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DTV4All

D4.1 - Cooperation with Standardisation bodies

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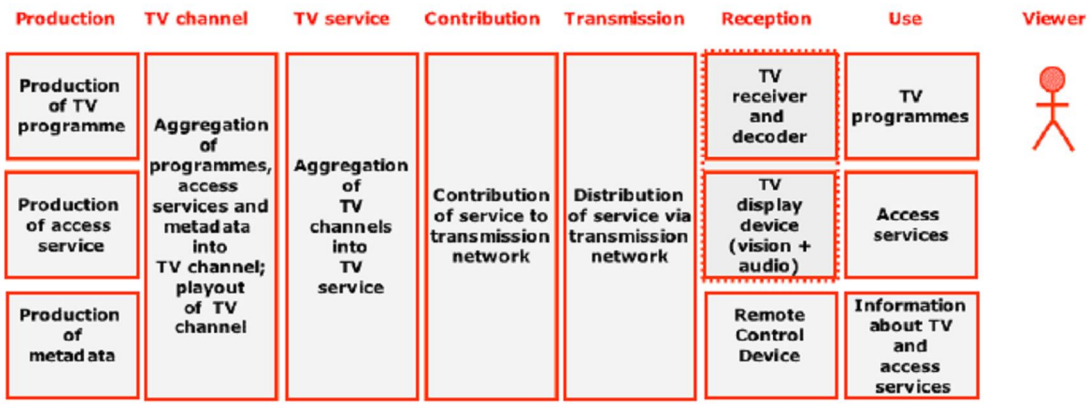
1. Introduction

The underlying aim of all the work of the DTV4All project is to make access services more widely available on digital television. This document focuses on how DTV4All will interface with standardisation bodies to achieve this aim because standardisation is required for interoperability and usability of access services on digital television. It therefore impacts on product and service design. The overall objectives of this document are to establish:

- The prerequisites for ubiquitous access services in Europe
- How standards contribute throughout the value chain to realising ubiquitous access services
- The scenarios the DTV4All project team foresee for promoting e-inclusiveness through the medium of digital television

The complete value chain is used as the basis for the scoping of the standardisation issues that DTV4All will address. In this process it is necessary to keep in mind the needs of the viewers', the stakeholders in the value chain itself and those who influence it such as regulators and legislators. A generic value chain for access services on digital television is illustrated below:



This document will indicate how the DTV4All team plan to examine standards that promote interoperability from the start to the finish of the value chain, i.e. from the production of the service to the viewer. However, to place an emphasis on the user first consideration will always be of their experience of using the service.

The most fundamental problem to be addressed in the standardisation arena by DTV4All is that there is no ongoing mechanism for assuring the collaboration of the whole value chain for the provision of access services in digital television. Taken together the European Broadcast Union (EBU) and the European Information Communication and Consumer Electronics (EICTA) access services forum that has recently been established have the potential to provide an

infrastructure for doing this. However, it should be noted that the EBU represents public service broadcasters and has greatest influence on free-to-air television. The EBU and EICTA do not have decisive influence on Pay TV services; here European and national regulatory requirements are the most important instruments.

Good understanding of the role and significance of this report requires an awareness of its regulatory and business model context of the above supply chain. The issues under consideration in the DTV4All project are not exclusively technical issues are strongly influenced by business and regulatory models.

At the national level there are regulatory requirements that do not always fit pan-European designs. Without European Union intervention of which the DTV4All project forms a part, the provision of new access services will be according to regional or national agendas. Accordingly, this document will discuss 3-4 scenarios for promoting access service take-up, one of which is a strong, European Union regulatory stance and close coordination with European standardisation bodies and interest groups. Another could be a self-regulatory, consensus model.

It is the generic business models of broadcasters that impact most on access services. Signing using conventional picture in picture and audio description by means of the user selecting the supplementary access service at the receiver is not yet “off-the shelf” but will approach maturity on one or a number of platforms in the period to 2010. These access services will, however, face disruption as second-generation high definition digital television (HDTV) platforms requiring new cost-effective access service delivery mechanisms enter into operation. For example, those mature signing services currently delivered over dedicated terrestrial broadcast channels will need to be revisited. HDTV services increase the demand for bandwidth in existing multiplexes putting pressure on the bandwidth allocated to access services delivered over dedicated terrestrial broadcast channels.

An example of the sorts of solutions to such issues that will be considered in DTV4All is moving the delivery of dedicated channels for access services to emerging platforms such as hybrid Digital Video Broadcast – Terrestrial/Internet Protocol (DVB-T/IP) receivers with broadband connections in regions where there is little or no spectrum available for dedicated terrestrial broadcast channels for access services.

Consequently, it is reasonable to ask why the market cannot be left to provide access services over IP. Unfortunately, as the topological notions of network “core” and “edge” have ceased to be useful to in evaluating the dynamics of the future communication value chain in a world of “innovation anywhere at anytime by anybody” it has become much more difficult to construct convincing business models for the provision of new services at low cost to the consumer by established operators [15]. Accordingly, for the foreseeable future the provision of access

services will be the responsibility of broadcasters required to provide them by regulators. However, the emergence of a "sudden strike" innovation on the technology and the business level in the area of access service provision is not a threat to broadcasters as its main consequence would most likely be that regulatory requirements placed upon broadcasters to provide access services would be eased.

The long-term viability of access services will also depend on the regulatory climate at national and European level, on national and European goals quantifying access services to be provided by broadcasters and platform operators as well as policy decisions on the digital dividend (e.g. UK: Communications Act (2003); Denmark: Stipulations on access services in the current Public Service Contract towards 2010) so that access services are taken into account not only on digital television, but also on IPTV, mobile TV and open Internet platforms. In a *laissez faire* climate, access services will be provided predominantly by public service broadcasters and niche providers funded out of the public purse. The UK and Nordic experiences indicate that commercial bodies can be given incentives to offer improved access services as part of Corporate Social Responsibility (CSR), provided that there are clear guidelines and that the roadmap for the introduction of access services does not place major burdens on those concerned that affect their competitiveness and sustainability. Should a consensus-based approach with elements of CSR fail to meet policy targets, other regulatory instruments may be needed.

This document is organised as follows: In section 2 the take up of access services across Europe is discussed. This is very fragmented, audio subtitling is an extreme example of this fragmentation as it is only available in The Netherlands. Section 3 discusses what is required for more widespread availability and use of access services across Europe. The consequences of a lack of standardised and feasible technical solutions are highlighted together with the mechanisms available to address this. In section 4 the dimensions of standardisation are identified as interoperability, product and service design. Section 5 discusses the progress made in the standardisation needed to realise the widespread take up of access services across Europe. In section 6 the progress made on recent recommendations for standardisation activities is reported. In section 7 the evolution of recent tentative recommendations for standardisation activities is discussed. While it is clear that interoperability remains a challenge for the providers of access services, it is by no means an insurmountable barrier to their provision. In section 8 the ways Ofcom in UK deals with a lack of interoperability and promotes awareness of the availability of access services to potential users of the services are discussed. Ofcom imposes no technical standards on the means by which Television Access Services are made available to viewers. The way in which this lack of requirements for interoperability is to a large part addressed by the UK Digital Switchover Help Scheme is discussed in section 9. This makes

clear the financial cost of a lack of interoperability. Section 10 discusses guidelines currently being implemented in the UK to achieve receiver interoperability which should reduce this financial burden. Sections 11 and 12 explain how the DTV4All project will cooperate with the EBU and EICTA to contribute to addressing the standardisation issues raised in this document. The actions on standardisation that will be taken by the DTV4All project are summarised in section 13.

2. The take-up of access services for DTV across Europe

The need for access services for DTV is clear:

“People with disabilities constitute about 15% of the European population and many of them encounter barriers when using ICT (Information and Communication Technologies) products and services. In certain cases, older people can be faced with similar problems. Accessible ICT products and services have now become a priority in Europe, due to the demographic shift: 18% of the European population was aged over 60 in 1990, while this is expected to rise to 30% by 2030.”[1]

”Independent user research conducted for Ofcom in the UK in 2006 shows that the demand for access services such as audio description and subtitling is very significant.[2]

The review found that 7.5 million people (=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.”

“Results from the case studies found that those who had used audio description regarded it as very helpful in understanding programmes better, and that a significant proportion of respondents’ who had not used audio description were keen to try it.”[3]

There is further information on the nature of the disabilities and the current and forecast size of the problem in reports such as Portlock et al. (2006) [4]; CSR Europe [5]; Mellors, W. J. (2006) [6].

