screen take-up is a spin-off benefit from the close co-ordination necessary between hardware and content interests for the launch of that format. The UK experience with free-to-air digital services shows that similar co-ordination is possible in free-to-air broadcasting.

The Action Plan evaluators had earlier considered that a “free rider” problem affects wide-screen: almost no commercial broadcasters – i.e those exclusively funded by advertising – participated in the Action Plan or have subsequently started wide-screen transmissions. They are waiting until others have developed the installed base, public broadcasters and pay TV operators. This replicates their approach to earlier innovations, teletext, stereo sound etc. This could prolong market failure, according to the evaluators, as consumers need a clear message of long term support for wide-screen. The agreement on migration to wide-screen between major broadcasters UK included commercial broadcasters, thereby ensuring they helped develop the market. This avoided the “free rider” problem.

Some broadcasters may still consider wide-screen to be expensive. This is no longer the case either for receivers³² or additional production costs. Others may consider wide-screen to be suitable for certain types of programming only. Audience research shows that consumers appreciate use of the wide-screen format for all types of programming; not just cinema and drama, but also studio programmes and news reports, contrary to received views elsewhere.³³

More programmes are produced in wide-screen than are transmitted in wide-screen. This is particularly true of fiction. Production professionals often prefer shooting in wide-screen as it is closer to cinema; but the programmes are frequently transmitted in letterbox 4:3 format even in digital services, following analogue practice. Failure to transmit in wide-screen may stem from concerns that wide-screen transmissions may disturb viewers with 4:3 TV sets. However, market players have made substantial progress in ensuring that the process of servicing a mixed population of 4:3 and wide-screen sets during the transition to wide-screen does not create any inconvenience to any particular group.

Meanwhile, wide-screen television receivers offer a number of ways of viewing 4:3 using picture expansion modes. Digital devices such as DVD players or digital set-top boxes can output video for the different viewing options possible on 4:3 or wide-screen sets, according to viewers’ own preferences. The wide-screen signalling system enables broadcasters to ensure that wide-screen programmes appear in the correct format, without consumers having to change the format manually using the remote control. Annex 2 illustrates some of these techniques and how they have evolved.

³¹ Study on interoperability, service diversity and business models in digital broadcasting markets undertaken for DG Information Society by Oxera. Executive Summary p.6; also Volume 1, Report, pp 126-150

³² http://europa.eu.int/information_society/topics/telecoms/regulatory/studies/index_en.htm
During October 2003, a major Belgian multiple retailer was offering a 28 inch/71cms wide-screen TV for E399.

³³ Market research undertaken by BBC to prepare its statement on the use of wide-screen for digital services, September 1996.

There are some early generations of pay TV set-top decoders which do not include wide-screen capability, for instance in France and Netherlands. This means that wide-screen and 4:3 have to be simulcast in separate digital transmissions. Likewise some technical difficulties with the first generation of D-Box decoders in Germany meant they could not filter wide-screen television transmissions back to letterbox for those viewing in 4:3. Premiere temporarily ceased transmitting wide-screen; but second generation D-Boxes do not have this problem and wide-screen transmissions have resumed. In due course, these earlier generations of decoder are likely to be retired.

Major international sports events are still only available in 4:3. It has been difficult to convince event owners to produce master coverage in wide-screen 16:9 and use “shoot and protect” techniques to enable 4:3 coverage to be extracted. There are no obvious technical reasons why this approach could not be used.

There is perhaps a more general reason for the absence of systematic wide-screen broadcasting strategies in Member States. Free-to-air broadcasters are used to addressing different populations segments at the content level, via different programmes or thematic channels. They are unaccustomed to offering a diversified portfolio of digital service types - multi-channel, interactive, wide-screen/high quality – to attract different population segments. This is perhaps related to the limitations of analogue technology which could only deliver one type of service using a dedicated receiver, colour television, or radio for instance.

The attraction of digital television is that it enables a portfolio of different types of service to be offered simultaneously on a single receiver, drawing on the same underlying cluster of digital technologies: multi-channel, enhanced picture quality differentiated by wide-screen together with interactive television. Digital service diversity would mean offering these in parallel in order to maximise the appeal of digital television to different population segments. So far, the different service options have mostly been offered sequentially: an initial emphasis on multi-channel in the early years of the market, with more recent emphasis on interactive television, and little attention paid to enhanced video quality until the rise of DVD. Wide-screen can contribute to digital service diversity by helping to differentiate digital quality from analogue, as argued above.

3.4.2. Policy perception – a potential barrier?

National policy makers may consider there is a tension between the higher price of new screen formats and policy makers’ concern for universal coverage, and the lowest possible entry barriers for poorer citizens. High prices have been a temporary phenomenon however. There are strong incentives for manufacturers to scale up production and exhaust economies of scale, assuming adequate supplies of content are available to support roll-out. Prices fall as competition increases, as wide-screen TV take-up has shown. Consumer investment in new technologies - even while they are more costly - may be driven by the fact that television is inherently a cost-effective leisure activity compared with many other forms of recreation.

The absence or under-development of new screen formats in a particular market does not mean that the public is satisfied with existing formats, and is apathetic to new ones. It means rather that the right conditions for consumer adoption have not yet been established and there may be a market failure. Identifying and overcoming market failures which are judged to be against the public interest is one of the responsibilities of public authorities.

3.5. Section summary

This section has shown that wide-screen is a commercially valuable feature in digital television. It is highly appreciated by consumers when correctly implemented by market players, i.e. with sufficient services and programming. Consumer electronics manufacturers have powerful incentives to promote the format through Home Cinema, also DVD videogram

publishers. The format can differentiate free-to-air digital television from analogue and it plays a significant role in pay TV.

The wide-screen format exerts a market pull which attracts consumers to digital services and content. It is no longer a costly “early adopter” phenomenon, but a mainstream mass-market product, whose relevance stretches far beyond the fast-growing Home cinema segment. Digital broadcasting will increasingly share the main TV receiver with better quality DVD pictures. The public will benchmark broadcasters’ pictures against DVD. The advent of big, flat-panel wide-screen displays will increasingly reveal the limitations of analogue television and even of digital television in 4:3 format transmitted at today’s limited quality levels.

4. POLICY ORIENTATIONS FOR MEMBER STATES

4.1. Regulation and policy at EU level

Broadcasting is an area where Member States have some freedom to pursue their own choices, under the relevant Treaty Articles³⁴ and the Amsterdam Protocol,³⁵ in relation to the public service mission. This is balanced by a harmonised EU approach to infrastructure regulation, following the adoption of the new Communications Framework. This Framework separates content regulation from infrastructure regulation, for two reasons; first in order to achieve a horizontal approach to the regulation of networks that conforms with convergence; second so that general interests may be safeguarded at national level as Member States see fit through national content regulation. However, the adoption of the new Framework identified a number of interfaces where content policy objectives needed to be balanced against those of infrastructure.

The new Communications Framework addresses wide-screen only from the perspective of consumer protection. Broadcast network operators are required to pass on wide-screen services and programmes in wide-screen if they are received from the broadcaster in that format.³⁶ From the perspective of infrastructure policy, the interest in wide-screen lies in its potential for making services more attractive, and improving differentiation from analogue services. This will speed up the roll-out of services and potentially make some contribution towards an earlier closure of analogue services. As noted in 3.3 above, wide-screen and DVD are complementary products, providing a strong incentive for retailers to sell them together as a package. This is also becoming true for selling digital decoders in the United Kingdom, where most digital television is in wide-screen. This suggests that anyone with a wide-screen TV will be more likely to adopt digital media given that most wide-screen programming is digital.³⁷ Wide-screen might therefore help reduce the need for more intrusive public policy measures in support of switchover, notably mandatory digital tuners in TV sets.

