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Focus Group on Audiovisual
Media Accessibility

Technical Report

Part 1: Overview of audiovisual media accessibility: An introduction

International
Telecommunication
Union

FOREWORD

The procedures for establishment of focus groups are defined in Recommendation ITU-T A.7. The ITU-T Focus Group on Audiovisual Media Accessibility (FG AVA) was proposed by ITU-T Study Group 16 for creation in-between TSAG meetings and it was established on 22 May 2011. The Focus Group was successfully concluded in October 2013.

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Table of Contents

Summary

This Technical Report of the ITU-T Focus Group on Audiovisual Media Accessibility (FG AVA) presents an overview of what audiovisual media accessibility is, as analysed by FG AVA. FG AVA had foreseen this work as a future work item for ITU-T Study Group 16 (SG16) "Multimedia".

Introduction

FG AVA was charged with examining what measures can be taken to make access systems for persons with disabilities more widely available across all audiovisual (AV) media-broadcasting and Internet protocol (IP) systems. Of particular interest are interoperable systems that can be used for all delivery systems.

This Technical Report contains the first four deliverables:

– Deliverable 1: What is meant by audiovisual media?

– Deliverable 2: What is 'accessibility' in connection with audiovisual media?

– Deliverable 3: Which kinds of digital AV media service are in within the scope of FG AVA?

– Deliverable 4: Key performance indicators (KPIs) for digital AV media service provision.

1   Scope of the work of FG AVA

FG AVA agreed to endeavour to prepare a series of deliverables. The deliverables were mapped against the Terms of Reference.

The final deliverables of FG AVA are aimed to:

– Identify actions that are needed to promote digital audiovisual media accessibility;

– Recommend a set of actions that should be followed up by ITU to promote digital audiovisual (AV) media accessibility;

– Prepare preliminary draft Recommendations for submission to the appropriate study groups where this is practical.

For the *scope* of our "Audiovisual Media Accessibility" activity, we have addressed three questions:

1. What is meant by "audiovisual media"?

2. What is the scope of "accessibility" in connection with audiovisual media?

3. Which kinds of media are in scope, as well as the rationale for including those selected?

2   Deliverable 1: What is meant by audiovisual media?

2.1   The scope of 'content'

The term audiovisual media covers *content*, i.e. audiovisual works or products, and the means by which they are created, exchanged, distributed and used. The ultimate goal is the enjoyment and /or content understanding of audiovisual works by all users.

There is an implicit distinction between audiovisual content or *works* and real-time audiovisual *communication* (relay services, voice and video telephony). FG AVA has focused on *digital* audiovisual works in recognition of the fact that AV content is increasingly being made available in digital form only.

Many analogue media have either already been 'switched-off', or will be phased out in the coming years. Digital media may call for actions on the regulation and standards needed to support them. Analogue radio remains in widespread use throughout the world, and some technologies, in particular 'radio subtitles', can also be applied to them to help persons with disabilities.

As the use and enjoyment of digital AV works presumes that potential users can find the content they want, FG AVA has also addressed *metadata* (information about content). Included here are spots and trailers about forthcoming content, program guides including electronic program guides (EPGs) and other kinds of content listings. Information about content also includes the mechanisms used to search for and select a given piece of content using metadata of this kind.

A small but important addition to 'content' is emergency alerts in connection with disasters. Warning citizens about imminent danger from an earthquake or tsunami is also within the scope.

As will be described in depth in Deliverable 2 (Digital AV media accessibility), the scope of FG AVA included not only digital AV content and metadata but also 'Access services' that can improve the extent to which persons with disabilities can use and enjoy content.

'Access services' are services like closed captioning/same-language subtitles, video description /audio description and visual signing (in which an interpretation into a sign language is provided).

This kind of access service may be delivered with the digital AV content itself, or the access service may be generated locally by some kind of assistive technology. An example is a screen reader such as JAWS where on-screen text is 'read aloud' using a text-to-speech (TTS) device.

In summary, the term 'digital AV media' encompasses:

– Digital AV works-both 'content' and emergency alerts;

– Metadata about these digital AV works; and

– Access services offered with the digital AV works so that content (including emergency alerts) can be used by persons with disabilities.

Even the term 'digital AV media' covers a wide range of options. There are borderline areas where a clear-cut distinction is difficult to make. This is discussed in more detail in FG AVA Deliverable 3 (Which kinds of digital AV media service are in within the scope of FG AVA?).

The categories of digital AV media that were selected for further study by FG AVA during its meeting in September 2011 included:

– *AV Content on Digital Television, and Digital and Analogue Radio*, using satellite and terrestrial broadcasting and cablecasting to fixed or portable receivers.

– *AV Content on Internet protocol television (IPTV)* or managed wired networks.

– *AV Content on Internet* or unmanaged wired or wireless networks.

– *AV Content on* Wireless *Tablet* or wired and wireless *personal computer* (*PC)* devices.

– *AV Content on* Wireless Mobile or *hand-held* devices (usually smaller than tablets).

FG AVA had modest resources for its work and hence the main focus has been the categories of AV media services listed above. FG AVA was not been able to address computer *games on computers, games consoles, mobile and hand-held devices* nor *digital recorded music* for this reason.

Narrowing the scope takes into account the existing legislative and regulatory framework covering digital AV media. In most territories, television is the medium that is most strongly regulated. Lessons learned from that medium can usually be applied to other digital AV media too.

As will be explained in Deliverable 5 on stakeholders, AV content needs to be considered as an integral content *service*:

Figure 1-Audio visual media content

Work on media accessibility requires an understanding of the stakeholders involved and of the processes from the creation of digital AV media to their delivery and use. For AV media in the 20th

century, a 'manufacturer paradigm' was sufficient, with five links in the generic 'AV content service chain' shown in Table 1 below:

Table 1-Audiovisual content service chain

1. Audiovisual (AV) works and their creation	2. AV media exchange & distribution	3. Devices for rendering AV media	4. Devices for interacting with AV media	5. Using AV media

As part of its remit, FG AVA chose also to include the accessibility of the *processes* to create digital AV media and how to ensure the active participation of persons with disabilities from start to finish. For this reason, an additional Working Group (WG K "Access to working procedures") was set up to assess the accessibility of the FG AVA meetings themselves and to make suggestions about making physical and virtual meetings accessible for use by ITU[1]. There are both ethical and pragmatic reasons for using this participatory approach to involve persons with disabilities in AV media service creation.

The fifth part of the value chain-'using AV media'-has required considerable attention. The connotations of AV media use began to change in the eighties and have evolved rapidly in the 21st century. The manufacturer paradigm in which the user passively 'consumes' media is now inadequate. In a world of mobile phones and social media, equating AV media use with consuming media does not adequately reflect the current range of media habits.

For this reason, FG AVA prepared a basic taxonomy to classify the types of participation[2].

