TV Content Delivery to PC, Tablet, Smartphone
From the Accessibility Vision into Market Reality

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***Abstract*— The article addresses media accessibility for all citizens in the connected TV environment. HbbTV (Hybrid Broadcast Broadband TV) is an European standard increasingly adopted by European broadcasters. One of the challenges in the coming years will be the delivery of multi-platform audiovisual content (anytime, anywhere, any device) and making this content accessible for all. The elderly and people with various disabilities rely on subtitles, audio description or sign language. Customizing accessibility services through options for personal preferences is only one example of future possibilities. This essay highlights accessibility issues in the connected TV and smart phone environment. It gives insights on the genesis and future modules of the European project Hbb4All (Hybrid Broadband Broadcasting for All), which started in December 2013 for a 3-years-period. It addresses a wide range of interactivity, interoperability and personalized accessibility features based on the HbbTV(hybrid broadcast-broadband) concept and will be user trial oriented. Given the recent start of the project, first results are expected after a one-year-running-time up from 2015.**

Keywords-interoperability; accessibility; connectivity; multi-platform devices; market take-up.

I. INTRODUCTION

Is Michel Hazanavicius' silent black and white film *The Artist*, against the current, at the time of stereoscopic 3D, UHD 4K and interactivity? This French film is brimming with inventiveness and finds a wonderful support in black and white.

Blancanieves is a 2012 Spanish-French black and white silent fantasy drama master film written and directed by Pablo Berger [1]. Based on the fairy tale "Snow White" by the Brothers Grimm, the story sets a romantic vision of 1920s Andalusia and is a love letter to European silent cinema.

Neither *The Artist* nor *Blancanieves* was specially invented for the deaf. And yet, those concerned by some form of deafness are very sensitive and may consider the film as an advantage. Thus, there have been comments about the film as "*being deaf, I finally saw my first French film in the cinema and I laughed to read on the lips of the actors. I can already tell you that they do not jabber anything and respect the dialogues. For once I understand better than a hearing person ^ ^*" [2]. *Blancacieves* has been audio-described in the French language by author Paul Memmi for blind people. His creation is also a standalone oeuvre, to which one can listen to without watching the film.

Inventiveness and creativity, when associated with intelligence and talent, even against the current, can add value to the greatest number. The same applies for accessibility: first addressing people with disabilities, it is a process facilitator that brings ease of use for all, thus significant (mass) market developments.

Connected TV and the second screen allow new user experiences with personalized user centric content delivery. In terms of accessibility, user studies reported in the EU project DTV4ALL [3] that a solution with the interpreter in a small window is not optimal, as the picture-in-picture does not contain enough detail. Other solutions were preferred, and today the average TV screen is becoming bigger [4] allowing new user experiences. One of the major challenges of the coming years will be the multi-platform delivery of audio-visual content (anytime, anywhere, any device) [5], be it a broadcast or a (future) Internet IPTV service. Hybrid delivery platforms such as connected TVs and two screen solutions will be ubiquitous.

In the following, this article describes the relevance of the project with regard to mobility, gives an idea about the connected market environment, where accessibility services may be deployed, focuses in the following part on HbbTV and second screens (understood mobile devices), a section that explains the 4 projected pilots considering needs for people with disabilities. As the project started only some months ago, it concludes with expected results.

II. RELEVEANCE WITH REGARD TO MOBILITY

Since access to information was officially declared by the United Nations a Human Right in 2003, legislation, policy and regulations have been introduced and standards were drafted to assure einclusion. The legal framework of the European Commission is the "European i2010 initiative on e-Inclusion – to be part of the information society" (2007); this called on the ICT industry to work to help disabled people access digital TV and electronic communications products. It adopted the Audiovisual Media Services