4.2. Need for co-ordination on wide-screen at national level

Wide-screen raises policy issues for content as well as infrastructure, notably programme production; so Member State involvement is essential.

According to the recent study cited earlier³⁸, the key requirement for the success of wide-screen is co-ordination of broadcasters and industry in order to avoid market failure. The study offers a number of options for achieving co-ordination. These range from encouraging industry co-ordination, to imposing it, by requiring that a certain number of hours is transmitted in wide-screen. Any measure has to comply with EU competition law.

³⁴ See Treaty establishing the European Community, Article 151 on culture as well as Articles 86 and 87 available at:

www.europa.eu.int/eur-lex/en/treaties/dat/EC_consol.pdf

³⁵ Available at: www.europa.eu.int/eur-lex/en/treaties/dat/amsterdam.html#0109010012

³⁶ Directive 2002/19/EC on access to, and interconnection of, electronic communications networks and associated facilities, OJ L 108, 24.4.2002, p.7-21. See Art 4.2. This obligation is discussed in section 3.6 of ONP Network Committee Working Document *The 2003 framework for electronic communications, implications for broadcasting*, 14 June 2002, available at:

http://europa.eu.int/information_society/topics/telecoms/regulatory/digital_broadcasting/index_en.htm

³⁷ That wide-screen TV penetration in UK digital television homes is double the national rate of wide-screen TV penetration is a strong indicator for this.

³⁸ See section 3.4.1

4.2.1. Action to support wide-screen

Member States can take steps to encourage wide-screen at national level, by including it in their digital broadcasting policy. For instance, switchover policy offers the opportunity to stimulate migration to wide-screen in parallel with migration to digital television.

There is also scope to encourage greater use of wide-screen in digital terrestrial television, since Member States control the underlying resource and licensing criteria. Given that terrestrial has limited capacity and cannot compete with cable and satellite on the number of digital services, the differentiation brought by wide-screen could be useful. Further discussion with Member States on these issues is expected in the Communications Committee and in the context of e-Europe. The issue could also be raised in the Television Without Frontiers contact committee.

4.3. Follow-up by the Commission services

In fulfilment of the evaluators' recommendation to disseminate best practice in wide-screen implementation across Member States and accession countries, the Commission services are launching a study to bring together implementation experiences and to identify ways of addressing some of the remaining barriers identified above. This will support implementation by Member States and new adhesions, notably in the context of digital switchover, and help ensure that the benefits of the Community investment achieve continuing impact.

Once this is completed, transfer of responsibility for wide-screen to Member States will be complete, in line with the evaluators' recommendations.

4.4. Summary

Wide-screen should be considered both from the perspective of infrastructure and content policy. Public policy may have a role in achieving co-ordination between market players in respect of wide-screen broadcasting. This would ensure that wide-screen could fulfil its potential as a differentiator for digital quality compared with analogue television.

5. TOWARDS AN UPDATED VIEW OF HIGH DEFINITION TELEVISION

HDTV is the next step after wide-screen, adding high resolution, and optimal pictures for big screen displays. It is likely that HDTV will be available to some consumers in Europe before the closure of analogue broadcasting. HDTV marks a further stage in the development of the trends analysed in this document.

After ten years of invisibility, the profile of High Definition Television is starting to rise again in Europe. The German digital television platform organisation re-opened its HDTV subgroup in 2003 after closing it ten years ago. The Euro 1080 project will start HDTV transmissions in 2004, partnered by SES Astra which is also creating a forum to bring together leading TV companies to discuss the introduction of HDTV services. During October 2003, TF1, TPS, and Sagem were co-sponsoring HDTV satellite test transmissions with their partner Eutelsat. There is also HDTV activity or interest within other broadcasters.

HDTV combines the wide-screen aspect ratio with high resolution and is therefore the next enhancement to television after wide-screen. Digital HDTV services are already available in the United States and Australia. High-end Home Cinema equipment able to pass HDTV programming is already on sale in Europe, without any HD content being available. It is likely that digital HDTV will be available through DVD within three years, according to one recent report.³⁹

5.1. What are the characteristics and benefits?

The main technical characteristic of HDTV is that it offers between four and five times the resolution of a standard definition television system.⁴⁰ HDTV is intended for viewing on displays of over 1 metre diagonal. The combined effect of the wide aspect ratio and higher resolution is to widen the viewing angle from 10 degrees for standard definition television to around 32 degrees. This transforms television from an objective viewing experience – staring at a small screen – to a subjective viewing experience, i.e. the eye wanders within the frame to different elements. This significantly enhances realism and impact and thereby the enjoyment of the work. HDTV moves the home viewing experience another step closer to cinema⁴¹ in technical and viewing terms. CD has enhanced the possibility for enjoying music compared with vinyl records. The difference between standard definition television viewed on a small display and HDTV viewed on a large display is comparable. HDTV has the potential to maximise the differentiation between analogue television and digital television.

From a programme production perspective, the increased spatial resolution means that there is less need for close-ups and cutting between cameras: action can develop within the frame on several levels, in a more cinematic style. This is particularly relevant for sports coverage, but offers benefits for single camera production like drama too. As a master format for stock programmes with extended commercial life, HD video also has advantages. It can be converted to other formats including standard definition TV and even film. When HDTV is available as a service or through DVD to the public, programmes can then be shown in native resolution, rather than needing up-conversion.

³⁹ *High Definition: the future of DVD*, multi-client study by Screen Digest, http://premium.screendigest.com/content/2003-06-01_yp_1.shtml/view

⁴⁰ The increase in the resolution will depend on the technical parameters selected, numbers of pixels per line and numbers of lines of resolution, together with temporal resolution.

⁴¹ Cinema exhibition will continue to decide the commercial success or failure of films and to be the medium which best conveys the intentions of those who create films. As a public medium, it is also a shared experience for audiences, which increases the enjoyment of the work.

5.2. Experiences in high definition since 1992

5.2.1. Europe

Following reorientation of EU policy away from the analogue MAC technologies and HDTV in the early 1990s, there has been a widespread view in the industry that HDTV itself failed. Market players rejected the analogue technology proposed for HDTV in the early 1990s because they preferred to concentrate on digital technologies and other, more easily implemented service options, notably multi-channel television. HDTV services and equipment were never offered in Europe; European consumers therefore never had an opportunity to reach their own opinion on HDTV.

According to industry plans from the early 1990s, digital high definition television services would be introduced in Europe, but not before 1999⁴². However, no HDTV services have been introduced in the Union. Only now, as demand for multi-channel falters in some markets, have some market players started to include HDTV in their future reflections. EBU analysis of the future impact of large flat-panel displays on digital broadcasting provides some important indicators and perhaps a new way of assessing the future role of high definition.⁴³ This is considered in greater detail in the technology section, below.

The position over the past ten years can be summarised as follows following preceding analysis:

- (1) There is still a perception among European market players that HDTV failed in the market.
- (2) Broadcasters prefer to focus on the cheaper and more spectrum-efficient option of multi-channel standard definition television, together with interactive services; they lack incentives to introduce HDTV and consider there is no business model.
- (3) Where a change in the display format is needed, use of wide-screen standard definition is a more cost-effective alternative than HDTV. The cathode ray tubes used in today's receivers anyway limit the size of the picture and the viewing experience.