FG AVA used the term "participation" in its Technical Reports rather than just "interaction" in order to encompass the full uses to which digital AV media are put. Some examples are shown in Figure 2:
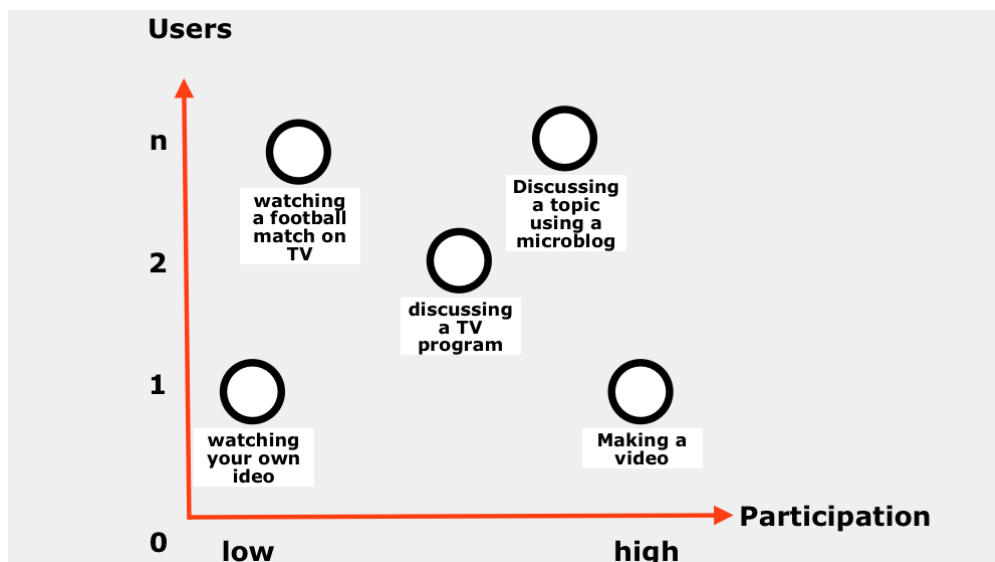

Figure 2-Participation and interaction in AV content

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[1] AVA-I-0304 ("Requirements and good practice for supporting remote participation in meetings for all. Draft final report. Version 0.5").

[2] A more detailed introduction to the rationale of this approach can be found in AVA-I-0296 – "Taxonomy of Participation".

The scope of 'digital AV media' in the work of FG AVA thus covers:

–   digital AV media services;

–   the content of such services (including content, metadata or 'meta content', access services and emergency alerts);

–   the networks through which the content is delivered;

–   the devices to which the content is delivered and with which the users interact with the service.

3   Deliverable 2: What is "accessibility" in connection with audiovisual media?

Accessibility is "the degree to which a product, device, service, or environment is available to as many persons as possible". The aim is to help create a society that is as inclusive as possible.

Figure 3 shows the relationship between a digital AV media service and a user of that service, using TV as the example[3]:
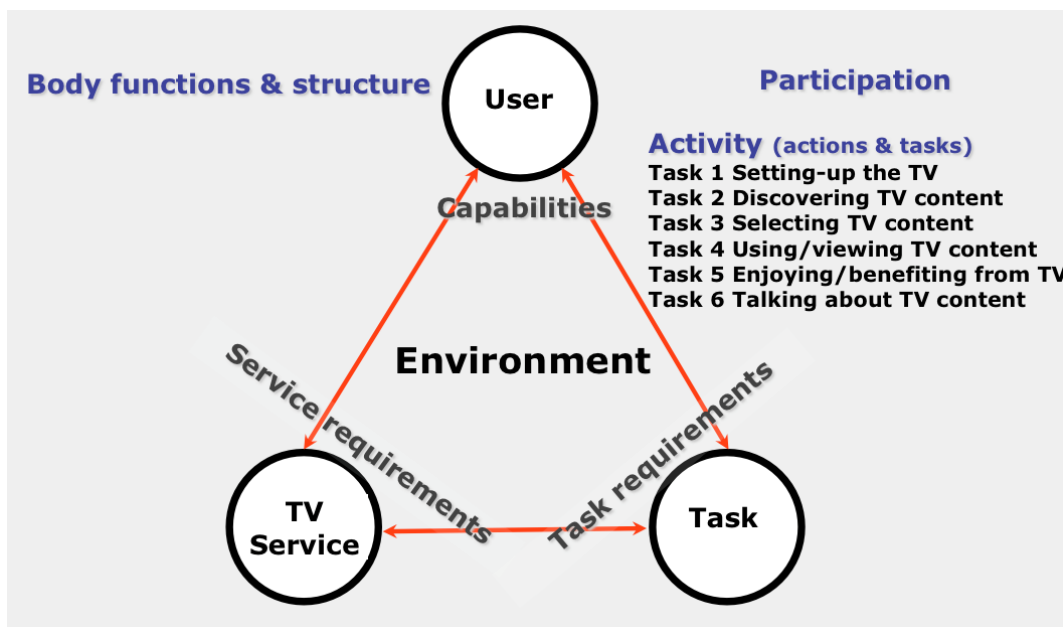
Figure 3-Relations between user and digital AV media service

Accessibility is the "ability to access"-and possibly benefit from-some system or entity.

Barriers to media accessibility may exist. Where accessibility is not present, the result from a social perspective can be 'exclusion'.

Accessibility is most frequently used to focus on the needs and rights of persons with disabilities. In some countries and territories, the scope of accessible media is somewhat narrow-persons who are deaf, persons who are blind and persons whose mother tongue are a sign language.

The UN Convention on the Rights of Persons with Disabilities (UNCRPD) uses 'accessibility' with a far broader scope. Not only does it address the capabilities of persons with sensory impairments

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3 There is a detailed explanation of the concepts in ava-i-0214 "Barrier-free Media - Making a difference".

such as deafness and blindness but it is also applied to age-related needs. From this perspective, accessibility should take into consideration the changing requirements of individuals in the course of their lifetime.

In a world in which individuals move within a country, or migrate from one country to another, FG AVA also considered the social and cultural dimensions of accessibility and exclusion.

The 'service-user-task' triangle of Figure 3 above highlights the fact that AV media accessibility depends on the interplay of these three elements and the context in which media use takes place.

If one first addresses the media service itself, there are 4 main service requirement areas:

(1)   *Intrinsic usability*: The principles of universal design can be applied (the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design) so that a given digital AV media service can be used and fully appreciated in its original form by its audiences (e.g. the audio is intelligible, there are no hops in the loudness within and between programs, on-screen text is legible, setting up the device to receive the service is easy, i.e. making devices 'friendly'). This area needs to identify the diversity of users with minor impairments where small improvements in usability can break down potential barriers to media use.

(2)   *Extrinsic usability or viewing/listening context:* The 'extrinsic' usability factors such as remote controls, interfaces with devices for assistive technologies such as screen readers and hearing aids. These need to take into consideration the capabilities of the users and the tasks they need to carry out in order to use and appreciate the AV media service.

(3)   *Access services*: Enhancing the accessibility of the content by offering an access service with the digital work (e.g. closed captioning/same-language subtitling, video description/audio description or subtitling, clean audio, speech rate control, or visual signing). This area needs to identify the diversity of users with major impairments for whom the lack of a given access service leads to media exclusion.

(4)   *Assistive technologies*: Extending the accessibility of digital media by ensuring their interoperability with assistive technologies used by persons with disabilities (e.g. screen readers, wireless connections to hearing aids).

Accessibility can be regarded as a pyramid of levels each with a number of barriers to be addressed. This is shown in Figure 4[4]:

For digital media, one of the prerequisites of digital AV media (shown at the bottom of the pyramid) is the availability of electricity. Approximately 20% of the world's population does not yet have electricity[5]. Novel business models are being tested that might mitigate this aspect[6].

'Availability' and 'affordability' are both prerequisites at the bottom of the pyramid. Users in rural areas may also lack access to broadcast networks and the Internet.

For persons with disabilities, the lack of access services or the poor usability of the AV media services themselves may constitute a major barrier to media use.

Finally, if the individual is not aware of the accessibility and usability options to break down these barriers, this lack of 'digital literacy' may itself be a barrier to media use.

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[4] AVA-I-0214 "Barrier-free Media - Making a difference". There are further details on page 6.

[5] Ban Ki-moon, *Powering sustainable energy for all*, International Herald Tribune, page 12, 12 January 2012.