Nevertheless, it should be noted that the lack of detailed pan-European statistics about the size of the challenge and the extent to which access services are being rolled out constitutes a problem in its own right. A study on "Measuring Progress of eAccessibility in Europe" was commissioned by the European Commission in 2006 the basic aim of which was to provide an evidence base to support the future development of EU policy in the eAccessibility field generally. With respect to digital television (DTV) the executive summary of the report [28] states that:

“• On average, less than one-third of national language broadcasts of main public broadcasters in Europe were provided with subtitling (for deaf people) in 2006; there is wide variability (from 95% to none) in the amount of subtitling across individual countries

• On average, less than one-tenth of national language broadcasts of main commercial broadcasters in Europe were provided with subtitling in 2006; most of this is provided in just a few countries

• Public broadcasters in only five Member States provided any of their programmes with audio description (for visually impaired people) in 2006 and, where they did, the levels provided amounted to a very small percentage of their overall programming; only in one country did any commercial broadcaster provide any audio description."

What is clear at the present time is that for the European broadcasting market (and in several countries outside of Europe), Digital Video Broadcast – Terrestrial (DVB-T) has become the accepted standard for digital terrestrial television (DTT). DVB-T services have been launched in over 30 countries worldwide and more than 50 million receivers have been sold. Likewise, Digital Video Broadcast – Satellite (DVB-S) and Digital Video Broadcast – Cable (DVB-C) have gained a leading position for DTV distribution over satellite and cable in Europe. The DVB-T/-S/-C standards exactly define aspects such as framing structure, channel coding and modulation schemes; however, they do not embrace a powerful application programme interface (API) for the integration of additional interactive content. Today, the following mature accessibility services considered in DTV4All can be broadcast and received with regular DVB equipment:

- Subtitles: via conventional teletext; support for DVB subtitles is not mandatory in general and thus lacks consistent deployment across Europe
- Signing: original TV image together with the signer are jointly transmitted in an additional service channel (possibly with lower bandwidth)
- Audio description: an additional audio track consisting of the original audio and the narrator is pre-mixed at the broadcaster side and is transmitted in dual channel mode together with the original audio track in the audio elementary stream (broadcaster mix); alternatively the mixing can take place in the receiver e.g. Freeview in the UK (receiver mix); the audio description channel can be transmitted and received separately on a second digital TV receiver (e.g. SVT); a hybrid between audio subtitles and audio description is created through speech synthesis at the head end at playout to be mixed in some cases in the receiver.

More complex and flexible scenarios cannot be implemented with basic 1st generation DTV equipment. To overcome these and other limitations, standardised middleware solutions, such as Digital Video Broadcast – Multimedia Home Platform (DVB-MHP) and Multimedia and Hypermedia Experts Group – 5 (MHEG-5), have been developed. Applications utilising the corresponding APIs have been rolled out in individual countries, but neither the receiver equipment itself, nor the appropriate services have attained a wide market penetration in Europe as a whole. However, in individual countries technological solutions supporting access services have been widely adopted, e.g., MHP in Italy and MHEG-5 in the UK. This puts consumer

electronics industry and broadcasters in an unsettled situation where it is not possible to efficiently provide more complex and elaborate accessibility services on a consistent basis.

As mentioned above, audio subtitling is an extreme example of the resulting fragmented take up of access services across Europe. Audio subtitling and subtitling are very different modalities for making media content accessible. There is little use of audio subtitling at present. Its only widespread use is in The Netherlands, where it is used in 40% of their TV foreign programmes, by public service broadcasters in Finland and Sweden where it involves speech synthesis at the broadcaster's playout facilities to generate an audio service, and in some DVDs from the UK.

At a conference [24] in 1999 the initiative for an implementation project for spoken subtitles was born (Theunisz, 2002). The primary objective was to make foreign TV programmes more accessible for those who are visually impaired, and also for older people, and for people with language impairments such as aphasia or dyslexia, or cognitive impairment such as mental retardation or decreased concentration. The technology required to bring spoken subtitles to the home was a decoding system. Broadcasters needed a speech-synthesis computer which is fitted with speech-synthesis software converting text into speech. This output is then converted into a signal and broadcast without disturbing the programme.

The project "Spoken Subtitles" was developed and evaluated with a high degree of acceptance and on 14th December 2001 the audio subtitling service was officially opened by the Dutch Secretary of State and the president of the *Nederlandse Omroep Stichting* (NOS). Audio subtitling has been implemented as a permanent service on Dutch TV.

The work of the Royal National Institute of Blind People (RNIB) in the UK towards including text to speech chips into integrated digital television receivers or set-top boxes by 2009 constitutes an alternative to audio subtitling produced centrally, and offers the benefit of reduced bandwidth requirements and lower production costs than, say, Audio Description. The successful adoption of such solutions requires not only an extension of existing standards such as Digital Video Broadcast - Generic Data Broadcasting and Service Information Protocols (DVB-GBS) to handle the signalling of audio levels to facilitate an audio mix of the original sound and the audio subtitles but also user tests to establish the acceptability of synthetic speech. What would be acceptable in, say, a thirty-minute news broadcast might be inadequate for television fiction, where much of the information that conveys the spirit and sense of the programme lies in the intonation and delivery of the speaker. User acceptance will also evolve over time.

It is important to note that there are off-the-shelf technologies which are not implemented as digital TV access services such as using a text-to-speech chip to provide a "talking EPG" (Electronic Programme Guide) and clean audio which makes the speech of a narrator or actor

more easily understood by the hearing impaired. Approximately 50 million people in Europe find speech on TV difficult to follow. This is often due to distracting background sound sources such as sound effects, ambient noise or music. Introducing Clean Audio as an alternative channel could tackle this problem by focussing on dialogue and narrative speech not only helping to improve speech intelligibility for users with hearing impairments but also for users in noisy environments (e.g. on-the-go, in-car, *etc*.)

The executive summary of the study "Measuring Progress of eAccessibility in Europe" [28] notes that “in the case of television, the basic eAccessibility yardstick is the extent to which disabled people (in so far as is technologically possible) have access to and can enjoy the same choice of programming as everyone else. The evidence from the study again indicates a substantial lack of availability of key accessibility provisions and a range of factors (e.g. lack of awareness, lack of information and, in some cases, high costs) that act as barriers to take-up of solutions that are available, as well as a perception of limited and slow progress in general.”

Providing access services for high definition television (HDTV) programmes presents new challenges. In the United Kingdom Sky and Freesat can deliver stereo audio description (AD) with HDTV or multi-channel sound with no AD but this option is not available on cable. AD on HDTV has no terrestrial solution at the moment. AD is available with standard definition television (SDTV) as a stereo channel.

3. Requirements for more widespread availability and use of access services

The scaling up of mature digital TV access services as well as the selection and adoption of emerging ones will depend not only on whether they are technically feasible but also on whether consumers find them acceptable, and whether there is a viable business model and a supportive regulatory regime. All three are prerequisites. The issue of users, technology and business models was highlighted in a recent Information Society Technologies Advisory Group (ISTAG) report [7].

Users' needs and interests are already being addressed at multiple levels:

- At European level there is already a consultative mechanism in place for broadcaster to consumer access services in which EICTA, the EBU, European disability organisations and the European Commission are participants. EICTA has tabled a draft specification that is currently being reviewed [8]. Specific actions were discussed at the Council of Ministers meeting in Lisbon in early December, 2007. Two of the partners in the DTV4All project already take part in this consultative forum as part of the EBU delegation. This is a key strength of the DTV4All consortium.
- At national or regional level, there are also consultative mechanisms in place. Public service broadcasters like the BBC, DR, RBB and TVC develop their access services with and for those who have impairments. Qualitative and quantitative user evaluations for mature access services have already been conducted but require collation and analysis in order to provide strategic inputs at European level. Participatory development mechanisms and results gathering constitute a key strength of the DTV4All project.

Given the challenges facing broadcasters and platform operators as a result of the emergence of so-called second-generation digital television, the viability of some mature accessibility services is threatened. Currently, a large number of broadcasters are still reluctant to deploy additional accessibility services because of a lack of standardised and feasible technical solutions. Operators are afraid to invest in technologies which turn out not to have a significant market penetration. Additionally, limited spectrum availability becomes an issue where access services have to compete for bandwidth with other services or TV channels. For those access services requiring high bandwidth that are aimed at a comparatively small target group, non-broadcast means of transmission such as parallel IP-unicast represent feasible and competitive alternatives to terrestrial broadcast. Approaches to countering these threats to and limitations of access services need to be developed at a European level for them to be effective.

Emerging access services that require second-generation devices and platforms for their delivery need systematic assessment so that the results of the assessment can be fed into the strategic planning of medium-term investments in digital television to promote their roll-out. In the current laissez-faire regulatory environment, the take-up of these emerging access services is dependent on a broad consensus on them being achieved at national and European levels. Without Commission support the process of consensus building the take up of the emerging access services is likely to be patchy.