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Directive in 2010 [6]. A toolkit was set up for the Transposition of the Audiovisual Media Services Directive into National European Member States Law in 2008 [7]. Further initiatives fostered einclusion like the Web accessibility Initiative [8] and the possibility for hearing impaired and blind to access movies in theatres [9]. The roadmap to the European Disability Act [10] is a legislative initiative to improve accessibility of goods and services within the European internal market, and studies report on various projects and initiatives [11]. However, "content" processes - from conception, production, translation, exchange and archiving to distribution and use - are still complex procedures, both technologically and commercially. All access services, be they for the elderly or for people with disabilities, are language dependent. To turn the accessibility vision into reality, the active participation of multiple stakeholders is required in the value chain. This is the objective of HBB4ALL project [12], that builds on HbbTV, as the major European standard, for converged services and looks at both the production and service sides.

The project is co-funded by the European Commission under the Competitiveness and Innovation Framework (CIP) [13] and let by 12 partners from several complementary fields: universities, TV channels/broadcasters, research institutes, and SMEs (small and medium sized companies) [14].

This young major European project started in December 2013 for a 3 years period. It addresses technical, research, societal and social issues. It is not R&D (Research and Development) financed as such, but fosters market take-up of innovations. For example the partners define common technical components through different existing applications and products to create new services. Furthermore the project intends to accelerate the "go-to-market" in building on (existing) applications ready to come to the market. Therefore, technical adjustments need to be done within the connected TV and mobile devices environment, for example synchronization. The project partners intend to reach market take-off through large scaled user tests in at least 3 European countries.

This project is dealing with connected TV, which means interactivity coming on TV, mobile devices using TV services and accessibility (for people with impairments like non seeing or non/hard hearing people). The second screen (mobile and tablets) will be used for accessibility services. The project addresses all those screens within the connected environment, because the heterogeneity allows creating meaningful new applications. Technical working groups among the partners have been set up. No public project information is yet available on technical issues, and first results are expected beginning 2015.

The following highlights some market considerations, technical prerequisites, and focuses on accessibility with the HBB4ALL all project, integrating mobility use.

III. CONNECTED MARKET ENVIRONMENT

EDF (European Disability Forum) [15] counts 80 million people with disabilities in Europe, Age Platform AGE Platform Europe [16] refers to 100 million ageing people throughout Europe. They describe themselves as "European network of around 167 organisations of and for people aged 50+ which aims to voice and promote the interests of the 30 million senior citizens in the European Union and to raise awareness on the issues that concern them most." As a mix, this represents an estimated 40%+ of the European population. These given figures alone represent already mass market potentials, only within the field of concerned users.

Beyond the fact of producing "personalized services for all", originally invented for specific populations, it is all about moving from classic accessibility mechanisms to personalised media systems that allow to make life and access easier for all users. Tablets or touchscreen devices expressly show new ways for innovative interactive TV content handling, especially with input from the content industries.

Such social innovation topics are discussed for example among players from the value chain within the French public-private Media4D Think Tank initiative [17]. Media4D is a public-private brand initiative from Holken Consultants and co-funded by the French State (Direccte), the cities agglomeration Plaine Commune (North Paris Region) and private partners, among which France Televisions, group La Poste, Icade (real estate group), SMEs, user associations and creative people. Members of the Think Tank are working to set-up a very first multi-device (4 screens) and multi-accessible (audio-description, subtitling, sign language) user experience in different public places in Northern Paris territories. User tests, cross sectorial awareness creation, deployment of accessibility applications and services are major objectives of the envisaged experiences.

In the meantime, the Media4D Think Tank is the place to get access to concrete examples, discuss the state of the art in terms of accessibility in the audiovisual and digital content world: R&D, content, audiences' needs, but also financing and funding for content providers as well as potential new business models are among the topics. Creative people who include accessibility from the scratch within their content production process, story telling or scenario writing will probably create very original œuvres and therefore also interest larger audiences.