[6] The Economist print edition. Technology Quarterly: Q1 2012. *Starting from scratch. Technology and development: A new business model could help people in poor countries light their homes cheaply using solar power.* 3 March 2012.
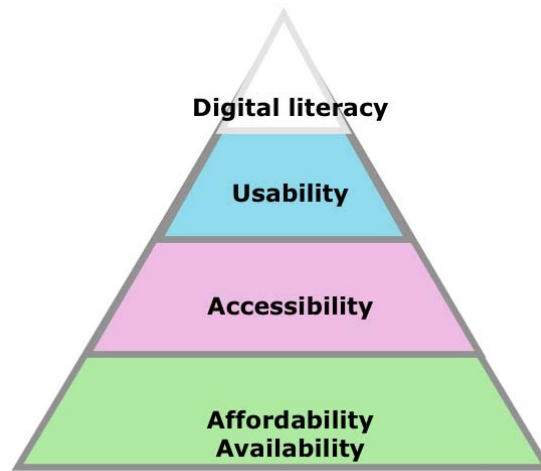
Figure 4-Pyramid levels for accessibility

From a moral and ideological perspective, the UNCRPD provides the case for an inclusive society in which everyone is in a position to enjoy access to all media.

Media accessibility clearly has economic and social perspectives too. The provision of AV media is an end in itself, a source of economic activity.

At the same time, media accessibility can be seen as the first prerequisite for media literacy-to inform, to educate and to entertain. Recent studies on the impact of *not* being online (in the sense of having access to the Internet) indicate relationships between media literacy, employment, potential earnings and household savings[7].

4   Deliverable 3: Which kinds of digital audiovisual media service are within the scope of FG AVA?

There are criteria that can be applied when arguing the case for AV media accessibility. These include metrics such as:

–   *Potential audience size* (How many individuals or households could potentially enjoy access to, say, digital television or mobile information services?)

–   *Audience consumption-time* (How many hours a week does the average person spend?)

–   *Audience consumption-turnover* (How much money does the average person spend?)

–   *Economic circumstances of users*-(Are AV media services affordable in emerging economies, or less affluent social groups?)

A preliminary analysis of AV media trends ranks television, film, newspapers and magazines, video games and recorded music among the top audiovisual media, with video games set to overtake newspapers in terms of global turnover by 2016. Trends for social media make use of the Internet via computers, laptops, mobile phones or computer tablets.

Table 2 summarizes the scope of FG AVA-the areas of digital AV media that have been included, taking into consideration the time and resources available to Focus Group participants:

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[7] Approximately half of the 11% of the UK population who were "off-liners" in 2011 are persons with disabilities (personal communication from Martin Wilson, Head of Media Literacy, BBC).

Table 2-The focus of FG AVA work on content, networks and devices

1. Audiovisual (AV) works and their creation	2. AV media exchange and distribution	3. Devices for rendering AV media	4. Devices for interacting with AV media	5. Using AV media
Television and radio programmes Emergency alerts Films Social media (Internet) [Video games] Derivative works: - Access services including captioning, audio description and visual signing) - Emerging access services (clean audio, personalized captioning) Metadata services such as electronic program guides and on-screen information	Digital television Digital radio IPTV (Managed IP networks) Mobile telephone networks Open Internet (Unmanaged IP networks)	Digital television receivers and set-top boxes Computers and laptops Mobile phones Computer tablets Interfaces for rendering access services listed in (1) Interfaces for rendering AV media in external devices: - Hearing aids - Screen readers – Text-to-speech (TTS), text to Braille	Remote control devices Keyboards Assistive technologies: Text-to-speech (TTS) Speech-to-text (Speech recognition) Eye tracking Motion detection	Discovering Selecting Using Sharing Collecting Reviewing Creating (further details in AVA-I-0139-Taxonomy of Participation)

The table above summarizes the content, networks and devices that FG AVA was able to focus upon.

As regards the users of digital AV content, FG AVA adopted a broad interpretation of accessibility that is implicit in UNCRPD which goes further than addressing the needs and interests of individuals who are blind, deaf or have a sign language as their mother tongue.

The use of a *participation taxonomy* allowed FG AVA to go further than relative passive modes of media use.

Equally, FG AVA chose to adopt a broad interpretation of accessibility that follows from the application of the thinking behind an accessibility pyramid.

5 Deliverable 4: Key performance indicators (KPIs) for digital AV media service provision

5.1 Introduction to KPIs

"Key Performance Indicators (KPIs) are metrics that measure performance in relation to desired outcomes. All KPIs are metrics, but not all metrics are KPIs. Decision-makers can identify a metric as a KPI if it is directly linked to a strategic objective, if it is actionable and if it is part of a multi-dimensional assessment of organizational performance"[8].

Legislation and regulation governing media accessibility does, in some cases, contain metrics and key performance indicators (KPIs) to assess the implementation of a given initiative. A good

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[8] Warwick, Lori. The Differences Between KPI & Metric, http://www.ehow.com/list_6755502_differences-between-kpi-metric.html.

example of this for access services for individuals who are blind or have serious visual impairments is contained in legislation from the US Congress[9]:

> *(iii) Report-Nine years after the date of enactment of the Twenty-First Century Communications and Video Accessibility Act of 2010, the Commission shall submit to the Committee on Energy and Commerce of the House of Representatives and the Committee on Commerce, Science, and Transportation of the Senate a report assessing--*
>
> *(I) the types of described video programming that is available to consumers;*
>
> *(II) consumer use of such programming;*
>
> *(III) the costs to program owners, providers, and distributors of creating such programming;*
>
> *(IV) the potential costs to program owners, providers, and distributors in designated market areas outside of the top 60 of creating such programming;*
>
> *(V) the benefits to consumers of such programming;*
>
> *(VI) the amount of such programming currently available; and*
>
> *(VII) the need for additional described programming in designated market areas outside the top 60.*

The provisions of the Act contain both 'supply-side' and 'demand-side' metrics. In essence, it is a cost-benefit assessment.

Nine years after coming into force, costs to all the key stakeholders in the media industry of providing programming with video description are to weighed against the use and benefits to 'consumers' of such programming in the top 60 designated geographical areas. This will form the basis of new decisions to modify this kind of access service and to extend it to further geographical areas. In this sense, KPIs were an integral part of the accessibility legislation.

Some governments such as Canada[10] have metrics to assess their performance (including accessibility) when communicating with citizens. They can be used across the board to track performance over time for digital AV media used to inform and educate citizens. A summary of Core Key Performance Indicators can be found in Appendix 3 of the proposal dated 2004[11].

Specific AV media have their own metrics.

5.2   Types of KPIs

5.2.1   Web metrics

The W3C/WAI Research and Development Working Group (RDWG) held an online symposium on Website Accessibility Metrics in late 2011 to explore the current state-of-the-art in the field[12].

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[9] Twenty-First Century Communications and Video Accessibility Act of 2010, Section 4, C iii, page 17.

[10] *Guidelines for Core KPIs (Key Performance Indicators),* Treasury Board of Canada Secretariat, Canada. http://www.tbs-sct.gc.ca/si-as/kpi-icr/interim/interimtb-eng.asp

[11] http://www.tbs-sct.gc.ca/si-as/kpi-icr/interim/interim25-eng.asp#_Toc81723404

[12] Shadi Abou-Zahra (2012), *Website Accessibility Metrics: Introduction to the Special Thematic Session.* in K. Miesenberger *et al.* (Eds.): ICCHP 2012, Part I, LNCS 7382, pp. 386-387, 2012. Springer-Verlag Berlin Heidelberg 2012.

AV content on websites is increasingly monitored using software that checked for technical compliance with national and international guidelines (WCAG 1.0 and 2.0).

In several European countries, public sector websites are subjected to an accessibility audit in most cases using a combination of monitoring software and tests on a small number of users with disabilities.

