

E-Inclusiveness and Digital Television in Europe – A Holistic Model

Peter Olaf Looms

Danish Broadcasting Corporation, DR,
DR-Byen
Emil Holms Kanal 20
DK-0999 Copenhagen C
polooms@gmail.com

Abstract. This paper reviews the nature and size of the accessibility challenge and identifies pitfalls in the current strategies to promote e-inclusiveness. Using examples such as the DTV4ALL project which focuses on free-to-air broadcasting, the paper argues the case for working systematically with stakeholders associated with the entire access service supply chain to draw up and implement a continent-wide strategy to promote e-inclusiveness and digital television.

1 Introduction

For most people around the world, watching television is a simple matter: find the remote control, press the “power” button and then zap to the channel you want to see. By 2012, most industrialised countries will switch to digital terrestrial television (DTT) transmission and switch off analogue transmissions. But switching from analogue to digital offers benefits that come at a price. Experience from the first 12 years of digital television shows that analogue switch-off may create problems and require corrective action. Free-to-air television aims to be socially inclusive and usually has obligations to make television accessible for all. Who are likely to encounter problems during the transition to DTT? How can digital television become more inclusive? What are the access options DTT can adopt in the short and medium term to promote inclusiveness? What are the prerequisites for widespread take-up of these services? These are four of the questions I would like to address in this article.

2 Who Are Likely to Encounter Problems during the Transition to DTT?

2.1 Setting Up the Digital Television Receiver

Watching DTT requires the viewer either to purchase an integrated digital television receiver or to buy a digital set-top box and connect it to an existing television set. The viewer may have to change the aerial or buy a new one. On the face of it, setting up should not be a big problem, but Clarkson and Keates [2] indicate that the design of

digital television interfaces and services can exclude various groups of the population. In a report on a DTT technical trial [3] notes that "a minority needed support - most issues were resolved over the telephone by the Trial Helpline. A small minority needed a lot of support – mostly the very elderly and the disabled." The elderly needed help for a number of reasons: difficulties in installing their own equipment, difficulty in re-scanning, lack of confidence (extra advice and re-assurance were needed in using the equipment), remote control issues, the use of subtitles because of hearing difficulties, and difficulty in bending down.

In a related trial, [4] reports that "Not all 'vulnerable' people need help. In Bolton, where installation help was made available only as a 'fallback', family and friends successfully installed the equipment for 69% of the elderly participants. Only 31% needed help from Trial engineers."

2.2 Watching Digital Television

Having set up the receiver, the next challenge is whether the viewer can find and watch the programmes he or she wants. Do people really have problems watching programmes on digital television? If so, what are the problems, causes and options for taking corrective action?

The nature and size of the problem can be difficult to gauge. In Hong Kong, according to Census and Statistics Department from 2001, about 4% of the population is reported to have some kind of physical, sensory or mental impairment. Disability Status (2000) in the USA reports that "approximately 1 in 5 Americans has some form of disability, and 1 in 10 has a severe disability". In Great Britain, the studies referred to by [9] indicated that some 17.3% of the adult population (persons 16 or more) have one or more disability.

The differences between the Hong Kong figures on the one hand and the US and UK figures on the other could reflect genuine differences. A closer examination reveals that the smaller figures for Hong Kong could also be ascribed to differences in terminology and definitions. Mellors [16] identified similar issues when analysing levels of hearing impairment in various European countries, with a range of 4.7% (the UK) to 1.7% (Italy) that could be accounted for by differences in the threshold used to assess hearing impairment (35 dB in the UK and 55 dB in Italy).

There are various schools of thought about the metrics for exclusion and inclusiveness. Mellors [16] makes use of hearing measurements. Other major studies such as [9] base their figures on capability problems reported by subjects themselves. The advantage of self-reporting is that it covers a wider range of problems than can be covered by formal assessments of impairment.

While there seem to be national differences in quantifying the inclusiveness challenge, the studies mentioned above all demonstrate a causal link between capability problems and age. Stallard [20] notes that "today there are more than 70 million people aged 60 and above in the EU, representing just under one in five of the population.... Many of these citizens will experience dexterity, cognitive, hearing and sight problems in later life."

2.3 Accessing Digital Television

The rationale for action across Europe was outlined in a European Commission policy document [8] from 2005: “People with disabilities constitute about 15% of the European population and many of them encounter barriers when using ICT products and services”... “18% of the European population was aged over 60 in 1990, while this is expected to rise to 30% by 2030.” ... “The implications are clear: making the benefits of ICT available to the widest possible number of people is a social, ethical and political imperative.”