For the widespread availability of access services generally it is essential that the major risks concerning the scale and availability of access services are addressed. For free-to-air television these risks are:

- The extent to which industry-wide consensus can be reached on services, platforms and devices and the standards that underpin them
- The underlying business models for the provision of access services, especially if the corresponding obligations imposed on pay-television and IPTV operators are less exacting than those imposed on public service broadcasters

For pay television the risks are:

- The regulatory climate governing the actions of the operators in question
- Being able to document the business case for access services (in terms of both capital costs and operating costs they impose)

Effective and efficient solutions coupled with sustainable business models are vital. The development of such solutions requires inputs from universities and training bodies concerned with the nature of the services themselves. The development of sustainable business models requires contributions from stakeholders.

Digital television for all requires consultations with stakeholders throughout the whole value chain and needs to encompass broadcaster to broadcaster activities such as norms and standards for those producing, exchanging and archiving audio description and subtitles as well as the metadata (data about the service) for driving such services.

There are a number of market issues requiring further analysis:

- Switch-off of analogue terrestrial television has already taken place in three European countries but mainstream Digital Terrestrial TV (DTT) receivers do not yet handle services other than teletext or DVB-subtitling. In some cases, there are receivers on the market that do not support even these services. In other cases, there are spectrum issues related to finding bandwidth for access services in their current forms on the digital

television spectrum that will be aggravated as high definition television with its large bandwidth requirements becomes more widespread during the period 2012-15.

- Digital cable and satellite television services are also widespread. Here the service provider decides on the technical platform to be used for delivering access services which does not have to follow any standard. Implementation of new access services on these platforms is thus completely different from the standards-based approach of free-to-air broadcasting and will typically require a transition period of at least three years so that the investment in receivers currently in use can be written off. If access services are to be offered on pay TV platforms, services scheduled to come on stream in 2012 will therefore need to be agreed and in place by 2009.
- The lack of a widely adopted middleware standard. Interactive digital text and access services using the open Application Programme Interface (API) Media Home Platform (MHP) have run into difficulties and have already been phased out by the DTT operators in Finland and Austria to free up bandwidth for other services. MHP and MHEG-5 also known as Euro-MHEG are open APIs but their penetration in most member states is not sufficient to meet the requirements of access services unless subsidies are made available for the purchase of the necessary equipment by those with impairments. In a fragmented European market with national peculiarities, access services are under pressure. Reducing the level of fragmentation would improve the case for hardware manufacturers to include access features and services into digital television receivers as a matter of course.
- National legislation and public service contracts on access services in full compliance with the European Commission Subsidiarity Principle leads to a fragmentation of the over-the counter digital TV receiver market. Some services can be decoded using mainstream consumer electronics (e.g. DVB-subtitling) whereas others will continue to require specialised receivers needing subsidies to make their production viable. The distinction between mainstream and specialised receivers requires close attention.
- Consumers of television are demanding convenience and flexibility. This means that there is a gradual shift away from watching TV while it is broadcast to the Anything, Anytime, Anywhere paradigm, where TV content discovery and use increasingly takes place asynchronously. In the period after 2010, this has implications for access services not just on receivers but also on recorders and on-demand services.

Offering a full range of access services on digital television in Europe is thus not just an issue of agreeing a specification for a Digital TV receiver and ramping up existing activities but looking carefully into the most cost-effective solutions that match the culture and context of a given digital TV platform in the country or territory in question.

DTV4All addresses many of the action points put forward by the "TV for All" report [16] that was produced by European Committee for Standardization (CEN)/ European Committee for Electrotechnical Standardization (CENELEC) from a mandate by the Commission [17] and developed in collaboration with all relevant stakeholders, including the Commission, European Telecommunications Standards Institute (ETSI)/CEN/CENELEC, user and consumer representatives, service providers and broadcasters and equipment manufacturers. Parallel to this, the EBU established the Project Group on Access Services (P/AS) which published a comprehensive report on access services in Europe giving recommendations to the stakeholders. A publication on P/AS is available through EBU [18].

4. Dimensions of standardisation

4.1 Interoperability

In digital broadcasting broadcasters make, modulate, and transmit a Transport Stream that contains a main video which may be accompanied by other information including, sometimes, information needed for access services to be discovered and used.

To receive the service in their home, users require a suitable receiver - an integrated digital TV or a Set-Top-Box - that can de-modulate, decode, and extract the information contained in the Transport Stream in order to present a service on their TV receiver. This process includes operations dependant on user input, as the user can chose whether or not to make use a given access service that accompanies the main video.

One of the reasons why digital access services have not been taken up widely across Europe is that the specification and features of Set-Top-Boxes, particularly their software called middleware, vary from one country to another within Europe. Broadcasters make services for their target coverage areas only, and in some cases have to produce a number of different technical variants of the same service for the various terrestrial, satellite, cable and IP platforms in the target area in question. The practices of one country cannot be transferred to another without consideration of any differences that may exist in the specification of the Set-Top-Boxes used in the countries concerned. For example, reception of the British Broadcasting Service's (BBC) audio description services using a Set-Top-Box requires a device approved by the Royal National Institute for the Blind (RNIB). Such services can be made available in Germany using a Set-Top-Box made for the German market but cannot currently be made available across all digital television platforms in European Union countries because of these differences in national specifications.

This situation is further aggravated by the desire of consumer electronics manufacturers to market integrated digital television receivers. In a European market that has national requirements in terms of encoding, modulation and decoding of high definition signals and multi-channel audio (let alone different application programming interfaces (APIs)), fragmentation due to national specifications leads to higher unit costs or to the dropping of features to handle access services, or both.

The report to CENELEC, Standardisation in Digital Interactive Television [10], states "the lack of interoperability on the software level and the hampering development of open, horizontal markets for interactive content and digital interactive receivers in Europe, are considered by many to be the key issues".

DTV4All is a project funded by the European Commission to facilitate the provision of access services on digital television across the European Union. The most valuable contribution DTV4All can make is to identify the enablers that will allow a common core set of access services to be offered in all EU member countries in the near future. With this contribution in mind, this document examines the enablers for the interoperability of Set-Top-Boxes, and by implication, of the delivery mechanisms for access service on digital television across European Union member states.

4.2 Product design

The path towards standardising and identifying users' requirements to further access to Digital TV and interactive services by disabled people was outlined in the Interim Report to CENELEC on TV for All in 2003 [10]. This document acknowledges the economic benefits of addressing many issues using Design for All principles, mirroring the view of DTV4All that digital television receivers targeted at the general user should include the capability to support access services as standard.

In the context of DTV4All the main contribution of [10] is that, in addition to interoperability, it highlights another dimension to standardisation, the potential of standardisation to further inclusive design. It is emphasised that while standardisation can bring benefits in this respect, codes of best practice and agreements between the participants in the value chain also have an important role – a three-pronged approach. For example, in [10] it is pointed out that the International Telecommunication Union - Radiocommunication Sector (ITU-R) Consultative Committee on International Radio (CCIR) Teletext System B format can carry closed subtitling on both analogue and DTV but that steps have to be taken to avoid inter-symbol interference disrupting subtitling captions and recommends that a code of practice is adopted for aerial installation procedures to address this. In this report the DTV4All consortium will reinforce this three-pronged approach (standards, codes of best practice and value chain consensus) by making clear that it also applies in the context of achieving interoperability.

It is asserted that as the UK leads Europe in several mechanisms that promote the use of access services [28], such as codes of practice, these mechanisms designed for the UK market should be reworked for European Union wide application. This view is supported by [10] which states that: "The UK's ITC guidelines for subtitling, signing and audio description provide a minimum form of best practice together with the views of such organisations as the FDPDA, RNIB, RNID, Hearing Concern and the *Subtitulado E para personas sordas y personas con discapacidad auditiva*". For example, one of the main conclusions of [10] is that a remote control unit providing direct connection to access services would be valuable to users while

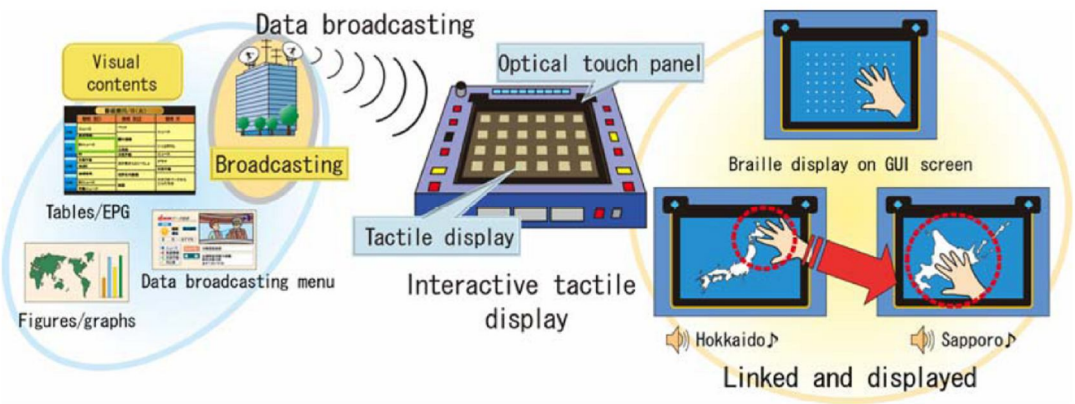
placing a limited burden on manufacturers. In the UK, TW have manufactured a "universal" remote. They supplied the DTV4All project with a demonstration remote for the Vienna 2008 Ministerial Conference and compiled a short leaflet to accompany it. The remote provides control of both a Set-Top-Box (STB) and a TV. It has individual audio description (AD) and subtitling buttons. There is a home button so if someone gets confused about where they are the home button takes them back to a starting point e.g. channel 1. Buttons on the remote will tell the user if subtitling or AD is on or off so the user can know if a programme has these services associated with it or not. A beep can be enabled so the user can know if their STB has received a button press on the remote (with the exception of a volume button press as the volume change prevents a beep from being emitted). Feedback is provided so people can confirm the settings of their subtitling e.g. which channel they are on. Tones are provided to indicate to a sight impaired user the settings of their AD.