From some quarters, there is concern that the audit approach falls short of what is required. In a paper on web accessibility metrics and guidelines[13], the authors noted that "there is also a need to ask the question 'How do metrics help web authors and developers provide more inclusive online services?' The authors concluded "that there was a need to address the requirements of the user and usage context which are not accounted for with metrics which only address factors associated with the digital resources. Rather than focusing only on development of more sophisticated accessibility metrics for web resources, the authors argue the emphasis should be based on enhancing practices which support the development of processes and policies which can help to provide more inclusive access to resources and services".

The challenge appears to be a question of KPIs rather than metrics for such websites. The metrics focus narrowly on technical compliance with guidelines rather than looking at the website performance: are the users aware of the existence of the website? Which users make use of it? Do users think that they benefit from the AV media in question? Existing accessibility testing often uses quite small samples of users with rather arbitrary disabilities. In contrast, the use of simulators that build on the capabilities of a wide range of persons with disabilities holds the promise of identifying where the media service performs inadequately and offers specific suggestions to the development team as to what needs to be changed.

Something along the lines of Davis's 'Technical acceptance model'[14] shown in Figure 5 would provide a holistic basis for selecting KPIs, in particular when addressing the needs of elders:
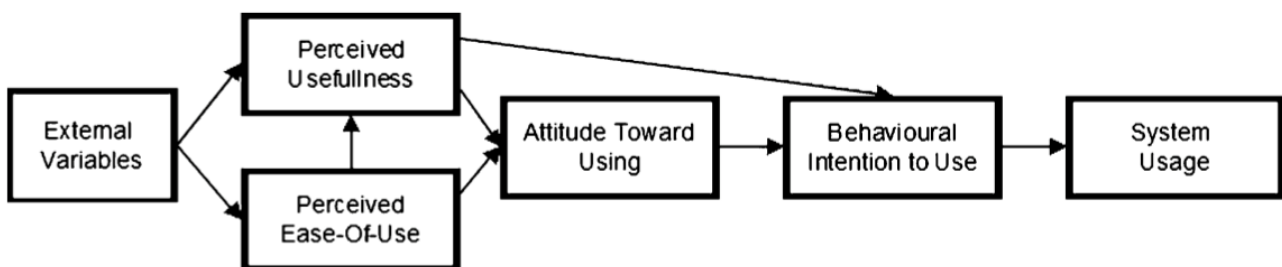

Figure 5-Davis's technical acceptance model

5.2.2   Television metrics

Television has its own usability and accessibility metrics and guidelines. A useful review of accessibility guidelines for television was conducted by Mark Magennis, Director of the Centre for Inclusive Technology (CFIT) in Ireland for TV Access[15].

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[13] Martyn Cooper, David Sloan, Brian Kelly, Sarah Lewthwaite. *A Challenge to Web Accessibility Metrics and Guidelines: Putting People and Processes First* in W4A2012 - Submission Type, Communications. 16-17 April 2012, Lyon, France.
Co-Located with the 21st International World Wide Web Conference. Copyright 2012 ACM ISBN 978-1-4503-1019-2.

[14] Davis, F.D. (1993), *User acceptance of information technology: system characteristics, user perceptions and behavioural impacts*. Int. J. Man. Mach. Stud. 38(3), 475-487.

One of the challenges is the need to consider the context of television viewing, for example, whether the viewer is alone or watching with others:
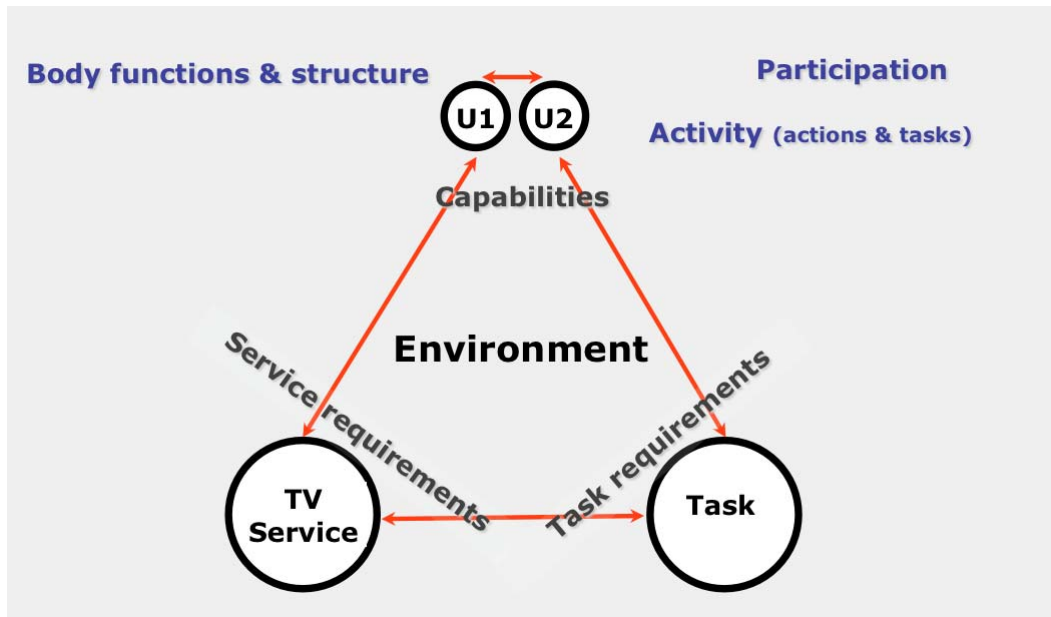

Figure 6-Context of television viewing

Unlike mobile phones or web content, the service requirements for television also need to keep in mind the acceptability of access solutions when there are two or more users (U1, U2, and U^n). An example is visual signing: if U1 needs signing and U2 does not, what is the impact of having, say, open sign language interpretation on a television programme? This is a critical issue for offering access services for movies in cinemas or on digital versatile disks (DVDs) and for multi-player computer games too.

Some regulators have global targets for accessibility provisions regardless of access service such as CSA in France. Others have specific targets for specific access services (for closed captioning/same-language subtitles, for video description/audio description and for visual signing).

Regulators such as OFCOM (UK) and FCC (USA) go into more detail in terms of the content genre or TV channels for which video description/audio description should be provided. There are often specific metrics to ensure that access services are provided for TV programming in prime-time and for the first airing of a programme, to pre-empt broadcasting schedules where access services are provided when there are few viewers. The Polish regulator (KRRiT) has targets and metrics related to the scheduling of TV programmes.

While most regulators have targets for access service provision, few have metrics and KPIs for access service use. OFCOM in the UK has KPIs for audio description which came into regular service in 2003. As the targets only call for audio description (AD) provision for 10% of programming, there was concern that those needing the service would not know of its existence. For this reason, OFCOM conducts regular surveys of AD awareness and use in the UK. This is accompanied by campaigns organized by the public service and commercial broadcasters. This allows the television industry to monitor the take-up of AD over time.

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[15] TV Access - Campaigning for accessible and affordable digital television in Ireland http://www.tvaccess.ie/

In a FG AVA input document, parallels between KPIs for public health campaigns and TV access service provision are highlighted[16]:

Table 3-KPIs comparison: Health campaign and TV access service

Health campaign stages (Fujimura)	Parallels to TV accessibility (metrics-% of population)
1: Pre-contemplation	Unaware of the options for accessible media
2: Contemplation	Aware of accessibility options
3: Preparation	Take-up: preparing to use the service
4: Action	Using the access service for the first time
5: Maintenance	Using the access service on a regular basis

The conclusion of this deliverable on KPIs for digital AV media services is that decision-makers concerned with AV media accessibility can benefit from the experience gained by others in the field. Specifically, those working with television, the web and mobile accessibility legislation and regulation already have examples of good practice on what to base their own work, keeping in mind the political, social and cultural specificities of each territory.