Digital television is one of the most widely used ICT products and services. The European Commission argues that the transition from analogue to digital terrestrial transmission in Europe by 2012 represents a unique opportunity to provide better access to TV and other services. Written evidence [10] given to the House of Commons Select Committee on the Television without Frontiers Directive (2006-7) indicates that the overwhelming majority of those with perception, cognition or motion impairments would like to be able to watch television like everyone else.

Assessing the size and nature of the demand for access services is far from easy as there is no direct relation between impairment and demand. OFCOM [18] notes that “the demand for access services such as audio description and subtitling is very significant.”... “7.5 million (equivalent to 12.3% of the population) said that they had used subtitles to watch television, of whom about 6 million (10%) did not have a hearing impairment.”

It seems that subtitling in particular is used not only by those with hearing impairments but also by those who find it difficult to understand young people speaking quickly or using slang (intra-lingual communication), by those in countries with two or more official languages (inter-lingual communication to facilitate the understanding of all of these languages by offering opt-in subtitles) and in countries with significant immigrant groups for whom subtitling in their mother tongue may promote integration and social cohesion.

A report by Klein et al [12] on usable and accessible design for the UK’s Digital Television Project estimated that 4.4% of those currently able to access analogue television could be excluded from simply viewing when using digital terrestrial television set top boxes at switchover. A further 1.6% currently able to access analogue television could be excluded from using advanced features such as digital text and interactive services.

As part of work on the European Commission project DTV4ALL, we have listed a number of access problems and used UK data from Grundy et al. (op. cit.) available online to make some rough estimates of the number of people who could be excluded from accessing digital television. A summary is included in table 1.

We can conclude that the elderly and those with various capability problems may well have difficulties getting started with DTT, unless they have help from family and friends or a support programme. The DTT platform, however, does have the potential to make television more inclusive by offering a range of access services.

Table 1. Proportion of the adult population in Europe expected to have problems accessing digital television (DTV4ALL estimates based on Grundy et al (1999))

Access issues with digital television	estimate (% of population)
1. Finds it difficult/impossible to hear the audio of TV programmes	1,8%
2. Finds it difficult/impossible to hear/understand speech in mother tongue	2,3%
3. Sometimes finds it difficult to hear/understand speech in mother tongue	2,3%
4. Finds it difficult/impossible to understand speech in a foreign language	n.a.
5. Finds it difficult/impossible to see the visual component of TV	0,7%
6. Unfamiliar with remote controls and interface conventions on DTT	10,9%
7. Finds it difficult/ impossible to use services such as Subtitles (SDH)	9,4%
8. Finds it difficult to switch gaze from screen to remote control device	3,4%
9. Finds it difficult to read subtitles, On Screen Displays including EPGs	3,4%
10. Finds it difficult/impossible to use the television remote control device	10,9%
11. Finds it difficult/impossible to set up and configure TV set or Set Top Box	10,9%

3 How Can Digital Television Channels and Programmes become More Inclusive?

In many parts of the world, some access services such as subtitles and signing have been available for some time on analogue television using Teletext and simultaneous interpreters signing in a corner of the screen. Offering access services usually lies between the following two extremes: the Individual, or Medical, Model that focuses on impairments and the Social Model of Disability first coined by [19], where “disability” is used to refer to the restrictions caused by society when it does not give equivalent attention and accommodation to the needs of individuals with impairments.

In the first model, those with impairments would have to buy specialised DTT set-top boxes themselves or get them as part of public health provisions in social welfare states. Critics of this model claim that it often ignores the self-esteem of those involved and tends to be ad-hoc, parochial and expensive.

In the second model, however, society at large assumes a collective responsibility for being inclusive. Here the technology required for access services by and large is built into all DTT receivers. Dewsbury [5] suggests a shift of focus, focusing on what the individual wants to do and making a sensible mix of both models.

Enabling audiences with impairments to get what they want out of television will often require access services that can be merely assistive or truly inclusive. Analysis of current access provisions shows three main scenarios:

1. At the one extreme, the service is provided for all content genres both during the day and at peak viewing hours so that viewers of all ages and abilities can derive benefit

from watching the same television programmes. Subtitles for the deaf and hard of hearing at the BBC is an example of a service that is both assistive and inclusive.