Work is being done on other core conclusions of [10], namely, that tactile surfaces, and clear on-screen text and intuitive menus be provided.

Significant academic research has been done in recent years on clear on-screen text which forms an important input into the work of the DTV4All project towards initiating a European standard for subtitling.

In the United Kingdom, the Digital Television Group (DTG) Usability Group recently established a Human Interface Subgroup. This subgroup will be working towards improving the accessibility of digital television for all consumers. This work will feed through directly to improving access to users with physical and cognitive impairments.

In collaboration with the University of Tokyo Japanese broadcaster NHK has developed a tactile display with a high-precision optical touch panel that allows visually impaired people make use of data broadcasts and interact with the Internet. It can display figures and graphs with mechanical concavity and convexity. The interactive tactile display developed by NHK is illustrated below ([33]).



The more problematic conclusions of [10], namely, that manufacturers be persuaded of the benefits of making equipment that provide TV for everyone and that broadcasters be required to provide access services are being realised through a combination of political and market forces. Recent legislation of the European Parliament requires broadcasters to provide access services, the Audiovisual Directive of December 2007 [31]. Pressures placed by electronics retailers on DTV equipment manufactures margins are driving design for accessibility into their products. This is because these pressures are a response to the costs born by retailers as a result of call centre costs resulting from users requiring support in setting up equipment.

It is claimed in [10] that a reduction in the cost of assistive service production may be achieved through exchanging programme material that has already been subtitled or audio described in the main European languages. Unfortunately the assumption here is that the intellectual property associated with the access services has either been cleared for all territories or is not an issue which is not the case. Furthermore, experience to date with the exchange of subtitles along with television programmes within the Nordvision programme exchange mechanism (some 3,000 hours yearly) indicates that there can be unsuspected problems related to:

- Service differences: e.g. the use of colour to denote different speakers is not consistent among the 5 participating countries of the Nordvision programme
- Tariff differences: colour for subtitles triggers a higher level of payment in one of the countries
- Legal differences: territories and the duration of the rights associated with subtitles may preclude exchanges of certain kinds of materials.

The suggestion mentions major European languages. French and German may be “major” languages but there needs to be a discussion of, say, access services in *Hoch Deutsch vis a vis* German for Germany, German for Austria, and German for Switzerland, and so on.

While there could in principle be some cost savings, these might be more than offset by increased administration costs until programme exchange is file-based and online, as is the case in Nordvision. Even then, subtitled programmes would be relatively easy to exchange, whereas Audio Description will be fraught with problems until there is a migration to a well-defined and standardised Receiver Mix.

It has been suggested that the European Broadcasting Union (EBU) or similar organisation could act as a central base for compiling a file register for use across Europe. However, this is not realistic for the foreseeable future and in any event it would only cover the public service broadcasters.

4.3 Service design

Crucially, there is more to interoperability than the receiver and other equipment. In order to understand what standardisation is needed in service design to ensure the interoperability of the service, it has to be established what is required to ensure interoperability for the service from the commissioning of that service to its use. Working back from the user and their awareness and use of the access service, it is necessary to identify what it takes to deliver that service on a Digital Video Broadcast (DVB) based infrastructure. This means identifying how the essence of the service and its metadata, which is the information about the service that is broadcast with it, gets all the way from those who produce it to those who use it. The transmission requirements of the BBC explain why this is necessary. The BBC has to deliver access services both on its "own" transmission infrastructure (e.g. Freeview and Freesat) and that of third parties such as Sky and Virgin.

For each service it is necessary to consider not just the data streams in the transport stream that can be used to provide subtitles or audio description but also the metadata about the access services available, and production metadata that allows for the mixing and level adjustment for, say, audio description receiver mix in the box. This means that Digital Video Broadcast – Service Information (DVB-SI) and Digital Video Broadcast - Generic Data Broadcasting and Service Information Protocols (DVB-GBS) need to be discussed along with a host of existing standards governing specific services. It is also necessary to make a distinction between the setting up and the regular use of a digital television receiver.

In the first case, the individual has the challenge of arranging for the digital receiver to receive the appropriate channels and the access services associated with them. Different receivers handle auto-tuning and set-up very differently in areas where the household can receive the same channel from more than one transmitter (for example a home near the edge of the coverage zones of two adjacent transmitters or in parts of Europe where people are used to watching television channels that spill over regional or national frontiers.

There are also issues associated with access services and being able to identify these services as access services all the way down the value chain so that they can be discovered and used by their intended audiences.

In the second case, we are assuming that the digital television receiver has been correctly set up. From then on there may be accessibility and usability issues relating to how the manufacturer has chosen to implement the various DVB standards.

5. Progress in recent years

Progress on Receiver Terminals, Peripherals and Interactive Equipment

In basic design principles including inputs from disabled viewers in the design phases of new products and services, designing ICT systems to avoid exclusion has become a discipline it its own right as can be seen from publications and courses by John Clarkson & Simeon Keates [32]

It was suggested in [10] that standardisation organisations consider the establishment of a conformance centre which would undertake testing decoders to ensure that they provide the necessary minimum functions allowing accessibility. However, conformance testing is normally the domain of the platform operator, e.g. Freeview and Sky for the DVB-T and DVB-S platforms in the UK, and not a standards body or a regulator.

One of the issues is here is the conformance regime. Testing of this kind costs money. These charges are usually passed on to the manufacturer and/or importer of the digital receiver. Mandatory testing in small markets leads to complaints about additional upfront costs that have to be borne in order to get the necessary badge or label. Voluntary testing leads to a situation where some manufacturers/importers chose not to pay for conformance testing and then have a competitive advantage in terms of their costs and thus their retail price. In the latter case, some platform operators publish lists of approved receivers and absolve themselves of any responsibility in the case of consumers who choose to use a non-approved receiver with their service.

There are often regulator requirements in terms of the transmission network and/or conditional access. There would seem to be a good case for following the UK approach where usability and accessibility issues have been grouped together with receiver requirements for personal video recorders (e.g. Chapter 20 of the D Book).

It was recommended in [10] that, in conjunction with representatives of sight impaired people, an industry standard is devised in for remote control functions. An approach that has been discussed in connection with the standardisation of personal video recorders is to either go for a pan-European core requirements specification or to use a bottom-up approach, getting clusters of countries (e.g. the UK, Eire, the Nordic countries) to voluntarily adopt a shared specification and then to invite others to do so, hopefully ending with a pan-European standard.

In was recommended in [10] the remote control should indicate that a remote control button has been depressed. This is realised in the TW ‘universal’ remote through the use of audio tones.

More interestingly [10] noted that if the following facilities could be built in to receivers they would be of considerable benefit:

1. The option of auditory tone and visual clues to indicate incoming information and processing.

There are a variety of solutions currently available on the market providing such options to varying degrees. While these solutions can be improve the issue here is one of standardisation rather than technology.

2. The ability to repeat any audio messages.

3. An option for essential keys or buttons to "speak" when pressed should be available.

In terms of 2 and 3 it is clear that some coverage in terms of minimum announcements needs to be included in guidelines for remote controls otherwise a blind person could press the red button on their remote get kicked out of an audio description application and be unable to get back into it. However, these facilities cannot be made available until the broader issue of the provision of text to speech functionality is resolved, see the text on 'talking' EPG below.

Upgrades and future proofing, in terms of software downloads and simple addition of hardware: are just aspects of standards towards means of upgrading receivers which unfortunately do not yet exist.

Interconnections between TVs, Video Cassette Recorders (VCRs), and Personal Video Recorders (PVRs) etc, are not completely standardised but the types of interconnections available are not so numerous as to cause difficulties. For example if text to speech, including a 'talking' EPG is to become a widely available feature it could be achieved through a dedicated stand alone device that may need to support RS-232-C, USB etc.

Minimum decoding functions and Conformance to European Commission Standards: It is recommended, perhaps in conjunction with the DVB board, that standardisation organisations draw up and then promote an easily recognisable symbol that indicates compliance with minimum functions of being able to decode AD and subtitling.