6   Deliverable 5: Stakeholders

For the scope of our "Stakeholder" activity, FG AVA addressed three questions:

1   What is meant by "stakeholder", "AV content service" and "value chain"?

2   Who are the key stakeholders in the three instances of widely used AV content-broadcast television, video on demand (VOD) using a managed Internet network on a laptop and user-generated content (UGC) on a smartphone or computer tablet?

3   What are the main drivers of change to make AV content accessible for each of these three instances?

6.1   What is meant by "stakeholder"?

Stakeholders are "those who have an interest in a particular decision, either as individuals or representatives of a group. This includes people who influence a decision, or can influence it, as well as those affected by it[17]."

As shown in the three instances covered in this deliverable, accessible content involves *multiple stakeholders*, not least persons who use media who have a range of different interests and needs.

FG AVA chose to address AV media accessibility as a *multi-stakeholder process*.

Hemmati (*op. cit*.) defines multi-stakeholder processes (MSPs) as "processes that aim to bring together all major stakeholders in a new form of decision-finding (and possibly decision-making) on a particular issue. Ideally, they are based on recognising the importance of achieving equity and accountability in communication between stakeholders, involving equitable representation of different stakeholder groups and their views.

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16 AVA-I-0214 "Barrier-free Media - Making a difference".

17 Hemmati, Minu (2002), *Multi-Stakeholder Processes - Beyond Deadlock and Conflict*. London: Earthscan.

MSPs are based on democratic principles of transparency and participation, and aim to develop partnerships and strengthened networks between stakeholders. MSPs cover a wide spectrum of structures and levels of engagement.

MSPs can comprise of dialogue (in the sense of exchange towards mutual understanding), or grow into processes of consensus-building, decision-making and implementation. The exact nature of any MSPs will depend on the issue, the participants, the time-frame, available resources, and other variables."

6.2   What is meant by "AV content service"?

Deliverable 2 mapped out FG AVA work towards the kinds of AV content that were chosen to address the work. As was explained in that deliverable, making content accessible encompasses actions on three fronts:

(A)   *The intrinsic and extrinsic usability* of the AV content itself (such as the so-called Loudness Recommendation from the EBU R128)[18];

(B)   *Access services* (enhancing the accessibility of digital media by offering an access service such as closed captioning/same language subtitles and video description/audio description with the AV content itself); and

(C)   *Assistive technologies* (extending the accessibility of digital media by ensuring their interoperability with assistive technologies used by persons with disabilities).

FG AVA deliverable 1 documented the need to address not only AV content creation but also the creation of 'meta-content' (metadata and information services about the existence and availability of AV content such as program listings, electronic program guides and even online app stores). This meta-content also covers information about the existence and availability of access services for a given piece of content, as well as mechanisms to allow users with disabilities to use their own assistive technologies such as screen readers when using content on their laptops, smartphones or computer tablets.

6.3   What is meant by "Value chain"?

A convenient way of visualizing content, metadata creation and access service creation and delivery is a 'value chain', a term coined by Michael Porter in 1985[19]. "A value chain is a chain of activities. Products pass through all activities of the chain in order and at each activity the product gains some value. The chain of activities gives the products more added value than the sum of added values of all activities." A generic 'value chain' for AV content is shown in Figure 7.

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[18] EBU R128 is the result of two years of intense work by the audio experts in the EBU PLOUD Group, led by Florian Camerer (ORF). The new Recommendation is accompanied by a Loudness Metering specification (EBU Tech 3341), a Loudness Range descriptor (EBU Tech 3342), Loudness test material (various different sequences) Production Guidelines (EBU Tech 3343) and Distribution Guidelines (EBU Tech 3344).

[19] Porter, Michael (1985), *Competitive Advantage: Creating and Sustaining Superior Performance*. New York, N.Y. The Free Press.
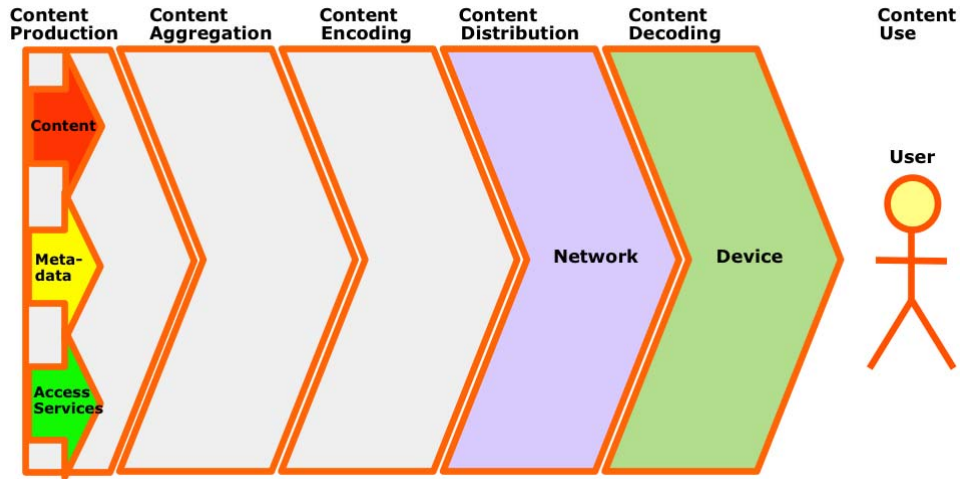
Figure 7-Generic value chain for digital audiovisual media content

At each point in the value chain, individuals and organizations are involved. As FG AVA was concerned with making content accessible, the 'users' of the AV content had to be considered with care, along with all the other key stakeholders from content source to use.

7   Stakeholders and digital broadcast television

Figure 8, "Digital broadcast television accessibility" uses the same value chain to illustrate who the key stakeholders are and why a multi-stakeholder process is important for digital broadcast television accessibility:
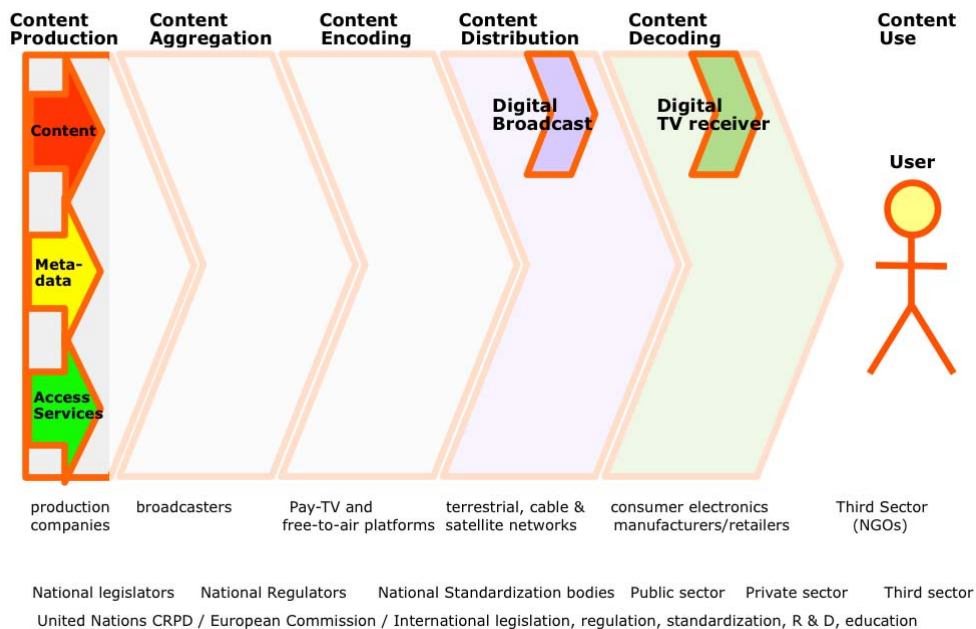

Figure 8-Digital broadcast television accessibility

The value chain describes three related categories of content production:

– *The content itself* (television programmes that are organized in the form of television channels and further aggregated into free-to-air or pay-TV offerings that are then delivered by some kind of broadcast network to the viewer's television set);

– *Meta content* (metadata about the programme in the form of programming guides, spots and trailers so that the user can discover and select something to view); and

– *Access services* such as closed captioning/same-language subtitles or video description/audio description to facilitate the viewing experience by persons with disabilities.