2. In the middle we have an access service provided for all content genres but the scheduling of the programme is such that it does not lead to reactions from those who do not want or need the service. An example is visual signing for programming that is offered on channels with more limited audience share and scheduled in connection with repeats aired late at night, well away from peak viewing. This approach is assistive and inclusive outside key viewing hours.
3. At the other extreme, the access service is not provided for general output, but there are schedule slots designed for audiences with special needs. An example is again visual signing where a policy decision has been taken to offer programmes made specifically for those requiring signing, rather than providing visual signing for “normal” content genres such as news programmes. As with (B), these programmes are scheduled away from peak viewing hours. This approach is exclusive, and is only assistive outside key viewing hours.

In an ideal world, it should be possible to offer both scenario A and C. Feedback from call centres from broadcasters and operators indicates that offering “open” solutions such as signing that have to be viewed by all on major channels and/or in prime time can lead to adverse reactions from viewers without impairments. Offering easy-to-use, opt-in access services would thus seem to be the approach that leads to the fewest objections from general audiences.

4 What Are the Solutions DTT Can Adopt in the Short Term and Medium Term?

DTT based on MPEG-2 technology already has a range of mature access services solutions that broadcasters and platform operators can offer. The nature and extent of access services depend in the first instance on the regulatory climate governing DTT and then the application of three general criteria suggested by ISTAG [11]: Is the service to be offered acceptable and have a demonstrable benefit to its intended audience? Is there a technology that can be integrated into existing work flows and that is scaleable? And is there a sustainable business model for the service in question?

For an access service to be viable, all three criteria have to be met. Unlike Pay-TV which is dominated by the operator, the decision-making process for free-to-air broadcasting on DTT is not driven by one stakeholder. The introduction of an access service requires a high degree of consensus among all of the stakeholders involved before improved access services can be implemented. For compromise to take place and consensus reached, a key prerequisite is that each stakeholder understands the interests and resources of everyone else in the value chain. Unless the solutions chosen constitute a win-win for all concerned, coercion in the form of national legislation, public service contracts or standards for digital television receivers and remote control devices will only lead to obfuscation, passive or active resistance on the part of one or more stakeholders, or worst of all to services that cannot be sustained.

The problem facing DTT in particular is that in the course of the coming five years, new production and distribution technologies using encoding and decoding standards

such as MPEG-4 and displayed on flat panels in high definition will take over. Access services that work well today may come under threat for various reasons. Wood [22] notes that the challenge of such transitions is exacerbated by timing differences. Not only is the transition from analogue to digital television taking place at different times, so too is the transition from first generation, MPEG-2 based solutions to second-generation MPEG-4 based solutions delivered via broadcast or even IPTV networks. While some countries such as the UK choose to wait for the finalisation of DVB2 standards before migrating to high definition on DTT, others such as France have been obliged to find a solution pre-empting DVB2. Instead of marching in step, the transition from one generation of digital television to another is more like leap-frogging. Whereas in the past we had standards and stable solutions for several decades, the effective lifetime of a transmission platform is now measured in years rather than decades.

All services have a lifecycle: new technologies emerge, become “sunrise solutions” and some become widespread. After some time – years or decades – the solution shows sign of age, of not being viable. These “sunset technologies” then have to be phased out and replaced by a new sunrise solution. The challenge is to find the optimum switch-over point.

Two examples of sunset solutions highlight the issues: the use of Teletext to offer subtitles for the deaf and hard of hearing, and Audio Description delivered as a second pair of stereo channels (the so-called broadcast mix). EBU [7] describes the two main standards for subtitle delivery for the DVB digital television standard, DVB Teletext (EN 300 472) and DVB Subtitling (EN 300 743). Subtitles via Teletext have been with us for decades, whereas DVB subtitling has only gained ground in the last decade. Whether and when to switch to DVB subtitling depends on which stakeholder one asks. Viewers may not be aware of the existence of the two delivery mechanisms. When shown both on a high definition television receiver, however, most prefer DVB subtitling for its flexibility, attractiveness and usability, especially since DVB subtitles can be recorded and viewed on PVRs, which is not necessarily the case for Teletext subtitles. Consumer electronics manufacturers would like to see pan-European agreement on such services, ideally agreement not to have to support both standards in order to keep down costs. Where the regulator, standardisation body or DTT platform operator does not mandate the use of Teletext, this is likely to be dropped. Broadcasters who have offered Teletext subtitling services can continue to use their existing production set-ups but will need to change the contribution and transmission set-ups for their services.