- If AD is to be delivered with multi-channel audio Dolby claim AD can be provided as part of Dolby Digital Plus

Capacity:

- Currently a major issue is the fact that the majority of receiver chipsets do not have the power to provide AD.
- Receiver mix with multi-channel audio is a target of DVB-T2, the emerging standard for second generation digital video broadcast – terrestrial.

Base-line Receivers: The EICTA accessibility group are currently working towards a specification for a base line receiver. If such a specification does not exist by the end of the

DTV4All project the project will provide a 'straw man' specification as a starting point for work on specifying a base-line receiver.

Interactive television access: It is recommended that standardisation organisations draw up European guidelines similar in manner to the US for example.

- This is not realistic until such time as there is a widely used API. It is unlikely that Pay-TV operators such as Sky will abandon more than 10 years' work on openTV. The behaviour of patent pools such as Via Licensing (in connection with MHP and TV Anytime) has created considerable caution and mistrust among broadcasters and pay TV operators.

Web Content Accessibility

As the following chart taken from [25] shows, digital TV is considered relatively inaccessible to those with impairments while the web is considered relatively accessible.

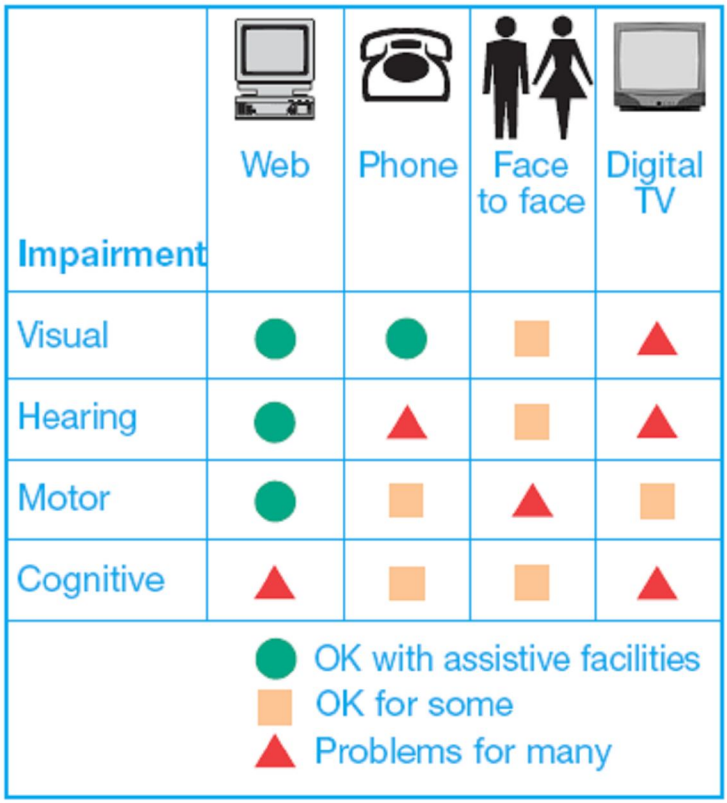


Chart 1 **Accessibility by channel for different types of impairment**

"If the Web Accessibility Initiative (WAI) Guidelines from the World Wide Web Consortium (W3C) are followed, websites can be made accessible to a very wide variety of people with disabilities and the delivery of inclusive government services in a multi-channel context becomes a more achievable objective through an accessible internet channel.", [25] p8. For the WAI Guidelines see [26]. Unfortunately, [25] highlights that as of 2005 eAccessibility of public service websites was disappointingly low. Therefore, offering IPTV with access services through a web site designed for accessibility is not a solution to meet the access needs of digital TV viewers across the European Union in the near term particularly when in some member states a minority of the population currently have access to the Internet at home. However, a useful lesson learned from the study of web site accessibility reported in [25] is that "it is crucial to equip content developers and authors with tools that support accessibility and to train them in how to provide content that is accessible. Different roles need different training". This lesson would be expected to apply to the provision of content for digital TV access services. Furthermore, it is argued in [25] that "Another medium-term objective should be for public sector organisations to implement an explicit procurement policy for tools and content, which might well have a significant effect on the industry" This expectation would be expected hold in the context of access services on digital TV.

Remote Controls:

- It should be established to what extent the universal remote control developed by TW addresses the recommendations in this area. What is clear is that DTV4All could usefully conduct discussions with stakeholders in the 4 countries on the viability of a non-mandatory specification of this kind.

Progress on Electronic Programme Guides (EPG's) and navigational menus

In Digital TV the agreed common standard is still the information provided through DVBs specification ETSI EN 300468 widely used in almost every DVB-compliant receiver set. In accordance with the Digital Video Broadcasting (DVB) system standard, EPG data are delivered in the form of DVB service information (DVB-SI) standard Event Information Tables (EIT). In other DVB-compatible systems, private EPG data formats (e.g. Sony's TvTv) are used to deliver EPG data using MPEG and DVB-compatible private data channels. Various methods may be used to notify Digital Video Recorders of updated EPG data, including periodically delivering updated EPG data. A successor for DVB-SI could become e.g. a standard called "TV-Anytime" [30]. A functionality this specification can support is the signalling of schedule data, mirroring the capabilities of the Event Information Tables defined in the existing DVB-SI specification. The standard also contains extended search and content referencing items. But

until now this "open ETSI standard" suffers under an unclear intellectual property rights situation which hinders its introduction into the market.

Progress on the production of access services

One of the most common problems often attributed to Subtitling for the Deaf and Hard-of-Hearing (SDH) as a service for the viewers is the absence of a) a common standard within and across countries and b) active consultation to the Deaf and hard-of-hearing audience. The DTV4All project will be undertaking a major study in an attempt to resort to the latter as a means to explore the possibility of achieving the former. The contributions that will be made by this study are described in section 13 of this document, actions on standardisation.

While some audio description guidelines have been already published and national standards are a fact in some countries, little research has been done on how well such guidelines travel and whether the cultural determinants underlying ADs permit efficient cross-cultural translation. Scientific studies yielding some insight into the feasibility of creating European audio standards, and a common European approach to quality Audio Description, are essential if a common European approach is to become a reality. The contributions that will be made in this direction by the DTV4All project are described in section 13 of this document, actions on standardisation.

Progress towards future developments

In [10] a number of future developments were highlighted as important for the provision of access services, these were:

The SAMBITS project proposal for a SAMBITS terminal in the form of a set-top box that would allow disabled people to receive digital television and Internet broadcasts.

"Talking" EPG

Implementation not technology is the issue. There are text-to-speech engines. The issues are how do you send information from the broadcast stream to the engine, and how is that information presented to the consumer. It is not at all clear how you read an Electronic Programme Guide (EPG).

The way in which the screen is read is particularly important so the information is presented in a structured way. There are lots of difficulties with lack of standardisation in the way things are delivered in the broadcast stream.

A basic issue is given a set-top-box with a certain amount of Random Access Memory (RAM) and a dedicated text to speech processor what can be obtained from it in terms of a text to speech service.

Another basic issue is how the text to speech service is delivered, is information ported from the receiver to a dedicated text to speech engine or is the text to speech engine part of the set top box.

The Digital Television Group (United Kingdom) Usability Group, Text to Speech Subgroup is looking at producing an outline specification for a new product, a stand alone device, because evolution of an integrated product is a much slower process. The RNIB has looked at a solution that is something in between these two approaches connected by a USB port to a set top box. The RNIB work has to date been product not standard focussed to deliver a proof of concept to make a point to manufacturers. The RNIB is waiting to move to open standards when it has made enough progress on this. The subgroup will create a common framework and a number of models.

The rationale for the subgroup's preference for a stand alone device is:

- For a non-niche manufacturer customer support is the biggest issue faced. Consequently, it is very attractive to such manufacturers to have a separate text to speech box so as to outsource support for that box to the company that makes it.
- There is a development potential for innovative design so that there is not necessarily one product being attached to a set top box. Such product could be fed by a number of devices not just a TV.
- The price break point for the text to speech engines is at a large volume. If the engine is an accessory then it can be sold in volume across a variety of manufacturers to hit the break point volume.
- The digital switch over is changing the mix of products on the market. Much more work is being done on return channel technology particularly for CANVAS and iPlayer. Long term development of the text to speech engine needs to be with an organisation other than the major receiver manufacturers which are tied up with too many other things because of this situation.
- The engine has to be an interactive device to be of any use. The cost multiple of customer support for the engine needs to be spread across a number of text to speech engine manufacturers to deliver a vibrant market. This is because then text to speech engine manufacturers could differentiate their product according to the customer support provided.