5.2.2. USA, Australia and Japan

American terrestrial broadcasters started transmitting digital HDTV services in 1998 and claim that they have achieved a sustainable, critical mass of HDTV services in the market and of receivers in homes. The earlier hesitation of different market parties and the co-ordination difficulties between them recall the early days of wide-screen in Europe.

The fragmented structure of US terrestrial broadcasting – many local stations retransmitting the programming of the major terrestrial networks – makes co-ordination difficulties more acute than in Europe. Several major terrestrial networks initially hesitated to offer HDTV because of the expense and uncertainty over consumer response. Terrestrial prime-time programming on the major networks has started to migrate into HDTV, led by CBS.⁴⁴ The Federal Communications Commission (FCC) has played an active role in trying to co-ordinate broadcasters, the different network operators and the consumer electronics industry so that HDTV is available to all US citizens. There is strong political pressure to speed up the transition to digital broadcasting, given the ambitious public target to turn off analogue

⁴² *The Success story of DVB: state of the project*, conference paper by Theo H. Peek, Chairman DVB, read at DVB World Conference, March 2001. <http://www.dvb.org/>

⁴³ See EBU Technical Information 134, referenced in section 3.3.5, footnote 25.

⁴⁴ One third of prime-time scripted series on the big 6 networks are shot in HD. More than half of all pilot productions use it, according to US trade press.

terrestrial transmissions in 2006, subject to achievement of an 85% household penetration target in local television markets. This has provided a rationale for regulatory co-ordination.

US consumers were initially uncertain about acquiring HDTV equipment because the major terrestrial networks were transmitting very few hours of HDTV programming. HDTV products were mainly purchased for wide-screen playback of standard definition DVD programming in Home Cinema systems. By end 2002, consumers had purchased around 4.8m HD monitors since the start of services in late 1998. The installed base will nearly double in 2003.⁴⁵ One significant barrier is rights holders' fear that free-to-air HDTV broadcasting without copy protection will make whole programme catalogues available in this very high quality format to pirates, who will then reinject them back into internet peer-to-peer systems. Industry is working on collaborative solutions for these problems and the FCC has several Notices of Proposed Rule Makings on copyright protection and digital rights management systems in process currently.⁴⁶

Satellite and cable platforms have started to transmit or relay services in high definition, alongside standard definition multi-channel. Cable operators in particular see an opportunity with HDTV and have launched services in 90 regional markets. The top 10 operators have committed to carry five digital channels of HDTV during at least 50% of prime-time. The two satellite operators are working to meet the voluntary milestones for HDTV programming proposed by the FCC Chairman in April 2002.⁴⁷ The greater capacity of satellite and cable is clearly an advantage when delivering HDTV, compared with terrestrial, when using current compression technologies. A recent forecast predicts that nearly 40% of all US households will have access to HDTV by end 2007 thanks to increased availability of HDTV services across all networks.⁴⁸

In both USA and Australia – where digital terrestrial HD transmissions started in 2001 - broadcasters have received a full additional terrestrial channel to enable them to offer HDTV services. This is a valuable incentive, worth substantially more in financial terms than Action Plan funding for wide-screen.⁴⁹ In both cases, broadcasters used HDTV as a reason to maximise the additional spectrum capacity provided by public authorities for digital television. In the USA, there are no formal obligations on broadcasters to transmit in HD; in Australia there is an obligation for each terrestrial broadcaster to transmit 1040 hours per annum of HDTV. This is an example of the principle that, where HDTV is used as a justification by broadcasters for more terrestrial spectrum, the conditions should be explicit and enforceable.

The HDTV concept was originally pioneered in Japan by the public broadcaster NHK, which has devoted extensive resources both to research and implementation over a 30 year period. More recently, Japanese broadcasters have invested heavily in programme production in order to feed the analogue and digital HDTV services available by satellite.⁵⁰ These have an audience of around 1.3m households, compared with 3m households for digital multi-channel

⁴⁵ Source: Strategy Analytics. Installed base of 8.34m estimated by end 2003.

<http://www.strategyanalytics.com>

⁴⁶ See "FCC explores digital copy protection", NPRM (FCC 02-231) of 9.8.02, available at: www.fcc.gov/dtv/documents.html

⁴⁷ Annual Assessment of the Status of Competition in the Market for the Delivery of Video Programming, Ninth Annual Report, FCC, December 31st 2002, pp. 23, 35.

⁴⁸ "HDTV finally overcomes inertia, set for rapid growth", Yankee Group, <http://www.yankeegroup.com/>,

⁴⁹ US estimates of the value of spectrum allocated for digital terrestrial television rose as high as \$70 billion during the dot-com boom; but this valuation remains contentious.

⁵⁰ Seven broadcasters are transmitting digital HDTV using Broadcast Satellite; NHK's analogue MUSE HDTV service will terminate in 2007.

satellite services. Entry-level HDTV receivers have become more affordable at Y200,000 (€1690).⁵¹ Government guidelines stipulate that digital terrestrial broadcasters should transmit HDTV for more than half of their transmitted output. Digital terrestrial services are due to start before the end of 2003.

5.3. Technology trends

5.3.1. Production

The outlook for increased film and television programme production on high definition video is optimistic because of film makers' artistic and economic interest in electronic production techniques. Major film productions are being shot and post-produced electronically in high definition or super high definition formats both in Europe and America.⁵² All-electronic production and post-production widens creative vistas and can save time and money.⁵³ Film makers now have a high definition version of their historic 24 frames per second film production norm. The electronic cinema variant of high definition video runs at 24 frames per second, with progressive scanning as used on computer displays. This avoids picture artefacts associated with the interlaced scanning format used in broadcasting. Camera systems using these parameters are suitable for television drama production, but lack the temporal resolution necessary for broadcast applications like sports coverage. A higher frame rate is necessary to capture rapid action without blurring it.

Low-end HD video cameras can be rented from facilities houses for only 25% more than standard definition equivalents in certain Member States. This compares with a purchase premium of 400% or more a decade ago, when high definition video cameras had just left the laboratory. Standard definition wide-screen programming can also be upconverted to HD video and some broadcasters and producers have already started to sell such programming into US HD broadcast markets.

5.3.2. Compression techniques

HDTV reduces the potential for multi-channel as it normally 15-20 Mbits for a single service using the current MPEG2 technologies. However, new compression systems⁵⁴ offer a two-fold improvement in compression efficiency over MPEG2.

This is significant for two reasons. Clearly, if HD transmission could be coded at 5-10Mbits – comparable to high quality standard definition on DVD - this would be a significant incentive for broadcasters to reconsider HD as an option, even on terrestrial networks. HDTV would become spectrum-efficient with reduced transmission costs. More HDTV services and programmes could be carried in a given bandwidth, or mixed with standard definition ones, making the trade-off between the number of services and resolution less stark than it is today. New compression systems also deliver similar efficiencies with low bit-rates and will both enhance the feasibility and bandwidth efficiency of mobile TV services for portable personal devices and make it possible to carry full screen, standard definition video at very low bit-

⁵¹ Source: DVB/ARIB liaison

⁵² The so called Super High Definition studio format has higher resolution than the HD standard for television, up to 3072 lines of vertical resolution and 4096 pixels of horizontal resolution. This is the so called 4k format. Together with the intermediate 2k format, it is intended for electronic production of feature films, with the aim of matching or surpassing the theoretical resolution of 35mm film.