Laven [13] discusses the options for Audio Description on DTT and explains the rationale for moving from the so-called broadcaster mix to a receiver mix, where the mono audio track with AD is mixed with the conventional stereo tracks in the receiver. The transition from standard to high definition will exert additional pressure on bandwidth allocation for access services. As some HD programming offers multi-channel audio, the broadcaster mix solution will become unacceptable for DTT. Even the receiver mix method will be demanding if AD services are scaled up and two television channels with AD are present in the same multiplex. Ultimately the solution could be a kind of AD based on audio subtitles in which a speech synthesis chip in the receiver converts text into speech with male and female voices as required. Assuming that the method can deliver speech at an acceptable quality, the bandwidth

requirements can be reduced from 256 kbits/s to less than 30 kbit/s if the audio subtitles that form the basis of this synthetic speech service are delivered using DVB-subtitling.

These two examples highlight the need for holistic access service strategies that take into consideration all the stakeholders involved in that service. They also show that a given service goes through a maturity cycle during which the metrics of success may change as the service level is ramped up.

5 What Are the Prerequisites for Widespread Take-Up of These Services?

E-inclusiveness is thus more than just access services. It is also about television programming in general, about making it easier for anyone to benefit from television regardless of age or possible disabilities.

Access services for digital television are already available in many countries. To improve the e-inclusiveness of television, action is required on three fronts:

1. In the short term, facilitating the take-up of mature access services on what we have termed first generation digital television (1997-2012, broadcast systems based on MPEG-2).
2. Preparing for the next generations of digital television by assessing whether mature services are still viable on these emerging digital television platforms.
3. Identifying and validating emerging solutions that will either replace mature access services or extend the scope of access provisions on emerging digital television platforms.

In our work on the DTV4ALL project, we are carrying out a Pilot of mature services. We have asked ourselves the question: *Who needs to know what in order to be able to plan, produce, deliver, promote and successfully use mature access services by 2010?* As regards the “*who*” part of the statement, our existing plans focus on those with access problems, primarily those with impaired sight and hearing. Mention is also made of consumer electronics manufacturers. We suggest the use of the complete supply chain as our starting point for scoping. It is necessary to keep in mind the needs of the viewers, the stakeholders in the supply chain itself and those who influence it such as regulators and legislators. Data from the pilot will be used in a maturity model that encourages decision-makers to revisit their strategies at regular intervals in order to make adjustments in the light of political, social, economic and technological change. Proof of Concept work on emerging solutions will help identify promising candidates for future access services.

Unlike Pay TV which makes use of proprietary solutions and where the service provider can call the shots, DTT requires consensus all down the value chain because no one stakeholder can decide anything – compromise and consensus is a fact of life. As a result, selling DTT receivers over the counter requires a greater degree of agreement on standards and interoperability than for Pay TV solutions, especially if there is no compliance mechanism in place. Agreeing on new solutions for DTT takes a lot of discussion and time that ultimately pays for itself, if there really is consensus

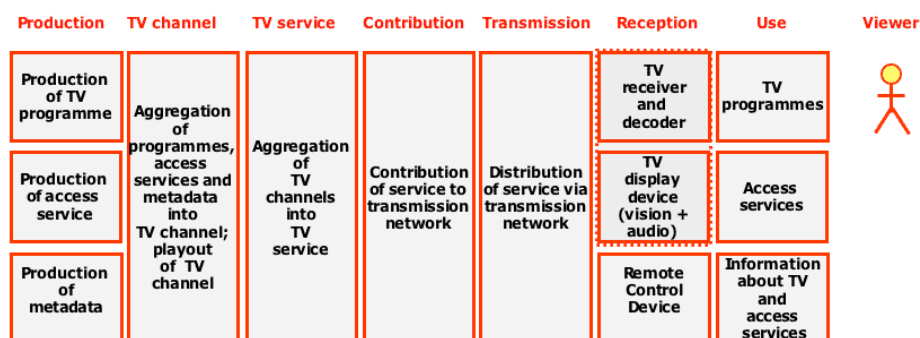


Fig. 1. Generic supply chain for digital television. Source: Looms et al. [14].

on access services. This is why in Europe we are seeing special-interest groups, broadcasters, hardware manufacturers and embarking on national, regional or even European endeavours to discuss options and come up with scaleable solutions that hopefully will ensure that digital television is accessible to all. We hope to identify both solutions and strategies that can be generalised and applied more widely as part of our work on DTV4ALL.

Standardisation bodies are also at work on accessibility. W3C [21] has come far in its work on standardisation and is currently working on both speech synthesis and speech recognition for the Web. Mpatwa [15] describes a recent ITU project potentially with global ramifications. It aims to complete a strategy toolkit for promoting e-inclusiveness on a wide range of information technology platforms.

As can be seen from this paper, standards in themselves are no guarantee that the market will work towards e-inclusiveness unless there are relevant incentives and sanctions to facilitate compromise and consensus.