Imagine a huge film success winning an Oscar – which does not exist yet - especially conceived for attention to accessibility, that the filmmaker would have included directly into the content production process. This Oscar would go around the world, inform implicitly and explicitly all people, public and professional audiences, about accessibility and e-inclusion. Once "evangelized", coincidentally market shares for connected TV sets and applications for mobile platforms would increase immediately, and time to market for innovative research projects on accessibility would be consequently reduced.

With this thought, Media4D put together researchers and content providers, TV channels and digital equipment providers, regulators and legislators … to start discussions and exchange between stakeholders in the value chain with the goal to find ways to boost or create corresponding meaningful markets for universal accessibility on the different existing devices/screens (cinema, TV, PC and

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mobile devices). With this background, the social innovation platform integrated the Hbb4All project in bringing social innovation strengths to supports dissemination activities for the HBB4ALL project, which deals with connected TV accessibility, thus interactive service access using among others mobiles devices.

This approach will complement technical skills and user trials, as outlined in the following parts.

IV. HBBTV SECOND SCREENS FOR ALL – INCLUDING PEOPLE WITH DISABILITIES

In November 2012, ETSI published version 1.2.1 of the HbbTV specification to include progressive streaming (MPEG-DASH) and some DRM (Digital Right Management) support [18].

A Connected (or Smart) TV set is not necessarily apt for truly hybrid interactive viewing experiences. Most often it is merely a multi-purpose device that *just* allows the viewing of broadcast television content *or* using separated and limited add-on functionalities through the Internet connection on the same screen.

For the truly hybrid services as offered by HbbTV, an "engine" is required that links the broadcast content (offered via satellite, terrestrial over-the-air and CATV or IPTV networks) and the Internet content (provided by any IP connection be it via DSL, CATV, or via mobile broadband networks). HbbTV provides such an engine that is activated via appropriate signaling within the broadcast transport stream. HbbTV is also being used as technology platform for portals from network operators, manufacturers and even for independent TV Apps, thus benefitting the entire eco-system. In principle, HbbTV can be used to provide any access service required: EPG, video on demand, enhanced text services. For the consumption of television, connected TV represents a prime means to help the elderly and people with disabilities (but also minorities) to improve their access to the TV content. Access services such as sign language, subtitles, audio description, clean audio, etc., can be made available via the IP link and can be displayed on either the main screen (or main loudspeakers, respectively) or on a second screen. The services can be made adjustable to the individual needs of the users. Especially, the second screen allows such tailoring as this is a personal device. The second screen application was primarily developed within the EC project FI-CONNECT [19]. The technical challenge (not yet standardised) is to time-synchronize the displaying of the broadcast and the IP delivered content. The EC project HBB-NEXT [20] is working on a solution that could be part of the HbbTV 2.0 specifications.

These specifications are, are among others, the basis to develop user applications and large scale tests within the HBB4ALL project prefiguring future deployments.

V. ACCESSIBILITY TO DIGITAL SOCIETY WITH HBB4ALL

The European HBB4ALL (Hybrid Broadcast Broadband for All) project addresses media accessibility in the connected TV, namely the new HbbTV (Hybrid Broadcast Broadband) environment. One of the challenges for the coming years will be the delivery of multi-platform audiovisual content (anytime, anywhere, any device), it will be a program or Internet service. Platforms' hybrid delivery as connected TVs and solutions to two screens allows a cost effective and convenient delivery access for those who need those services. The elderly and people with various disabilities rely on subtitles, audio description, improving dialogue or sign interpretation. Customizing personal preferences will be possible within predetermined limits.

The Hbb4All project aims at:

- Advancing solutions to future accessibility problems, when HbbTV becomes widespread in Europe;
- Understanding interoperability in a multiplatform and multi-language communication to test easy solutions for media accessibility;
- Benchmarking quality of access services from a user-centric approach, and promoting accessibility as an added value for education and social inclusion;
- Becoming a major platform/player in the e-Inclusion economy currently taking place, fostering the future market take-up of exiting innovations in conceiving universal accessibility tools and concepts to satisfy the diverse interests of all societal groups.