⁵³ Where a feature film is shot on film, around 25% of stock and processing costs for a normal shoot can be saved by using HD for reviewing each day's footage, "dailies". 75% of productions on MGM's 2003 production slate are using this technique, according to US trade press..

⁵⁴ MPEG4/AVC, also known as J2T, MPEG 4.10, H264/AVC. Microsoft's Windows Media 9 codec is an alternative technology with comparable performance. It has been submitted for standardisation to the Society of Motion Picture and Television Engineers (SMPTE), an American standardisation body

rates over telecommunications networks. Exogenous competition from these other networks may alter broadcasters' incentives away from maximising the number of channels at the expense of picture quality. The continuing roll-out of broadband networks is a pre-condition for this.

From the perspective of spectrum policy, it is important to maximise efficient usage, particularly of scarce terrestrial spectrum. New compression schemes merit policy makers' attention and broadcasters should be encouraged to use them.

5.3.3. *Displays*

In order to achieve differentiation from standard definition, and achieve the transition from objective to subjective viewing experience, HD needs to be viewed on big displays with a diagonal of more than 1 metre, or via projection. As argued above, flat-panel displays and projection systems are becoming more affordable for consumers. Manufacturers have considerable incentives to promote these products for the next generation of Home Cinema, now that some have started to reduce cathode ray tube production and focus on flat panel fabrication.⁵⁵ The market prospects for big display technologies has anyway been transformed compared with ten years ago, when HDTV pictures were last publicly shown in Europe.

The WideXGA plasma display format corresponds to the 720 line progressively-scanned HDTV format, used already in the United States and was included in EBU tests referred to earlier.⁵⁶ These tests showed that HD 720 line pictures looked as good or better than interlaced standard definition pictures compressed at the same bit-rate. Progressive scanning enables more efficient compression than interlace. The retail price of a 50 inch (127cms) wide XGA panel will have fallen to \$2099 in 2006, declining to \$1849 in 2007, according to a recent estimate.⁵⁷

The choice of scanning parameters for HDTV has some interest for policy makers. Choosing a progressive scanning format would facilitate the viewing of web pages on TV screens. Currently, web pages have poor visual quality on today's TV displays because of interlaced scanning. This reduces definition and legibility of text. HD is the most evident way of introducing progressive scanning into European television. The native scanning format of plasma display panels is anyway progressive.

In the USA, the digital terrestrial standard includes both progressive and interlaced scanning formats, with different numbers of scanning lines because market parties were unable to agree on a single set of parameters. US digital receivers include some or all of these parameters. It would be desirable if Europe could make a cleaner choice when the time comes. Meanwhile, Europe's DVB television transmission standards cover all possible HDTV technical parameters as options. The 1080 line interlace version has been implemented in Australia.

Some technologies might encourage take-up of HD displays, even in the absence of HD services or packaged media. Line-doublers improve the appearance of standard definition programming on big screens through upconversion, but add complexity and expense to consumer equipment. For broadcasting, once a certain penetration of HD displays has been achieved, it would become more cost-effective to transmit additional bits and displace complexity to the broadcast encoder in the transmission facility, in line with established broadcasting practice.

⁵⁵ In October 2003, Sony announced it would reduce CRT manufacturing from 17 plants to 5, drawing attention to its flat-panel joint venture with Samsung.

⁵⁶ See EBU Technical Information 134, referenced in section 3.3.5, footnote 25.

⁵⁷ Stanford Resources Television Systems Market tracker, all markets Q3 2003.

5.3.4. *Packaged media*

The DVD consortium - responsible for DVD standards - has been assessing technologies for the higher capacity version of DVD able to deliver HD video. These include improved compression and the long-heralded blue laser, which substantially increases the amount of information that can be stored on a DVD. The first HD-enabled DVD recorder was due on the Japanese market during 2003.

Meanwhile, film studios have already been remastering films in HD for re-release on DVD. This provides a very high quality master for standard definition and eliminates the need for further remastering when HD finally does reach consumers.

5.4. Barriers and incentives

As argued in earlier sections on wide-screen, the introduction of new screen format creates a tension at the level of business models between network operators' need to achieve speedy roll-out of digital television and the longer time needed to build a critical mass of costly displays. Across both pay TV and free-to-air, there is a need for co-ordination between broadcasters and between broadcasters and manufacturers in order to avoid stand-off and market failure. This helps to ensure a critical mass of content and creates consumer confidence.

For HDTV, there is a much higher risk of stand-off and market failure. HDTV still carries substantial additional costs for broadcasters, whereas the additional costs for wide-screen are now low. The financial benefits accrue to manufacturers from equipment sales. Business models based on external decoders have been able to accommodate wide-screen TV because of the soft start provided by the Action Plan and the analogue wide-screen phase. Wide-screen sets were already in people's homes; therefore it was possible to attach decoders to them and offer digital wide-screen services. For HDTV however, roll-out of HDTV displays has to be tied exclusively to digital media given that analogue HDTV was never introduced, except in Japan. Digital HDTV also reduces the number of services that can be offered, because it requires a higher bit-rate than standard definition.

There are some potential incentives and drivers too. As argued above, broadcasters' incentives may be starting to shift as demand for multi-channel saturates, and as new display technologies and compression systems become available and less costly. HD DVD could help build a population of high resolution displays. The further development of Home cinema provides strong incentives for the market parties - unless they decide to wait for broadcasters to start HDTV. It is much easier to achieve the required co-ordination between a few film studios and a few consumer electronics companies for launching new DVD formats, than between many broadcasters across different Member States.

Past experiences with Europe's fragmented broadcasting markets suggest that some co-ordination between Member States would be necessary to synchronise HD service introduction. Too often in the past, implementation of new broadcasting systems has been fragmented in time across Member States, making it harder for manufacturers to leverage economies of scope and scale on the receiver side. In dynamic markets, this increases the risk that different standards will be used, as technical innovation is constant. The asymmetric structure of consumer electronics manufacturing and broadcasting remains a problem. Broadcasting is managed at national level, but manufacturers need EU single market or global production efficiencies.

In its original policy rationale for the wide-screen television Action Plan, the Union maintained that the successful introduction of wide-screen into standard definition television

would provide a sound basis for the subsequent introduction of HDTV.⁵⁸ Wide-screen has the potential to contribute to a “soft start” for introducing HDTV into Europe. Programming produced in wide-screen can be upconverted into high definition; HDTV programming can easily be downconverted for transmission and reception on standard definition wide-screen TV sets. The major difference between wide-screen and HDTV is that whereas migrating all broadcast output to wide-screen is already foreseen by some European broadcasters, no European broadcaster has plans to migrate to HDTV, primarily for cost reasons.

5.5. Summary

High definition video production and programming will spread thanks to the film industry, whatever broadcasters do. This will affect European broadcasters and presents many opportunities and no obvious disadvantages. Studio production systems are standardised at ITU level. Major European broadcasters have started to produce some programmes with a long commercial life in HD. In the United States, the migration of prime time drama series towards HDTV is already underway.

HDTV maximises differentiation between analogue and digital television. Its benefits is to deliver a substantial increase in impact and realism for consumers on bigger displays. The introduction of HDTV as a broadcast service raises co-ordination problems between broadcasters similar to those observed in wide-screen. It is necessary to resolve these in order to achieve critical mass and a positive feedback loop between equipment and services. In the United States, the FCC has taken a pro-active role in achieving the necessary co-ordination between market players in order to assist the roll-out of HDTV, so far without regulatory imposition. In Europe, further co-ordination, across Member States, may be helpful so that manufacturers can achieve economies of scale for equipment. DVD can also contribute, given that co-ordination between only a few market parties is necessary to launch HD DVD.