Greaves *et al*. (2008)[20] provide a detailed analysis of these three content production categories in addition to the digital television stakeholders in Europe as part of the planning of the DTV4ALL policy support programme activities for digital TV. The analysis includes both stakeholders that are involved directly in the value chain and those who have interests that are brought to bear on stakeholders in the value chain (public sector bodies, private sector trade associations, third sector non-governmental organizations (NGOs) representing persons with disabilities, and so on).

The starting point for accessible television is the user, the persons who are going to watch television programmes. When it comes to the digital television viewers, there is no clear international consensus as to which persons with disabilities are the target groups for accessibility actions.

The UN Convention on the Rights of Persons with Disabilities (UNCRPD)[21] makes specific references in its preamble to a broad range of persons and the barriers they face:
 "e.   Recognizing that disability is an evolving concept and that disability results from the interaction between persons with impairments and attitudinal and environmental barriers that hinders their full and effective participation in society on an equal basis with others"/…/
"i.   Recognizing further the diversity of persons with disabilities"
"j.   Recognizing the need to promote and protect the human rights of all persons with disabilities, including those who require more intensive support"

While UNCRPD uses a broad definition of accessibility, other digital television legislation and regulation is somewhat narrower in their scope.

For historical reasons, national legislation and regulation governing media accessibility often focuses on persons who are deaf or have serious hearing impairments and persons who are blind or have major visual impairments. Third-sector organizations like Spain's ONCE or RNIB and RNID in the UK have a long and proud tradition of advocating the rights of their constituents. Other persons with, say, cognitive or age-related impairments are not always mentioned explicitly in connection with television accessibility. Indeed, such groups may not always have third-sector advocates.

Other countries which have third-sector 'umbrella' organizations representing persons with disabilities (such as Sweden and Denmark) tend to adopt broader definitions of accessibility and a holistic approach to accessible media. The advantage is that a given access service such as closed captioning or video description addresses the needs of *multiple* groups.

An example of this is closed captioning/same-language subtitles that are used not only by those who are deaf or have serious hearing impairments, but also by elders and immigrants). Advocating accessible media in this way is time-consuming and requires more effort to build coalitions of third-

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[20] Greaves, N., Looms, P., Orero, P and Owens, T. (2008), DTV4ALL. D1.1: *Detailed Work Plan for the full-scale Deployment of Mature Access Services* http://www.psp-dtv4all.org

[21] http://www.un.org/disabilities/convention/conventionfull.shtml

sector organizations for all. The advantage is that it pre-empts the fragmentation of accessibility provisions by ensuring that all citizens are given a hearing.

An ongoing preoccupation in the work of FG AVA focused on how to successfully promote AV media accessibility-what is needed to make change happen?

Nick Tanton (formerly at the BBC) and Axel Leblois (G3ict) have made some important contributions to an informal review of television broadcasting accessibility over the last few decades. Analysis from G3ict indicates that the first steps towards television accessibility in the past were often taken by public service broadcasters that receive revenue from a public service TV licence, voluntary contributions from viewers or from the government.

Proof-of-concept initiatives by organizations such as WBGH (Public media powerhouse) in Boston or the BBC in the UK demonstrated that TV accessibility was feasible and affordable. There then follows a period of consolidation in which TV accessibility is put on a firm legal footing after which the accessibility initiatives can be scaled up.

A good case in point is the United Kingdom. Closed captioning/same-language subtitles were introduced as a teletext service by the BBC in the eighties and work on audio description followed in the nineties.

The framework for the provision of access services by 'domestic broadcasters' (UK television broadcasters licensed to broadcast in the UK) emerged in OFCOM's Code on Television Access Services[22] that followed the Communications Act (2003). As can be seen, UK broadcasters in particular those with a public service obligation such as the BBC and ITV[23], had already introduced access services well in advance of the Communications Act.

The OFCOM Code introduced minimum targets for access services (subtitling, audio description and signing) for domestic broadcasters in 2005, see Figure 9.

By 2008, domestic broadcasters covered by the code were expected to offer 10% of their programming with audio description. The competitive nature of the UK television market is such that it leads to commercial broadcasters such as Sky feeling the need to match the higher, non-mandatory targets of 20% set by the BBC.

For non-domestic broadcasters offering television programming to other European countries, comparable targets for subtitling, audio description and sign language are being introduced in 2014 with a similar period in which to scale up service provision. OFCOM is using the EU Audiovisual Media Services Directive as the legal basis for introducing such access services.

The case shows that in the period after the introduction of access services, media legislation and regulation play a role in assuring momentum. This includes the phased introduction of new access services, and the improvement of the intrinsic and extrinsic usability of the television service (for example, measures on television intelligibility and international norms on loudness).

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[22] OFCOM Code on Television Access Services (2003).

Amended in accordance with Ofcom's statement Signing on television: new arrangements for low audience channels, Ofcom, 4 December 2007 (http://www.ofcom.org.uk/consult/condocs/signing/statement). Annex 2 amended in accordance with Ofcom's statement, Broadcasting Code review: Commercial references in television programming, Ofcom, 20 December 2010

http://stakeholders.ofcom.org.uk/broadcasting/broadcast-codes/tv-access-services/code-tv-access-services/

[23] ITV is a commercial public service TV network in the United Kingdom.

Anniversary of relevant date	Subtitling	Signing	Audio description
First	10%	1%	2%
Second	10%	1%	4%
Third	35%	2%	6%
Fourth	35%	2%	8%
Fifth	60%	3%	10%
Sixth	60%	3%	10%
Seventh	70%	4%	10%
Eighth	70%	4%	10%
Ninth	70%	4%	10%
Tenth	80%	5%	10%

Figure 9-UK OFCOM Access service targets for domestic television broadcasters (Source: OFCOM, UK)

The UK approach uses many of the elements of multi-stakeholder processes. An evidence-based approach involving formal consultation mechanisms engages the key stakeholders. Findings from consultations are published, inputs from stakeholders are taken into account followed by the formulation of a clear code for accessible television with targets and mechanisms and metrics to ensure compliance, along with transparent procedures to handle exemptions. Targets are increased over time, and the scaling-up period provides those holding broadcasting licences with enough time to take the necessary action.

As mentioned in Deliverable 4, legislation and regulation with no compliance mechanism for access service provision is no guarantee for accessibility. Spain has arguably some of the toughest television accessibility legislation, yet this does not lead to quality closed captioning/same-language subtitles as there are neither quality metrics nor compliance mechanisms set up by the regulator. Francisco Utray *et al*. (2012)[24] summarize the current situation as regards access services on digital terrestrial television in Spain and provide an account of their work to automate the monitoring of access service provision.

One of the main challenges for accessible television is moving from the experimentation stage to the regular provision of access services. In 2012 in Europe alone, there were instances of commercial broadcasters in the Czech Republic, Poland and Portugal taking political or legal action against regulators, to challenge the introduction of access services like closed captioning/same-language subtitles. A recurring theme is the concern by plaintiffs that they could not afford to introduce the suggested services given the current economic crisis.

Preliminary analysis conducted by Gion Linder of SwissTXT, the organization that provides access service for public service broadcasters in Switzerland, indicates that providing almost 100% closed captioning/same-language subtitles requires an increase in the TV production budget of 0.2%, among the German public service broadcasters, and of 0.5%, among the Swiss public service broadcasters.