Personalisation Agents

In was noted in [10] that personalisation agents can make it possible for digital television receivers or set top boxes to automatically track and adapt to individual user behaviour and preferences. They allow a situation analogous to that where multiple users login to the same personal computer and on login the computer's settings are customised to the particular user. In the context of access services it should not be forgotten that personalisation agents apply generally to a multiple user situation. In the context of digital television the users are likely to be members of the same household and therefore a wider age range needs to be catered for than is usually the case in a workplace. This raises a range of usability issues of which the challenges of accommodating users requiring access services are only a part. To date very little progress has been made in this area in terms of product on the market partly because of the limited processing power of cheap set top boxes currently on the market. The Digital Television Group Usability Group recently established a Human Interface Subgroup which will look at the way on screen menus and prompts look to the consumer so that they are given a good experience. Consideration of these issues naturally leads to consideration of personalisation agents. The Human Interface is currently receiving a lot of interest in the United States and it is essential that Europe moves quickly to deliver advanced solutions or solutions developed in the United States will come to dominate the market. Even if this were not eventually to be the case it is not desirable for the United States, Europe, and Japan to develop distinct approaches to the Human Interface.

European Research Centres

In [10] it was recommended that a European Research Centre on accessibility be set up. This has not happened and the DTV4All partners do not believe that such a Centre could address the crucial issues effecting interoperability which need to be resolved by the participants in the accessibility service value chain through standardisation activities or other forms of agreements between them.

While issues of interoperability still need to be resolved to ensure the widest possible availability of access services across Europe these issues are not the determining factors when it comes to the quality and general usability of the actual access services provision in Europe. The DTV4All partners do believe that the quality and general usability of the access services provided across Europe could benefit significantly from on-going user driven research activities by academic institutions, research centres, and broadcasters, into human factors related issues.

In so far as the Network of Excellence now exists as an instrument for creating virtual research centres progress has been made in the provision of enablers. Activities of the type envisaged are well suited to promotion through Networks of Excellence driven by users' organisations,

particularly since it is highly desirable to involve users' organisations across Europe to ensure that user participation in the research process is not piecemeal.

After [10] was written the SAMBITS project implemented basic interactive TV services by including with teletext content external links to URLs where additional information was provided. It also implemented additional video delivery using the private section of the MPEG2 transport stream. One scenario was that a signer video was sent in the private section with a receiver mix function to allow open signing of a TV programme.

Synchronised parallel delivery

Subsequently, the SAVANT Project [27] expanded the SAMBITS solutions. The additional information included with teletext was formatted for different displays Personal Digital Assistant (PDA), tablet PC, and large screen TV. A "synchronised" parallel delivery mechanism was also implemented for DVB and IP streams. This allows a signer video to be sent over an IP channel that is synchronised at the user's Set-Top-Box (STB) with a TV programme delivered to the STB by DVB broadcasting. Due to the relatively limited accuracy of the synchronisation, which with in a few frames is 50 - 80 msec, the synchronised delivery of an extra audio track over IP was not tested.

6. Current status of standardisation

Progress towards recommended standardisation

In [10] it was recommended that CENELEC consider standardisation in a number of areas. In this section the current status of each of these recommendations is reviewed. Below each of these recommendations is stated and identified by a number. Observations on the current status of the recommendation are given immediately below it.

1. Standardise the EBU File transfer format 3264
   - The EBU file transfer format 3264 is an 'open' format for the exchange of subtitles between broadcasters. The Timed Text ‘open’ format DFXP for the exchange of subtitles is currently being drafted by the World Wide Web Consortium (WC3).
2. Proceed with standardising DVB Subtitling ETS 300 743 V1.2.1
   - Subtitling in DVB is specified (ETS 300-743 and ETS 300-472).
3. In conjunction with other bodies develop a consensus towards interoperability with MHP as the main API.
   - At a recent EBU/EICTA meeting there was concern about integrated digital TV receivers and the need to agree on a common API. MHP is now effectively dead, and MHEG-5 (also known as Euro-MHEG) seems to be a strong contender.
4. Derive minimum standards for receiver control functions, labelling of switches, dials etc.
   - A Euro symbol is used for subtitling on some user interfaces so in the United Kingdom guidance from Ofcom in short event descriptors says use S or ST to denote subtitles.
5. Develop minimum standards for interconnections and their connectors to include colour coding.
   - Such standards do not exist at a European level but this is not considered to be problem.
6. Develop minimum standards for remote controls to include their size, shape, and buttons for clarity of marking and usage. Also to develop a set of recognizable symbols to denote functions.
   - In the UK, TW have manufactured of a "universal" remote the features of which were described in section 4.2 of this document.
7. Develop a minimum standard for the decoding of assistive services. That is to say ensure that all digital TV decoders sold in the EC have the ability to decode the main forms of assistive services.
   - If AD is to be delivered with multi-channel audio Dolby claim AD can be provided as part of Dolby Digital Plus
8. Together with EICTA and the EBU establish a conformance centre for digital TV terminals and displays.

- The DTV4All project is taking steps to bridge the work of EICTA and the EBU on interoperability of access services to allow consideration of interoperability across the entire value chain.

9. Together with EICTA develop a standard for a single "base line" receiver. (As this is being considered by the UK Government's Digital Strategy Group there would be a role for CENELEC ensuring that any standard is applicable Europe wide).
    - In the UK the Digital TV group recently issued guidelines for Digital TV receivers for the UK market, for more details see section 10 of this document.
10. Develop minimum standards for upgrading receivers in order to avoid receiver "legacy" problems. This could be achieved in partnership with manufacturers.
    - This work in anticipated to form part of the work of the EICTA accessibility group. However, it naturally comes after the specification of a base-line receiver which has yet to be done.
11. Consider if, in conjunction with the EC, it is practicable to produce standards for on-screen displays derived from the Internet especially those sites provided by government organisations.
    - The DTV4All project will discuss this with the EC towards the end of the project.
12. In conjunction with the EBU develop standards, or at least produce guidelines, for a "safe area" to display essential text and graphics.
    - Such guidelines are anticipated to be an output of the DTV4All project
13. In conjunction with broadcasters explore the possibility of minimum standards and guidelines for EPGs
    - It is anticipated that the recently formed United Kingdom Digital Television Group Usability Group Human Interface subgroup will produce such guidelines.

Other current standardisation related initiatives

The work of the International Telecommunications Union and their imminent strategic toolkit should have an impact on policy and standardisation work globally.

7. Evolution of tentative recommendations

Tentative recommendations for actions on standardisation were made in [10]. In this section the current status of each of these recommendations is reviewed and two new recommendations made. Below each of these recommendations is stated and identified by a black bullet. Observations on the current status of the recommendation are given immediately below it.

- The needs of disabled consumers should be built into standardisation procedures. The appropriate bodies to oversee this would be the European standards bodies CENELEC, CEN and ETSI. They in turn should establish a disabled users committee to ensure that they take these issues on board when standards are drafted.
  - The DTV4All project will be carrying out user tests to initiate the process of developing European standards for subtitling and audio description.
- Good aerial practice
  - Guidance on good aerial practice for the United Kingdom market is contained in [35] some of which is applicable generally.
- Use of DVB Subtitling ETS 300 743 V1.2.1
  - Subtitling in DVB is not widely implemented so far apart from the Nordic countries where it is mandatory.
  - As of 2008, TV stations in certain European territories still appear to be reluctant to send DVB subtitles. At the same time, many set-top boxes either do not support DVB subtitles or hide the functionality in sub-menus.
  - For the UK market, with the adoption of digital terrestrial television, Teletext was fully replaced by services based on MHEG-5 (ISO/IEC 13522-5) which includes subtitling functionalities.
- Consideration given to Audio Description (AD) in the DVB Implementation Guidelines
  - There is a new descriptor from DVB-GBS related to distinguishing between AD receiver mix and broadcast mix. A proposed annex to 3468, annex j, provides a supplementary AD descriptor that can allow a receiver to determine if the audio stream is a complementary or an independent stream.
  - There is a specialist group on AD in DVB-T2, the emerging standard for second generation digital video broadcast – terrestrial.
  - With respect to signalisation the service information needs to reflect whether AD is available or not. A mechanism for to be used for doing this needs to be defined. In the United Kingdom the Digital Television Group, Usability Group, Subgroup on Audio Description aims to work towards defining such a mechanism.
- Develop a consensus towards interoperability

- The existence of the EICTA usability group demonstrates that a consensus on promoting interoperability does exist among integrated digital television and set top box manufacturers on desirability of interoperability of their devices.
- The current work of the EBU demonstrates a consensus among broadcasters on the desirability of the interoperability of their transmissions.
- What is lacking at the moment is a European level body reflecting a desired for end to end interoperability in the value chain. The work of the DTV4All project is attempting to bridge the gap created by the lack of such a body.