How to watch TV content in PC, tablets, smart phones and TVs with an array of communication solutions, such as subtitling, audio description, clean audio, and many customizable features? Multiple European languages, large and small, sign language, and language situation – monolingual, bilingual - will be taken into consideration and also the three translation modes: dubbing, subtitling and voice-over.

For this purpose, the project will test access services in various pilot implementations (from the definition to the operational phase) and gather implicit and explicit user feedback to assess the acceptance and the achievable quality of service in the various delivery scenarios (broadcasting, hybrid, full IP). Four interlinked sub-pilots will be implemented in the HBB4ALL project:

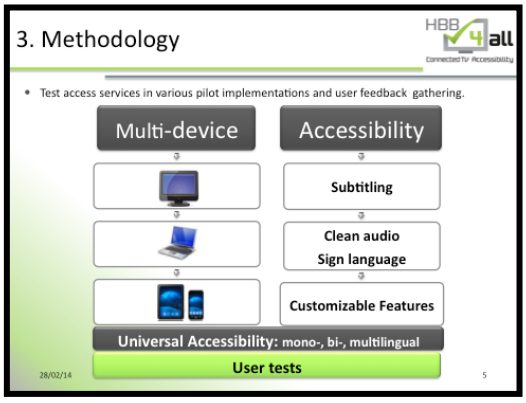

Figure 1. Hbb4All Methodology

A. Pilot-A: Multi-platform subtitle workflow chain

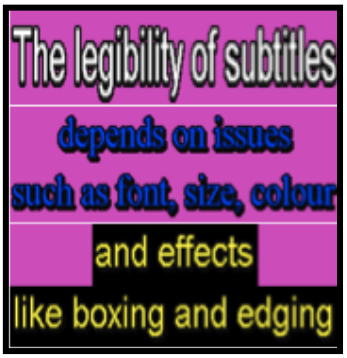

Figure 2. Subtitling effects

Pilot A deals with Multi-Platform Subtitle Services. Across Europe, broadcasters are working to provide subtitles on multiple platforms for individuals who are deaf and hard-of-hearing, or do not have sufficient language skills to understand the content without textual support either in the original or foreign languages. The main challenge is to provide subtitles tailored to the specific needs of the end-users in terms of channels, platforms and consumption requirements. This requires a well-conceived production and distribution strategy that allows for the exchange of subtitles and their automatic re-purposing producing quality and impact-driven access services for multiple platforms.

B. Pilot-B: Alternative audio production and distribution

Pilot B deals with alternative audio production and distribution. Given EU citizen mobility, TV content is not only seen by nationals, but also by large communities living away from home. There is also a need to broadcast same content in different languages synchronically (e.g., Swiss TV or Brussels TV), but the content is not the same across languages.

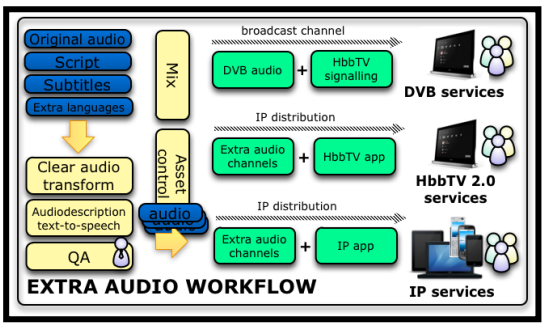

Figure 3. Extra Audio Workflow Scheme

C. Pilot-C: Automatic UI (User Interface) adaptation – accessible Smart TV applications

Pilot C looks at automatic User Interaction (UI) adaptation, and smart TV applications. During the last years digital TV as a media platform has increasingly turned from a simple receiver and presenter of broadcast signals to an interactive and personalised media terminal with access to traditional broadcast as well as web-based services.

The accessibility features of such a service will make use of the UI adaptation framework that was developed within the European project GUIDE (Gentle user interfaces for elderly people) [21].