Informal interviews with senior broadcasting executives in connection with DTV4ALL and FG AVA confirm that the business case for providing access services is sometimes exaggerated by

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[24] Francisco Utray, Mercedes de Castro, Lourdes Moreno, and Belén Ruiz-Mezcua, *Monitoring Accessibility Services in Digital Television,* International Journal of Digital Multimedia Broadcasting.
Volume 2012 (2012), Article ID 294219, 9 pages. http://www.hindawi.com/journals/ijdmb/2012/294219/

the third sector. A case in point here is Denmark.

Figures for the Danish public service broadcaster DR which, together with the advertising-funded public service broadcaster TV2, still has a substantial market share in Denmark indicate that the potential increase in market share or of 'reach' is at best a few percent[25]. The case for making television programmes and metadata about TV programming accessible is a complex mix of:

– Small quantitative increases in share and reach;

– More substantial qualitative improvements in viewer satisfaction;

– Improved image ratings (accessibility as part of corporate social responsibility); and

– Compliance with government legislation (in particular the Media Accord that governs public service media for a three-year period).

An additional issue to do with digital broadcast television accessibility is the need to provide an 'end-to-end' service comprising content, meta content and access services in a value chain where, either the pay-TV operator or the individual broadcasters, assume responsibility. Digital television is a closed, managed system. On pay-TV platforms, the platform operator like the satellite operator Sky in the UK has the ultimate responsibility to ensure that the infrastructure operates correctly.

For free-to-air broadcasting, the platform operator (e.g. Freeview in the UK) does not have the same muscle. It can manage the value chain as far as the receiver, but at that point it is dependent on standards such as digital video broadcasting (DVB) and the Digital TV Group (DTG) D Book to ensure interoperability.

At this point, the difference between 'mandatory' and 'optional' requirements in standards like DVB become apparent, as is shown by a recent analysis conducted by the Nordic Digital Television standardization body, NorDig and mentioned in a forthcoming book[26]. "The technical committee carried out a study on sixteen of the most widely sold digital television receivers in the Nordic area that comply with the current NorDig specification. The TV receiver models in the study account for a majority of receiver sales. Using a test transport stream, the receivers were evaluated using five different test scenarios to measure their performance in connection with Audio Description (AD). The scenarios included:

1. Being able to select AD (broadcast mix[27]) by signalling a 'virtual channel' so that the viewer just has to select the TV channel with AD on the EPG or by pressing the number keys on the remote corresponding to the TV channel ID;

2. Selecting AD (Broadcast mix) by signalling the presence of AD broadcast mix;

3. Selecting AD (Receiver mix[28]) by signalling the presence of AD receiver mix;

4. Selecting the AD (Broadcast mix) by pressing the 'alternative audio' button.

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[25] Looms, Peter Olaf [2013a] Business Case for same language subtitles for TV programmes in Denmark; Looms, Peter Olaf [2013b] Business Case for spoken subtitles for TV programmes in foreign languages in Denmark.

[26] Looms, Peter Olaf, Chapter 10, *Standardization of Audiovisual Media Accessibility - From vision to reality* in: Pradipta Biswas, Carlos Duarte, Luis Almeida, Pat Langdon and Christoph Jung (Editors) A Multimodal End-2-End approach to Accessible Computing. Springer Verlag, 2013, pp. 237-253.

[27] AD Broadcast mix is an alternative 'ready-to-use' mix of the audio channels including the AD. It is produced by the broadcaster.

[28] AD Receiver mix delivers the AD as a separate audio track to the receiver. This track is mixed with the original programme audio in the receiver itself.

All sixteen receivers were able to handle the first scenario. Four responded correctly to the second scenario. Four responded in different ways to the 'receiver mix' signalling (differences in levels and fading). None of the receivers responded correctly to Alternative Audio. The receivers were also tested to see if the scenarios lead to interference with the normal operations of the receivers."

The conclusion of this clause is that a multi-stakeholder process is usually required to get accessible digital broadcast television from the experimental stage into mainstream use. The case for action is a complex mixture of modest market-related benefits for the broadcasters and platform operators and of their image (Corporate Social Responsibility) from the perspective of their users.

8   Stakeholders and AV content on managed and unmanaged Internet protocol (IP) networks

Figure 10 shows the value chain for delivering audiovisual content on managed and unmanaged IP networks to integrated TV devices (connected TVs), to computers and to hand-held devices such as smartphones and computer tablets:

At first glance, it would seem difficult to establish a coherent framework that would lead to the provision of accessible AV content.

For this reason, a pragmatic approach is to see how the accessibility challenge on managed and un-managed IP networks is being handled. Nick Tanton chaired an Access Services Working Party to make AV content accessible on video on demand (VOD) platforms in the UK[29].

The focus of the group's initial work in 2013 was to:

–   Describe a high-level end-to-end chain (e.g. content from suppliers, preparation of content for delivery and presentation of content to the user) to illustrate the issues involved and possible/perceived "pinch-points" when delivering accessible VOD.
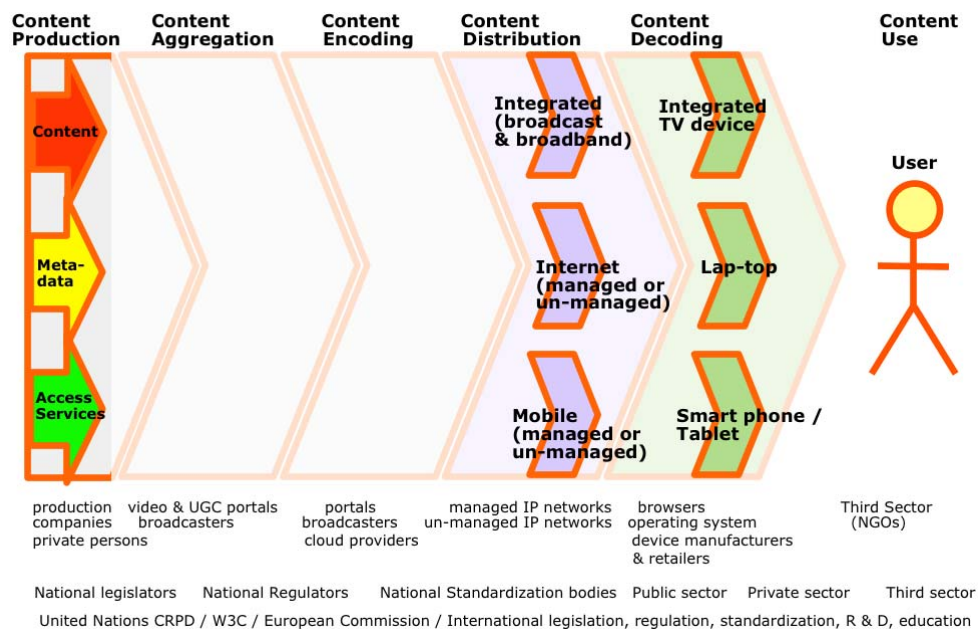

Figure 10-Content accessibility delivered in managed or unmanaged IP networks

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[29] ATVOD Access Services Working Party (2013).

–   Identify, enumerate and signpost the existing technical standards in actual use for the exchange of content with access service components, in its delivery in VOD services and in its presentation to the user.

–   Using one or more case study/studies concisely to illustrate how some accessible VOD services are delivered in the UK, focusing on the technical issues involved and the products and technologies used in implementation.

The aim is then to identify and enumerate specific perceived technical challenges to the provision of closed subtitles and audio description by particular UK service providers and what steps have been taken and what current or future developments might help to mitigate these barriers.

In his introduction to the work, the author makes some useful observations and distinctions.