- Development of a single "base line" receiver
  - It is hoped that the EICTA usability group will produce a specification of a "base line" receiver. However, if no such specification exists by the end of the DTV4All project, the project will deliver a 'straw man' specification for a base line receiver.
- Creation of a conformance and certification testing
  - See the comments on this in section 5 above
- Agreement towards standards for receiver control functions, labelling of switches, dials their sizes, connectors and connectivity guideline for equipment
  - Signalisation needs to be addressed first. Currently, channels can be labelled as having AD when they do not have it.
- Standards towards means of upgrading receivers
  - While it is highly desirable that such standards be developed it is unlikely that meaningful work on such standards can be done until a single baseline receiver has been developed and work is currently on-going on this.
- A minimum standard for receiver assistive service decoding ability
  - This is one aspect of work on developing a single baseline receiver. Until that work has been completed this is likely to remain an unresolved issue.
- On-screen displays standards or guidelines for: resolution of "onscreen" interactive information.
  - High definition subtitles on a small high definition compatible screen can be very hard to read
  - The United Kingdom Digital Television Group Usability Group has recently established a subgroup on Human Interfaces.
- Standards or guidelines for text, graphics and safe areas
  - There is no common standard within and across countries for Subtitling for the Deaf and Hard-of-Hearing. The DTV4All project will be undertaking a major programme of active consultation to the Deaf and hard-of-hearing audience in an attempt to explore the possibility of achieving a common standard

- Minimum standards for remote controls: size, shape and usage, tactile surfaces and audio alarm when misplaced
  - In the UK, TW have manufactured of a "universal" remote the features of which were described in section 4.2 of this document.
- Consider interoperation of remote control units
  - It is anticipated that the United Kingdom Digital Television Group Usability Group Subgroup on Human Interfaces will consider the interoperation of remote control units.
- Minimum standards and guidelines for EPGs
  - Subtitles may be available in several languages and are a general access tool. DVB-SI allows the user to distinguish between subtitles for the hard of hearing and subtitles 'normal'. In the UK all subtitles are labelled as 'normal'.
- Subtitling, Audio Description and Signing best practice
  - The DTV4All project will deliver best practice guides for audio description and subtitling
- Creation of a central register of previously recorded assisted programmes
  - The issues associated with this are discussed in section 5 above.
- Promotion of assistive services by broadcasters, newspapers and by national regulatory authorities (NRAs) in general
  - Currently in the UK Ofcom requires the availability of access services in the UK to be promoted. The ways in which this is done are described in the next section of this document.

Finally, the DTV4All partners make two additional recommendations for work that they believe would further interoperability:

1. Guidelines for good auto-tuning practice should be developed
2. Agreement should be sought on metrics for assessing individual access services and their take-up.

8. Dealing with a lack of interoperability and promoting awareness

The UK Government Communications Act of July 2003 extended the obligations on UK broadcasters to provide subtitling, signing and audio description. Ofcom [11] is the body responsible for defining the obligations and for monitoring the compliance of UK broadcasters with these obligations in order to ensure they are enforced. It is required to set ten year targets for subtitling, signing and audio description, and may set interim targets.

Ofcom requires UK broadcasters to observe certain minimum presentational and technical standards for the access services they broadcast in order to meet their statutory obligations, which are set out in Ofcom's Guidelines on Television Access Service Standards.

Dealing with a lack of interoperability

Significantly, from the point of view of set-top-box standardisation Ofcom imposes no technical standards on the means by which Television Access Services are made available to viewers. Instead Ofcom expects UK broadcasters to use reasonable endeavours to ensure that the access services they provide to meet their statutory obligations can be accessed by the greatest number of viewers in their homes regardless of whether the broadcaster delivers their services by terrestrial signal, satellite, or cable. This lack of requirements for interoperability is to a large part addressed by the UK Digital Switchover Help Scheme, discussed in the next section of this report, which assists users in identifying the receivers that will meet their needs.

At the 2008 Ministerial e-Inclusion Conference and exhibition in Vienna on 30th November to 2nd December 2008 the DTV4All project provided a demonstration of access services to stimulate debate on them. At the demonstration stand the Lithuanian minister of culture and representatives of Norway's broadcasting/telecom regulatory body and the Swedish Disability Federation asked the DTV4All project coordinator how the UK and Denmark managed to establish digital TV access services. In response a short report is being prepared by DTV4All partners on how the funding system for public broadcasters and the regulatory regimes work in the United Kingdom and Denmark which will also address how the broadcasters and users have reacted to the resulting environments for access services. This report will discuss in more detail the regulatory approach of living with a lack of interoperability emphasising that it has to be accompanied by a mechanism to address the problems caused by a lack of interoperability at the level of the individual user.

Promotion of awareness

Ofcom requires broadcasters to promote the availability of their access services to potential users of the services by making available accurate and timely information to electronic programme guide (EPG) operators listing their services, and by providing similar information on their websites. Ofcom imposes corresponding obligations on EPG operators through the EPG code. Broadcasters who provide programme synopses for use in EPGs are supposed to indicate which programmes are accompanied by television access services by including the standard upper-case acronyms for subtitling (S), audio description (AD) and signing (SL).

In the context of this document, a particularly interesting aspect of Ofcom's role is that it expects broadcasters to demonstrate that they are taking effective steps to publicise awareness of their television access services by providing periodic on-air announcements and information in publications aimed at persons likely to benefit from such services.

9. UK Digital Switchover Help Scheme

In September 2005, the UK Government announced a Digital Switchover Help Scheme. The scheme seeks to provide practical assistance to those UK citizens that most need help to receive TV after the digital switchover.

According to [12]: "The scheme is aimed at people aged 75 and over, people with significant disabilities and people who are registered blind or registered partially-sighted. People with significant disabilities are those who receive Attendance Allowance or Disability Living Allowance."

The assistance and support provided by the Scheme will include:

- providing equipment to convert one TV set
- help with installation
- follow-up support

This provision will be free to the poorest eligible households i.e. those on Income Support, Job Seeker's Allowance or Pension Credit. Other eligible households will need to pay a one-off modest fee."

The UK Government has been working with organisations representing the interests of user groups including the RNIB, RNID, Age Concern, Help the Aged and the Consumers' Association along with the Department for Work and Pensions, Department for Trade and Industry and the BBC to develop and deliver the Help Scheme.

The scheme is managed by an independent organisation and funded by the BBC. The BBC is concerned that DTV equipment provided under a government scheme meets minimum standards of usability. The BBC gets the views of disability groups on what it is doing.

Individuals eligible for help through the scheme are identified. Region by region there is mechanism by which people in a category eligible for help under the scheme are identified. Information about who they are is acquired from government and local government databases. The people identified are sent a letter, or later something more suitable for their capabilities, warning them of the analogue switch-off. A user friendly interface is provided so they can be helped to make the right decisions about the access equipment they will be provided with.

The timing of the Audio Description (AD) advertisements in the UK was dictated by the equipment necessary to support it finally becoming available.

Integrated DTVs do DVB-Subtitling and AD but are expensive. For integrated DTVs and set-top-boxes (STBs) the remote control is often last bastion of the branding department and raises

particular issues of its own to do with accessibility. In UK there are guidelines for best practice for remote controls. These represent ten years of experiences with DTV remote controls; The BBC provides these good practice guidelines to manufacturers it does not require manufacturers to do anything. One company has, for the UK government scheme, made a universal remote control already described earlier in this report.

UK DTV uses open standards for receivers.

There are two approaches to auto tuning. One is familiar to most people and requires their input, the other approach is autonomous. The receiver detects a change in reception conditions and notifies the user or adapts to the change, say at 3am when the user is not likely to be watching TV. This approach could potentially with the support of broadcasters provide a text notice to the user giving an advance alert of a change. There is a mechanism being put in place to deliver that kind of notification.

Lessons that will be learned from the forthcoming switch-off in the Scottish borders region will be reported.

10. Guidelines for receiver interoperability in the UK

In the UK the Digital TV group recently issued guidelines for Digital TV receivers for the UK market [13]. These guidelines seek to ensure receivers built for the UK market are interoperable and reach certain minimum standards that address features such as functionality and usability. In particular in [10] is stated that: "The core of the Digital TV network has been built on open standards. To ensure the development of a true open and horizontal market in receivers, delivering both a reliable and complete viewer experience, conformance of receivers to the relevant standards is essential.

For manufacturers to use the, "digital switchover Certification Marks" they should become a signatory to the Licence Agreement and ensure their products are conformant with the "digital switchover Certification Mark, digital TV Equipment, Authorised User Licence" document issued by Digital UK on behalf of the Secretary of State [14]."

Across Europe individual operators have conformance testing or other measures to promote "approved" digital television receivers.

11. Cooperation with EBU

The EBU encourages the practical aim and approach of the DTV4All consortium to help broadcasters provide access services in a sustainable way. The DTV4All project fits well with related work carried out in the EBU (e.g. see [19]).

An important part of the EBU's work is sharing experiences and best practices amongst its Members. The EBU welcomes the results from the DTV4All project being made available for sharing with the wider EBU Membership and the broadcast industry at large.