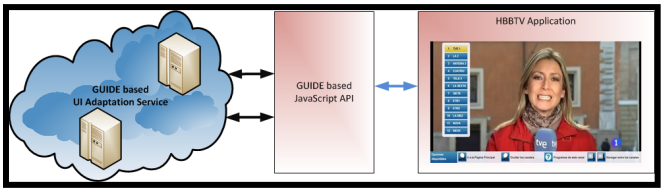

Figure 4. Example UI adaptation framework

D. Pilot-D: Sign-language translation service

The last pilot is related to sign language translation. Visual signing for audiovisual media such as film and television was shown for the first time in1929 as a means to make such content accessible to individuals whose mother tongue is a sign language and not an oral language. Users of sign language are often born deaf. In many European countries, there are constitutional and legal provisions to assure the provision of sign language for such citizens who, in numerical terms, account for less than 1% of the population.

Figure 5. Signing in Belgium – RTBF

Figure 6. Signing in Portugal - RTP1

Broadcasters dependent on advertising express concerns that an obligation to offer signing would lead to a noticeable reduction in advertising revenue, since audiences dislike "screen contamination" with the interpreter. Offering closed signing (where the viewer can choose to see or not to see the interpreter) requires much more bandwidth than closed

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subtitles or audio description. Signing is important not only for mainstream programming and TV programming specifically for the signing communities in Europe and elsewhere but also emergency alerts on TV.

On this basis, HBB4ALL is elaborating pertinent guidelines, guides of good practice, metrics, and recommendations. It will initiate campaigns to promote the project results and thus raise awareness not only on the necessity of access services but also on the technical solutions available. For that purpose, and to transform accessibility vision into reality, Hbb4All targets all relevant stakeholders of the value chain.

VI. EXPECTED RESULTS

Being an ETSI standard, HbbTV is currently linked with the DVB TV system family but can, in principle, be used in conjunction with any digital TV service in the world. DVB is widely used throughout all continents. Sooner or later, all countries in the world will have completed their analogue-to-digital switch-over. As a consequence, the results of HBB4ALL will be of worldwide relevance and will, through standardisation bodies such as the ITU and ISO, also be publicised on a world-wide level. Given the impact in close fields such as eHealth and eEducation for example, the results from this project will have important results and direct impact. On its basis, HBB4ALL is elaborating pertinent guidelines, guides of good practice, metrics, and recommendations and will initiate campaigns to promote the project results, and thus raise awareness not only on the necessity of access and interaction services but also on the technical solutions available with interoperability. For that purpose, all relevant stakeholders, from content providers to user associations, will be addressed. The overall objective of HBB4ALL is to become a major platform/player in the e-Inclusion economy currently taking place, fostering the future market take-up of exiting innovations in conceiving universal accessibility tools and concepts to satisfy the diverse interests of all societal groups.

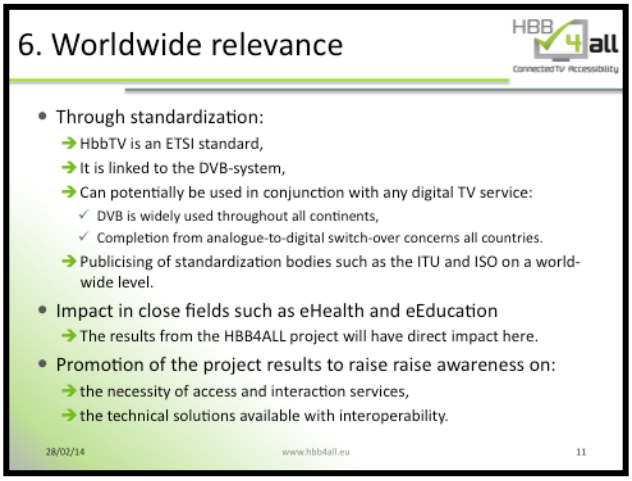

Figure 7. Worldwide relevance of the European Hbb4All project

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