> *In general, AV content has a much longer lifetime than that of many consumer delivery platforms. So newly-made or archive content will continue to be delivered to an ever-changing mix of platforms (Direct To Home satellite (DTH), Video on Demand (VoD), handheld devices connected to wireless networks etc).*

> *These platforms have different life-cycles (in terms both of launch, development and longevity) as will their applicable technical standards.*

> *This leads to the observation that a single physical end-to-end (e2e) chain for audiovisual content does not exist-there are many. There is, however, a single logical chain.*

> *It is therefore both impractical and unreasonable to consider the imposition of a single set of technical standards right the way through the chain although standards are important for each logical part of it. However a common understanding of the service requirements of access service components is both highly desirable and entirely feasible, regardless of the underlying network and device infrastructure.*

> *Designers of new platforms or user terminals, platform operators, contractors, system designers and manufacturers can then fully understand and seek to satisfy as many of those requirements as their particular technological constraints allow.*

> *Such an approach can offer a definition that is stable for much longer than the lifetime of any particular delivery platform.*

The conclusion is that, having put in place an understanding of the logical and actual AV content systems, it is feasible to describe the service requirements of access system components and to do this in a manner that involves and can be supported by all the stakeholders concerned.

9   References

References to specific documents are included in footnotes on the appropriate page.

10   Definitions

The ITU-T and ITU-R Terms and Definitions database offer some definitions of terminology. FG AVA has added terms and definitions in English that are included in the FG AVA technical report entitled "Vocabulary".

11   General proposals recommended by FG AVA on digital AV media accessibility

–   The access service with probably the highest 'KPI' for society for AV services is the provision of optional subtitles (US: closed captions) for users with hearing disabilities, which give, in

text, the dialogue being spoken. They make a major difference in following AV content for those with hearing disabilities.

– Compatible optional subtitling systems should ideally be usable with all video media delivery systems for television broadcasting, IPTV, Internet, and hand-held units. In this way, subtitles can be simply transferred together with content itself, across delivery platforms.

– However, it must be noted that technology and tools for a service alone are not enough, and the effectiveness of subtitles is also related to how well they are prepared, how much they cost to use, and the extent to which the user community is informed about them. Guidelines for the optimum editorial usage of subtitling, and awareness issues, are needed.

– Such services may alternatively be provided as 'burned in subtitles' (US: open captions), which may be more possible where there is no technical provision or capacity for optional subtitles. This consumes a TV or video channel, and may be annoying for viewers without hearing disabilities, so is less valuable.

– It should be noted that following caption/subtitle text and the video narrative at the same time can be more mentally taxing than following a video narrative alone.

– Optional audio descriptions (US: closed video descriptions, described videos) and audio subtitles are probably the second most valuable access services for society as a whole, and help considerably users with disabilities. They make a major difference to users following AV content with sight impairments.

– Compatible audio description and audio subtitling systems should be useable with all video media delivery systems for broadcasting, IPTV, Internet, and hand-held units. In this way, they can be transferred across media delivery systems together with content.

– The best arrangement for audio descriptions is to allow the user to adjust the volume balance of the programme to normal audio and the audio descriptions,-the so-called 'receiver mix' approach. This requires two audio decoders in the receiver. The alternative method of 'broadcaster mix' provides a complete second audio track that has both the normal audio and the audio descriptions combined into a single track.

– Technology alone is not enough, and the effectiveness of audio descriptions is also related to how well they are prepared, and the extent to which the user community is informed about them. Guidelines for the optimum editorial usage of subtitling, and encouraging awareness are needed.

– Where the content has a foreign 'native' language, spoken subtitles that provide local language can be valuable for those with, and without, disabilities. Following a video narrative with spoken subtitles can be less mentally taxing than following text subtitles.

– Optional signing services (the use of sign language to tell viewers what is being said and done in the scene) would be the third most valuable access service for society as a whole, though technology is not yet standardized for this.

– Technology alone here will not be enough, and the effectiveness of signing will also be related to how well they are prepared, and the extent to which the user community is informed about them. Guidelines for the optimum editorial usage of signing and encouraging awareness are needed.

– Signing services can be provided as 'burned in' to the video, thought this can be irritating to viewers without disabilities.

–   Subtitles (US: captioning) for radio can allow those with hearing disabilities to follow radio programmes. Report ITU-R BT.2207-1[30] for such systems, to work with both analogue and digital radio, is available. In principle, this could be the basis of a worldwide system of radio subtitling. However, the current Report is rather weak, and has not been widely adopted in practice.

–   Virtual speech rate control, which provides a mechanism for (apparent) 'slowing down' of speech rate, while keeping overall timing, would offer benefits for those with hearing disabilities, and the elderly. This system can be implemented entirely in a receiver without the need to broadcast a new signal, and thus requires no new technical specification. Guidelines on the speed alteration range to be provided by set makers would be useful.

–   Clean audio-the facility for the listener/viewer to adjust the balance between a central audio such as a commentary and a background-would be very valuable for those with hearing disabilities and the elderly. The clean audio could be arranged by a system in the receiver itself which extracts the central audio, or by a broadcast signal which facilitates the receiver's task. It would be valuable to have a common system for 'studio generated' clean audio to allow a common system in receivers.

–   Smart phones would benefit from a range of features which will help users with disabilities to gain most from audio visual services. These include the same kinds of access services as are relevant for broadcasting and for services intended for larger 'second screens'. Special measures in areas such as the letter size are needed to take account of the screen size and the usual viewing distance.

–   Script mining is the provision of the script of a pre-recorded television programme on a web page accompanying the images and sound from the programme. Users can follow the programme and the script at the same time to facilitate their being able to follow the programme. It could be valuable to agree on usage guidelines for such systems.

–   Many access services for AV media could be provided by using the Internet channel of a hybrid broadcasting system. In order to facilitate this service, it will be necessary to agree on a common system of synchronizing the television or radio content with the arrival on screen of the related data from the Internet services. This may be a time stamp or time code which is included both with the broadcast and the Internet content.

–   The provision of a reliable wireless system for supplying hearing aids with audio would be a major benefit for those with hearing disabilities. This will call for a specific frequency allocation for this service.

–   A fundamental requirement for accessibility is the recognition that access technology alone is not enough. There must be a recognition that successful provision requires an awareness campaign about the system-for both content providers and viewers and listeners, and they must be aware how to navigate and use the system-"if they cannot find it, it is not there", "if they don't know about it, it is not there":

–   Equipment designed to receive audio visual services must be designed to be 'friendly' to disabled users. There should be a common arrangement of controls for access services on all equipment.

–   It has been observed that the greatest barrier today to the wider use of access systems is the lack of an economic basis for providing the services. Broadcasters and content providers need

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[30] Report ITU-R BT.2207-1 (05/2011), *Accessibility to broadcasting services for persons with disabilities.*

to be able to finance the provision of the services. Creative and innovative methods of doing so are needed.

12   Recommendations on digital AV media accessibility in connection with digital TV, IPTV and Integrated Broadband-Broadcast (IBB) TV

–   Recommendations for a) requirements b) system specifications for the items covered in item 11 above. These should be submitted to both ITU-T SG16 (in so far as they concern Internet, cable, and IPTV services) and ITU-R SG6 (in so far as they relate to broadcast services). Both study groups should be asked to approve the same documents. If either study group changes the document sent by FG AVA, protracted and circular approval processes will be needed.

–   The Recommendations could usefully be arranged into a suite of Recommendations, for maximum impact.

–   A workshop should be arranged to bring together ideas for an economic model for the provision of access services.

13   Legislation and regulation

Broadcasters and related service providers should comply with the UNCRPD, which calls for 'all reasonable measures' to be taken to ensure equitable access by persons with disabilities. This means complying with the proposal listed in the above clauses.

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