Acknowledgement. This paper is based on work funded by grant agreement no. 224994 under the European Commission programme ICT PSP/2007/1. The opinions expressed by the author of this paper are not necessarily endorsed by either the European Commission or DR.

References

1. Census and Statistics Department, Persons with disabilities and chronic diseases, Special Topics Report (STR) Number 28, Hong Kong SAR (2001)
2. Clarkson, J., Keates, S.: Digital Television For All. A Report on Usability And Accessible Design Appendix E – Investigating The Inclusivity of Digital Television Set-Top Box Receivers. DTI, UK (September 18, 2003)
3. DCMS. Report of a Digital Switchover Technical Trial at Ferryside And Llansteffan, Department for Culture, Media and Sport, UK (July 2005) (2005a)
4. DCMS. Report of Bolton Digital Television Trial. Department for Culture, Media and Sport, UK (May 26, 2006) (2005b)
5. Dewsbury, G., et al.: The anti-social model of disability. *Disability & Society* 19(2) (March 2004)

6. Disability Status (2000 U.S). Census 2000, C2KBR17, U.S. Census Bureau. March 2003 and Disabilities and Age (October 1994-January 1995)
7. EBU. EBU Recommendation R-110-2004 Subtitling for Digital Television Broadcasting. European Broadcasting Union, Geneva, Switzerland (2004)
8. European Commission, Communication From The Commission To The Council, The European Parliament And The European Economic And Social Committee And The Committee of The Regions eAccessibility [SEC, 1095] Brussels, 13.9. 2005 COM, 425 final. Brussels, Belgium (2005), http://eur-lex.europa.eu/LexUriServ/site/en/com/2005/com2005_0425en01.pdf
9. Grundy, E., Ahlberg, D., Ali, M., Breeze, E., Sloggett, A.: Disability in Great Britain: results from the 1996/1997 Disability Follow-up to the Family Resources Survey. Charlesworth Group, Huddersfield, UK (1999)
10. House of Commons Select Committee on European Union - Written Evidence. Page 162, <http://www.parliament.uk/documents/upload/Final%20TVWF%20HL27.pdf>
11. ISTAG. New Business Sectors in Information and Communication Technologies. The Content Sector as a case study. Final Version (instigated by Ms. Vivian Reding). The European Commission, Brussels, Belgium (September 2007)
12. Klein, Dr Jeremy A., Karger, Simon A. and Sinclair, Kay A. Digital Television For All. A report on usability and accessible design. Prepared for the Digital Television Project (Department of Trade and Industry) by The Generics Group, Harston, Cambridge, UK 18 September (2003)
13. Laven, P.: Broadcasting for all. EBU Technical Review No. 296, European Broadcasting Union, Geneva, Switzerland (October 2003)
14. Looms, P.O.: D2.2. Evaluation Methodology. Public Report from the DTV4ALL Project. ICT PSP/2007/1. ICT Policy Support Programme (ICT PSP). Accessible digital Audiovisual (AV) system (Pilot B). p. 6. European Commission, Brussels, Belgium (2009)
15. Mpatwa, A.: Toolkit on e-Accessibility & Service Needs for People with Disabilities (PwD) ITU, Geneva, Switzerland (2009), http://www.itu.int/ITU-D/projects/proj_call-partners_GP.asp
16. Mellors, W.J.: WGHI - Working Group on Hearing Impairment Statistics on age and disability and in relation to Telecommunications - A significant market (2006), <http://www.tiresias.org/phoneability/wghi/stats.htm#ECfigures>
17. OFCOM. Guidelines on the provision of television access services. Selection and scheduling of programmes section 3.3. Published, London, UK (September 22, 2006) (2006a)
18. OFCOM. Television access services. Summary, London, UK(2006), <http://www.ofcom.org.uk/consult/condocs/accessservs/summary/>
19. Oliver, M.: The Individual And Social Models of Disability. Paper Presented At Joint Workshop of The Living Options Group And The Research Unit of The Royal College of Physicians on People With Established Locomotor Disabilities In Hospitals, London, UK, Monday 23 July (1990)
20. Stallard, G.: Standardisation Requirements for Access to Digital TV and Interactive Services by Disabled People. Final Report to CENELEC on TV for All. Chandlers Ford, Hants, UK (2003)
21. W3C. Web Accessibility Initiative (WAI) (2008), <http://www.w3.org/WAI/>
22. Wood, D.: General Overview of Production and Delivery Trends from an EBU perspective. Seminar on Multimedia Production and Delivery Services. Arab States Broadcasting Union / International Telecommunications Union, Tunis, Tunisia, 31 October-1 November (2008)