The role of HDTV is uncertain in Europe, but there is market potential. As with wide-screen, it is harder to harvest the benefits compared with other service possibilities that can be delivered without changing the screen format.

Given past experience, a policy-driven approach to HDTV would be counter-productive; however having prematurely over-estimated the role of HDTV in the past, the Union should not overlook its future potential.

⁵⁸ See Council Resolution of 22 July 1993 on the development of technology and standards in the field of advanced television services, OJ No C 209 3.8.93 p.1, recitals 1 and 2; also Proposal for a Directive of the European Parliament and of the Council on the use of standards for the transmission of television signals, COM (93) 556 final – COD 476, Brussels, 15 November 1993, Explanatory Memorandum, section 4.

6. CONCLUSION

This document examines the contribution of wide-screen television – 16:9 format - to the roll-out of digital television. The intention is to trigger a final round of debate on wide-screen at Member State level, notably on implementation issues, in line with the recommendations of the independent evaluators who assessed the role of the Union's wide-screen television action plan.

Market players have tended to exploit the different service options possible from digital television in a sequential manner. They have focused on multi-channel and interactive television, rather than on increasing the quality of video and audio. Broadcasters face a trade-off between the number of channels and video quality. Quality is seen as a weak driver for consumer take-up. However, new screen formats such as wide-screen can help differentiate the quality of digital video from analogue video. Rapid take-up of the DVD format and Home Cinema equipment shows that the public is interested in boosting the impact and realism of the programming through increased quality. DVD and Home Cinema use wide-screen to help differentiate DVD quality from analogue video cassette. Broadcasters could draw upon this example. Digital TV needs better differentiation from analogue.

Digital service diversity – offering a service portfolio of multi-channel, interactive, high picture quality differentiated by wide-screen - will be important for maximising the appeal of digital television to all social and demographic groups, across all markets and all networks. Digital service diversity is a pre-condition for achieving universal take-up and for digital switchover.

New screen formats are more difficult to introduce than other service options because of the need for co-ordination between broadcasters and between broadcasters and manufacturers. According to a recent study undertaken for the Commission, co-ordination is necessary in order to ensure a critical mass of services and programming in wide-screen so that the public can invest with confidence in wide-screen television receivers and displays. There are examples where industry has achieved adequate co-ordination in order to introduce wide-screen into digital broadcasting. However, there may be a role for public authorities to facilitate such co-ordination in order to avoid market failure.

Home cinema is recalibrating consumer expectations of quality, just as CD increased consumer expectations of audio quality earlier. Home cinema is achieving a substantial impact on consumer equipment acquisition. Take-up of DVD is already incentivising consumers to buy wide-screen TV sets and displays. Industry is planning to market a new generation of flat-panel displays in wide-screen format. This poses a quality challenge to broadcasters who are still transmitting digital television in the traditional 4:3 television screen format and at a quality level that is only equivalent to analogue television. Consumers with large wide-screen displays will expect DVD quality and wide-screen increasingly.

The role of high definition television should be reassessed in the digital era. Broadcasters in Japan and the United States have now achieved a critical mass of digital HDTV broadcasting, and US cable television networks are increasing their commitment. The DVD format will be upgraded to include high definition capability. The sustainable introduction of digital high definition video is already happening into cinema and television programme production. Technical and market trends discussed in this document will increasingly support the sustainable introduction of HDTV services and DVDs for consumers in Europe, subject to the same caveat regarding the need for co-ordination among market players. Greater co-ordination between Member States is also desirable so that equipment manufacturers are more easily able to leverage economies of scope and scale from the Single Market for the benefit of consumers.

ANNEX 1

Evaluators' recommendations

The Wide-screen Action Plan amounted to €206.8m and ran from 1993 -1997. The Action Plan was subject to an independent evaluation in 2000 This annex provides an outline summary by the Commission Services of that evaluation.

What are the market impacts of the 16:9 Action Plan?

Many factors influenced the wide-screen TV set market. Basic statistical analysis does not suggest a strong correlation between the implementation of the Action Plan and sales of wide-screen TV sets. Its impact was reduced by various factors, notably lack of concerted promotional effort by some market players and limited involvement of some Member States in support of the Action Plan at national level. However, the Action Plan ensured that the format was accepted as a practical option by broadcasting and production professionals. Without the Plan, the format could not have become part of the service mix for digital television.

Did the Action Plan meet the needs of its target audience?

The evaluators confirmed that the Plan did meet the needs of its target audience, by creating a climate of confidence along the complex chain of audiovisual market players, even if it was both launched and concluded too early.

Was the Action Plan set up, organised and managed efficiently?

The Plan reached a significant portion of its target audience and procedures for evaluating applications were satisfactory overall, with some 1/3 of companies surveyed having received a visit from auditors. However, there were some defects in monitoring and payment procedures.

Was the intervention logic effective?

Assumptions regarding the attractiveness of wide-screen to the consumer were confirmed during the life of the plan and by subsequent market developments. The format showed it was technologically neutral in terms of programme production and transmission standards. Digital broadcasting has reaffirmed its role. However, the Action Plan began and ended too early, given the period of time needed for such a product to become established. The approach of offering higher financial incentives to "late-starting markets" - Member States with less developed audiovisual markets - was of questionable value in terms of achieving the objectives.

Did the Action Plan achieve its main objectives?

At European level, the Plan's primary objectives were only very partially achieved during the life of the Plan. The wide-screen television receiver market reached critical mass in France, Belgium and the Netherlands during the life of the plan. However, the combination of the Action Plan's legacy and subsequent activity by market players is bringing tangible results in UK, Denmark, Ireland and Sweden. The Action Plan's impact on the market was ultimately significant.

What lessons can be drawn for possible future interventions of a similar type?

Industrial and cultural aims need to be clearly segmented or reconciled; the evaluators consider there was a tension between popular programming able to encourage the purchase of wide-screen TV receivers and some “quality” programming that was supported.

There should be quantitative targets rather than qualitative targets like critical mass which are susceptible to many interpretations.

Means for revising the aims and operating principles of a programme should be built in to a programme, rather than requiring a new legislative act. There should be greater flexibility to modify the conditions for concluding or extending a programme in the light of market conditions, avoiding a purely top-down budgetary approach.

Monitoring and management tools require efficient tools. The evaluators acknowledge that more recent programmes managed by the Commission have shown an improvement.

Recommendations on the follow up

The following are the objectives of a set of possible activities to follow up the Action Plan.

- Disseminate best practice for the market introduction of 16:9 television where the market is under-developed, and to inform candidate countries for accession to the EU about the benefits of 16:9.
- Develop proportionate and supportive regulatory strategies for introducing and developing a sustainable installed base of 16:9 receivers over a lengthy time period.
- Entice new digital pay-TV bouquet operators to supply 16:9 television, notably new cable entrants.
- Obtain from free-to-air commercial channels the same involvement as pay-TV channels and public broadcasters in building the 16:9 market, in order to overcome the "free rider" effect.
- Support the production and broadcasting, in 16:9 format, of major sports events.
- Foster 16:9 video production.
- Foster the circulation of 16:9 programmes.
- Ensure that 16:9 and Home Cinema are included in the MEDIA programme and in any future European Union reflections on electronic cinema.