The EBU offer to the project to assist in this process includes the following:

- Publication space in the EBU Technical Review [20] for article(s) on the project's results.
- Presentation(s) at relevant EBU seminars, especially the yearly EBU Forecast [21].
- Presentation(s) to and discussion with the EBU Subtitling/Txt group.
- Organisation and hosting of one or more seminar(s)/workshop(s) dedicated to Access Services (to be organised together with the Project Consortium)
- Taking up standardisation issues arising from DTV4All in various DVB groups, in the first instance those dealing with DVB-SI and DVB-GBS.

The EBU's technical work is predominantly carried out in Project Groups [22]. These Groups are created when EBU Members express a minimum level of interest in certain topics. In the recent past two Groups on Access Services have been active:

1. P/AS (Access Services);

2. P/MAS (Monitoring of Access Services).

The project partners will contribute relevant results to the EBU Working Group P/AS "Access Services" which studies the deployment of Access Service in Digital Television environments. If the DTV4All results indicate detailed technical work that needs to be carried out, the EBU's Technical Committee will consider starting a technical Project Group on that topic.

In the technical area the EBU publishes recommendations for its' Members/the industry at large to improve interoperability of equipment and working practices, such as for example the EBU Recommendation on Subtitling [23]. The EBU will consider recommendations coming from the consortium for adoption as EBU recommendations, following the normal EBU evaluation procedures.

Through EBU, with their more than 100 members worldwide, practical experiences and new service concepts can be shared, spreading 'best of breed' solutions. Continuation of the taken into operation additional access services at a national level can be encouraged.

Close links to the EBU have been established by various partners in the project. DR, RAI, and RBB are active EBU members and IRT is heavily involved in the joint technical work of the EBU. The EBU actively participated in the proposal preparation process and beyond and explicitly supports the project through a Memorandum of Understanding with the project.

12. Cooperation with EICTA

EICTA has been discussing an industry forum for access services and DTV since mid February 2007. There is a group of European access service stakeholders that continues to discuss potential collaboration in this field. EICTA and European Disability Forum (EDF) cohosted a meeting on 19 May 2008 to look at emerging access services and to try to reach agreement on work for the first of two years covered by the agreement. The EICTA group will be meeting 4 times a year, with a meeting scheduled for 30 June 2008. DTV4All presented its proposed work to the EICTA forum on 30 June 2008. To ensure the most effective dissemination to manufacturers the DVT4All project results will be disseminated to EICTA through the EBU's joint committee with EICTA. To obtain feedback from industry on the quality of the dissemination material provided to EICTA additional dissemination of the project results will be undertaken through the Networked and Electronic Media (NEM) technology platform which provides an excellent forum for discussion with its relevant industry membership.

Experience to date of collaboration between broadcasters and EICTA on access services for free-to-air broadcasting suggests that getting new features adopted requires sustained effort on multiple fronts (standardisation efforts to assure interoperability, consultations with stakeholders at European and national level to maintain focus on priorities, regulatory "carrots and sticks").

In order to convince EICTA of the need for standardised device solutions, large field trials of common access service solutions are essential. In order to substantially improve the overall situation, support from the European Commission will play an essential role in overcoming the related constraints. The field trials will be provided as part of the core work of the DTV4All project and Commission representatives will participate in the meetings of the EICTA group on access services.

13. Actions on standardisation

Implementation Guidelines

The main deliverables of the work on mature access services of the DTV4All project are a report and a presentation containing descriptions of the mature access services piloted by the project, guidelines for their implementation throughout Europe, and recommendations regarding emerging access services for which there is industry-wide support that address:

- Devices: Recommendations for device specifications to be adopted Europe wide based on existing DVB and EICTA draft specifications for DTV receivers (and recorders) and inputs from European territories already at an advanced stage of device and service standardisation using DVB-SI, DVB-GBS and related standards.
- Content: Guidelines for the provision of subtitling, audio description and signing for various content categories on digital television
- Services: Guidelines for the setting up and running of access services for broadcasters and platform operators using the maturity model proposed in Deliverable D1.1. The guidelines would include service models; business models; a listing of the appropriate standards for commissioning and producing content; Broadcaster to broadcaster and broadcaster to consumer standards and formats for exchanging content, metadata and services; training of those involved in developing and producing access services for digital TV; metrics and evaluation guidelines for services
- Roadmaps: Objectives and timetables on the basis of which objectives and timetables for subtitling, audio description and signing services for digital television platforms can be agreed at national and regional level, taking into consideration the circumstances of the digital TV value chains in each territory

The EBU and EICTA will consider how the report can be used in ongoing standardisation and interoperability work in Europe.

The EBU and EICTA are expected to use project deliverables as the basis for discussion with entities such as:

- DVB (DVB-subtitling)

- DVB-SI

- DVB-GBS

- DTG-SI group

- SMPTE (The Society of Motion Picture and Television Engineers)

- EBU group: AMWA (Advanced Media Workflow Association) - subtitling in media file formats (production & exchange)

- EBU TV Subtitling/Access Services Group

- EBU Production Management Committee

- EBU Delivery Technology Management Committee

- EICTA/EBU joint working party on Personal Video Recorders for free-to-air broadcasting in Europe

- Material Exchange Format (MXF) Forum

- Digital Television Group (DTG)-recorders group

- NORDIG-T: NorDig is a common platform for Digital Television to be used within the Nordic region

- EICTA draft specification for DTV receivers
- International Telecommunications Union G3ICT (working group "Toolkit for Policy Makers on e-Accessibility & Service Needs for Persons with Disabilities

- Web Accessibility Initiative (WAI), in particular the work on a Speech Synthesis Markup Language (SSML) Version 1.1 and a Pronunciation Lexicon Specification (PLS) Version 1.0

IRT will contribute relevant results to the EBU Production Technology Management Committee (PCM) and the EBU Delivery Technology Management Committee (DMC), which can create Working Groups on relevant technology for Access Services creation and delivery.

Initiating a European standard for subtitling

One of the most common problems often attributed to Subtitling for the Deaf and Hard-of-Hearing (SDH) as a service for the viewers is the absence of a) a common standard within and across countries and b) active consultation to the Deaf and hard-of-hearing audience. The DTV4All project will be undertaking a major study in an attempt to resort to the latter as a means to explore the possibility of achieving the former. With this objective in mind researchers from different EU countries will carry out experiments in eight different languages to examine the viewers' preferences with regard to some of the most important features of SDH: font and size, position, justification, character identification, context information (icons & emoticons), boxes, borders and shadows. It is interesting to note that the countries/languages chosen respond to a broadcasting tradition: Italy, Catalonia, France and Spain with dubbing, Denmark, Greece and Belgium with subtitling, Belgium and Catalonia as bilingual countries while UK is the EU

country where media accessibility has had most impact. In every case, the tests will be carried out first with users made up of three different groups: Deaf, hard-of-hearing and hearing viewers.

The results of the study will be considered to address the following hypotheses:

- there is a need and the potential for Europe-wide SDH guidelines
- there is a need to determine the relevance of users' feedback in the set-up of guidelines
- there is a need to empirically determine the technical parameters of SDH

In the light of these findings, the report will make recommendations relating to both the format and the content of SDH, the trade-offs between SDH and interlingual subtitling in countries with a considerable proportion of their TV output in multiple languages/foreign languages, as well as the training of subtitlers.

Initiating European standards for audio description

While some audio description (AD) guidelines have been already published, national standards are a fact in some countries, little research has been carried out on how well do such guidelines travel. And do the cultural determinants underlying ADs permit efficient cross-cultural translation? Scientific studies yielding some insight into the feasibility of creating European audio standards, and a common European practice of quality Audio Description, would be most welcome. With this in mind as part of the DTV4All project a team of researchers across Europe has set up a common project which takes the 'old' Pear Tree Project [29] as its starting point. This research is indeed targeted at developing international guidelines and standards for audio description, which are crucial to improvements in media accessibility for blind and visually impaired people.

It is hoped that the findings will inform the standardisation of international audio description practice as to what information about a film's story should be included in audio descriptions and how it should be linguistically encoded. Whereas much previous research in audiovisual translation has tended to concentrate on close analyses of small monolingual samples of actual audio description, the research to be undertaken by the DTV4All project is intended to be basic in nature by providing to the audio description community an understanding of how language and culture affect the ways in which moving images are put into words. This study has a high degree of practical import, but will also be of key interest to researchers in a variety of fields concerned with the relationships between the visual and the verbal (philosophy, aesthetics), vision and language (cognitive science, artificial intelligence), and image data and text data (multimedia computing).

The results of the study will be considered to address the following hypotheses:

- there is a need and the potential for Europe-wide audio description guidelines
- audio description can be translated effectively and efficiently
- it is cost effective for the same person to audio describe and subtitle

In the light of these findings the report will make recommendations relating to the audio description workflow, the content of audio description and the training of audio describers, taking into consideration the multiple delivery options including broadcaster mix, receiver mix and at some point audio subtitling/audio description using speech synthesis.

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