ANNEX 2

Compatibility between 4:3 and the 16:9 wide-screen format

Transition to wide-screen implies a period of co-existence between programming and TV receivers in the traditional format (4:3) and those in the wide-screen format (16:9). This annex explains some of the techniques used by broadcasters and manufacturers to help the process and the different viewing options that are available to consumers equipped with digital video products and modern television receivers. These techniques all enable programming originated in one format to be viewed on the other type of display; hence the transition to wide-screen may be considered as a transition during which nobody's utility is decreased, thanks to the various viewing techniques. Completing the transition will lead to a situation with greater overall utility, i.e. increased benefits for consumers.

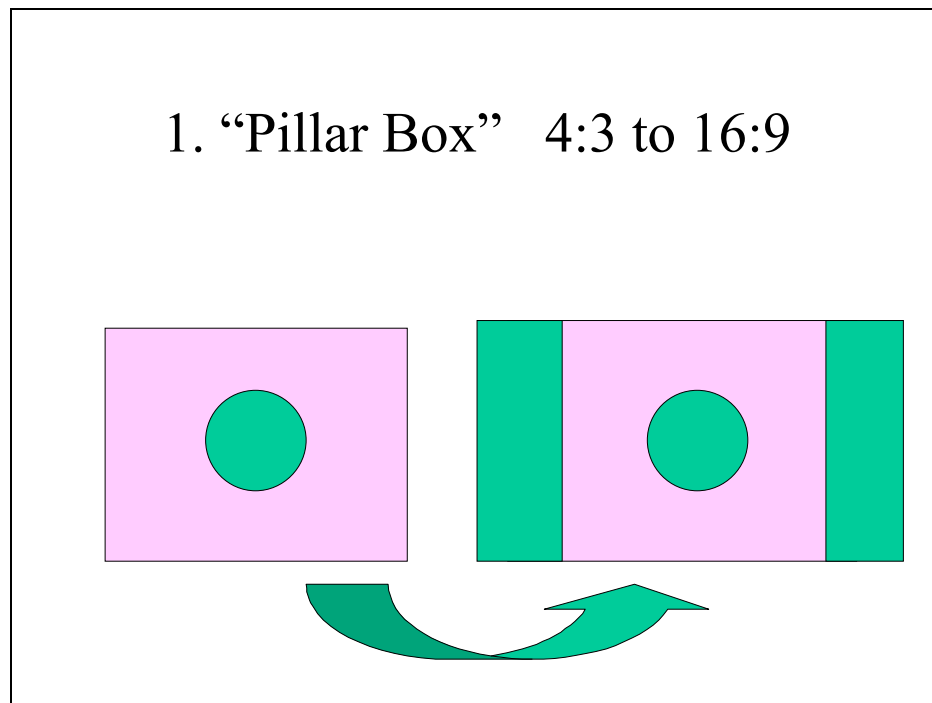
Two important concepts are the picture format and the display format.

The picture format is selected by the programme maker or film director for originating the production. This is also called an aspect ratio because it defines the horizontal and vertical characteristics of the picture (aspect ratio = image width / image height).

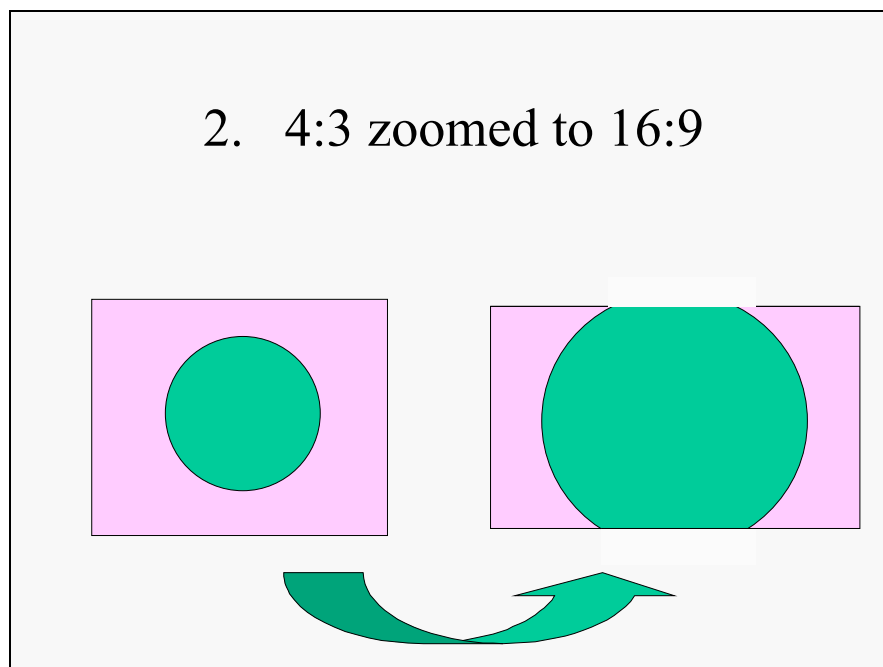
The display format addresses reproduction on video displays. Modern TV receivers can be set to scan in either 4:3 or 16:9 format, even if the physical proportions of the display itself are fixed at 4:3 or 16:9. Many of the techniques described below exploit this flexibility to change the scanning parameters, often combining it with a zoom function.

1. Viewing a 4:3 image on a 16:9 screen.

A 4:3 image may be displayed on a 16:9 screen with black lines 'pillar boxes', on each side as in (1) below. This uses the 4:3 scanning option on the wide-screen receivers. It does not use the full screen area of the wide-screen display.



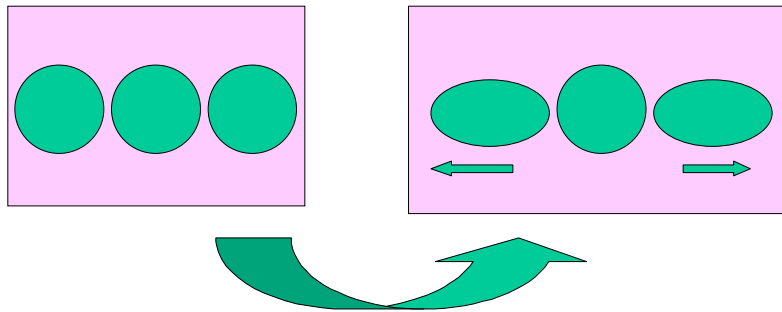
A 4:3 image may be equally displayed by expanding the active 4:3 picture area to fill the wide-screen display. The picture is zoomed so the width of the 16:9 picture matches that of the 4:3 picture. Consequently some of the 4:3 image is cropped at the top and bottom of the screen, as in (2) below.



Alternatively, the height of the 16:9 picture matches that of the 4:3 picture and there is a selective horizontal expansion. Manufacturers have developed algorithms which

leave the central part of the picture untouched, but expand the sides of the image in order to provide a full-width 16:9 picture as in (3).

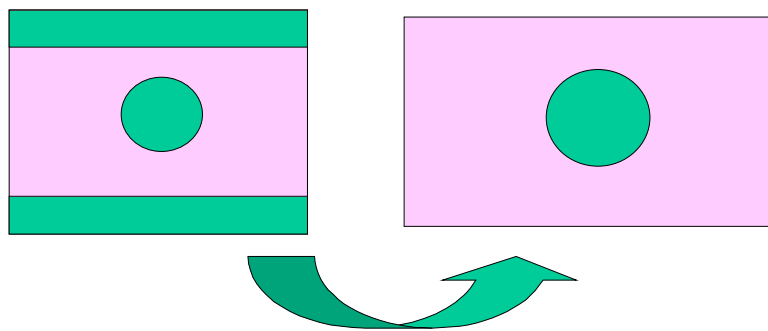
3. Differential stretch 4:3 to 16:9 full screen, “superwide”



This differential expansion avoid cropping by stretching the picture horizontally to fill the screen but risks some distortion, especially at the sides of the picture.

In analogue television, broadcasters developed a technique of copying wide-screen films over to video and electronically generating black stripes at the top and bottom of the picture to make it compatible with 4:3. This “letterbox” technique is still used and the 16:9 zoom feature described in (2) can be used to expand this image to fill the wide-screen display, as in (4). There is no distortion of the image or cropping, but some loss of resolution, owing to the expansion of the image.

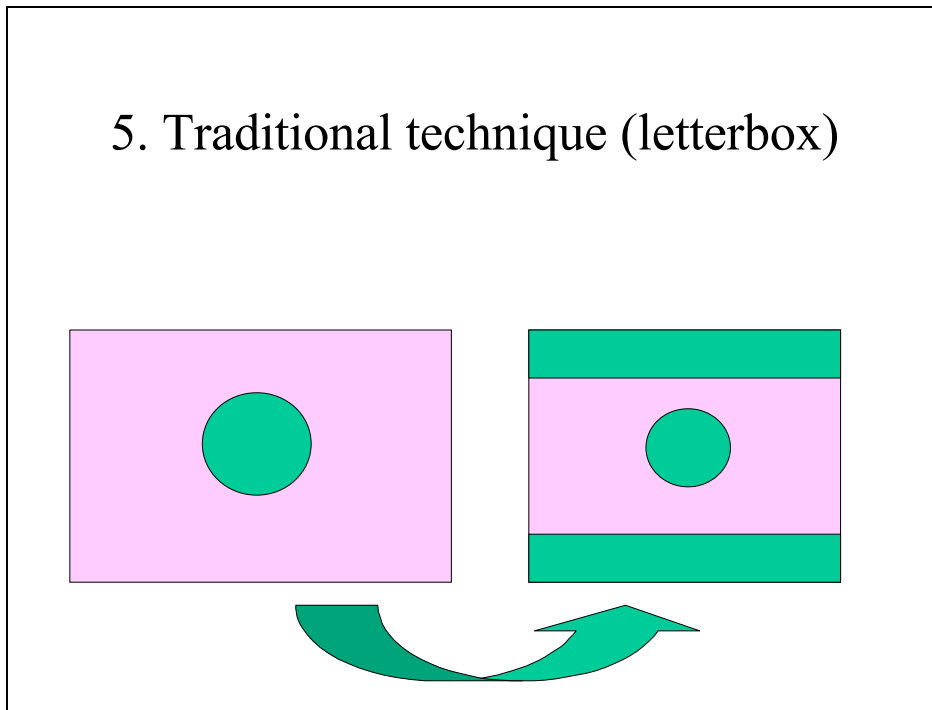
4. Viewing a 4:3 “letterbox” image on 16:9 screen



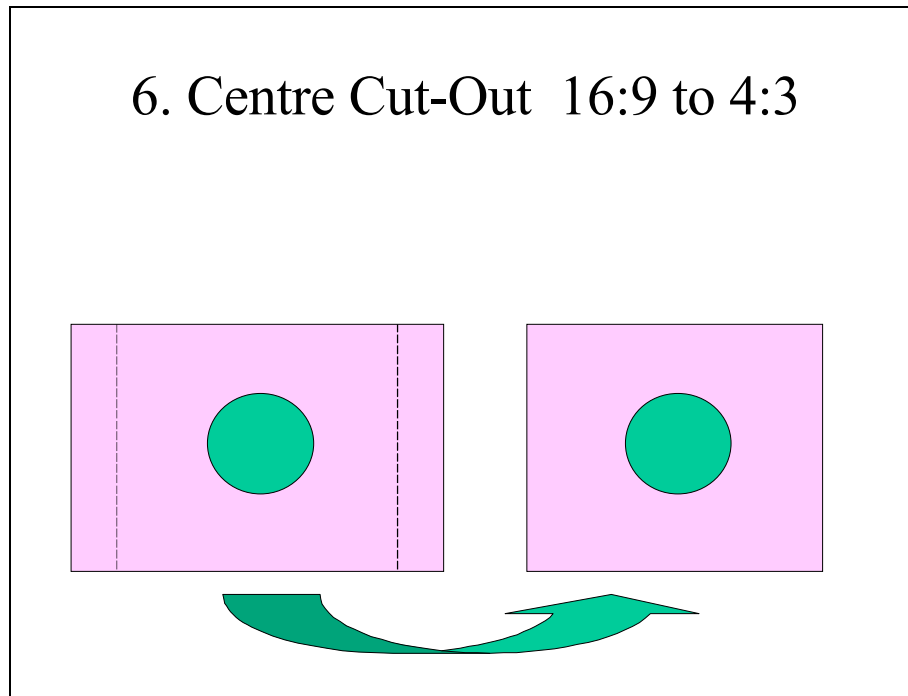
2. Viewing a 16:9 image on 4:3 screen

The classic technique is for the broadcaster to generate a “letterbox” version of the programme as described above. This is sub-optimal from a broadcasting perspective. In analogue, it meant wasting transmission capacity and spectrum on transmitting black lines. It does however ensure that the viewer sees the whole wide-screen image as shot by the director. Modern digital equipment – such as DVD players or DTV decoders - generates the letterbox locally. If used in conjunction with a modern 4:3 television, able to scan in 16:9, there is no need to filter the image and reduce the resolution. The receiver will display the image in native 16:9 format with higher quality; the limitation to the final resolution is caused by the display itself rather than the source material.

5. Traditional technique (letterbox)



A 16:9 image may also be viewed by cropping some of the picture sides area to fill the 4:3 display (centre cut-out), as in (6).

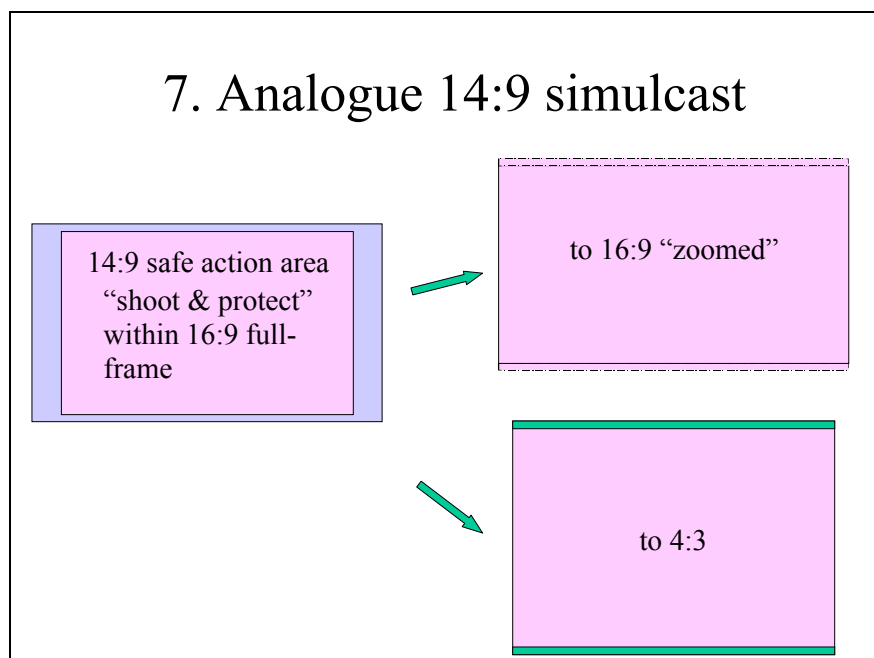


Unlike “letterbox” this does not preserve the whole picture, as composed by the director. The viewer may miss some action occurring at the sides of the picture. This is descended from a studio technique called “pan-scan”, used to produce 4:3 versions of wide-screen films so as to avoid “letterboxing”. The technician responsible for copying the film selects the main action within the wide-screen frame using a 4:3 framing device attached to the telecine film-to-video scanner, retaining only around half of the image area of each frame as shot. Film-makers have therefore been hostile to “pan-scan” as it destroys picture composition.

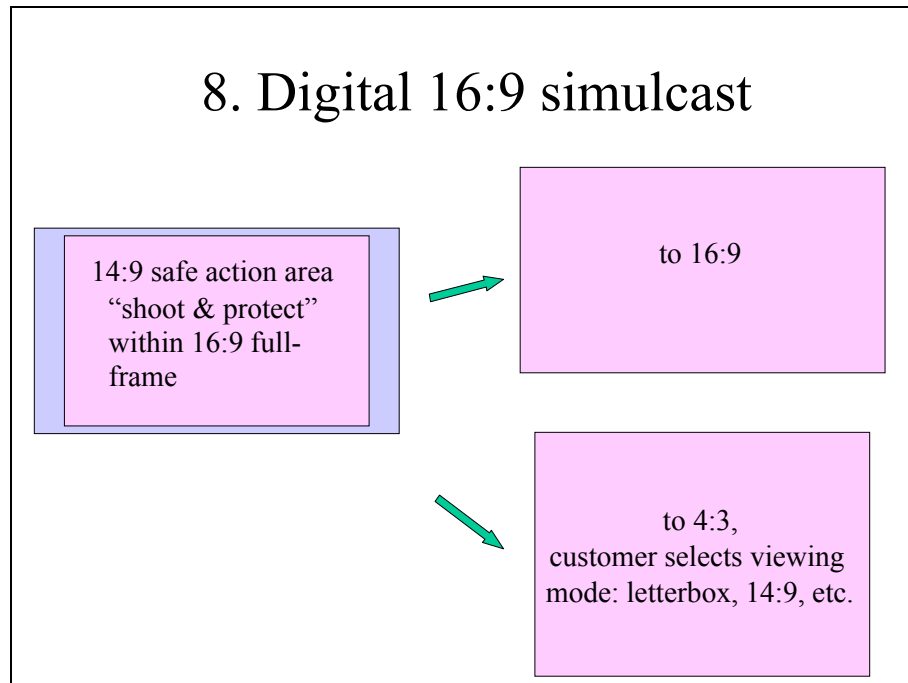
3. Using 14:9 as a compromise for simulcast

Some broadcasters have developed 14:9 as an intermediate format to assist the transition from 4:3 to 16:9, in parallel with the transition from analogue to digital. Programming is originated in 16:9 but the director ensures that action is concentrated within a 14:9 safe area. Such “shoot and protect” strategies were originally developed by the film industry to ensure that films could be shown on TV without techniques like pan-scan.

The advantage of this approach is that it supports the analogue/digital simulcast strategies. A 14:9 format copy of the programme is transmitted on the analogue service. When viewed on a 4:3 screen, a 14:9 picture requires a letter box of considerably thinner black lines than 16:9. A 14:9 picture can also be zoomed on a wide-screen TV, with minimal loss of picture information at top and bottom of the picture, as in (7).



The 16:9 master copy of the programme is transmitted in wide-screen on the digital service for wide-screen viewing (8). The set-top box will convert it to another format such as letterbox if the digital viewer has a 4:3 TV set.



In addition, broadcasters use a system called wide-screen signalling in order to signal changes of aspect ratio to receivers if adjacent programmes are in 4:3 and 16:9. This means consumers do not have to alter the display format manually using the remote control. DVD players also select the appropriate picture format automatically, in line with consumer preferences selected in the set-up menu.

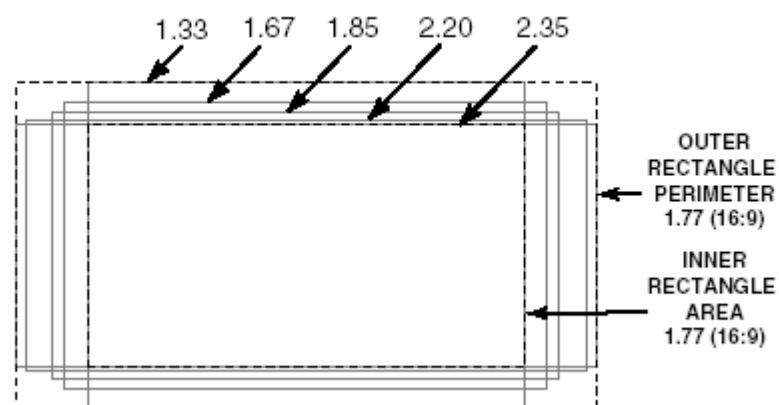
4. From 4:3 to 16:9 in cinema, television and information technology

The original cinema aspect ratio was 4:3 or 1.33:1. This was defined by one of Thomas Edison's technicians in the 1890s as a consequence of the decision to use film with a 35mm gauge. The 35mm gauge was obtained by halving the Eastman 70mm film gauge used for still pictures, thereby obtaining a significant cost saving. Use of the 4:3 aspect ratio maximised the picture area on 35mm film, an important consideration given the low resolution of early film stock, and was preferred against a square aspect ratio, possibly because the rectangular 4:3 format is slightly closer to the Golden Section of 1.618:1, considered to be an artistically optimal format since the classical era. The combination of 35mm and 4:3 became a de facto standard thanks to the market power of the Edison patent cartel, although it was subsequently endorsed by an international standardisation conference in 1909.⁵⁹

Apart from some experiments with wide-screen formats in the late 1920s, 4:3 was used for all films till the 1950s, when different wide-screen aspect ratios were introduced, including 1.66:1, 1.85:1 and 2.35:1. Improved film stocks had by then boosted the resolution of 35mm film, thereby weakening the earlier technical imperative for the full-frame 4:3 aspect ratio.

Television had already adopted the 4:3 format, to be followed by the computer industry thanks to use of a common manufacturing base for cathode ray tube monitors. The 16:9 format was agreed by all broadcasters and consumer electronics manufacturers for the future of television, including high definition, in the 1980s. 16:9 is a compromise between the many different aspect ratios used in the film industry. Its mathematical relationship to these and the 4:3 format facilitates the shooting, conversion and display of all programming material (See Figure 9 below). Moreover, 16:9 or 1.77:1 is very close to the Golden Section of 1.618:1.

Figure 9



The inclusion of 16:9 in the ISO MPEG digital video standards used both for digital television and DVD was highly significant. It ensured that 16:9 could make its way into the information technology world too. Wide-screen displays are becoming fashionable for lap-top personal computers, now that DVD drives are a standard feature, according to a recent report in the US trade press. Convergence is therefore helping to propagate the 16:9 format across the sectors.

⁵⁹

Widescreen Cinema, John Belton, Harvard University Press, 1992, P.17 et seq

ANNEX 3

Trade press sources

In addition to publicly available documents cited in the footnotes, the following trade press publications were used as an additional source of information for this paper.

New TV Strategies

Screen Digest

Variety

Consumer Electronics Daily