

ITUEvents

ITU workshop on the future of television for Europe

7 June 2019
ITU headquarters
Geneva, Switzerland

<http://itu.int/go/TV-Europe>

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Workshop organized within the framework of the ITU Regional Initiatives for Europe and the ITU Study Groups responsible for standardization of Television, namely ITU-T SG9 and ITU-R SG6

ENABLING
ENVIRONMENT

ACCESSIBLE
TELEVISION

MARKET
TRENDS

TECHNOLOGY
TRENDS

CHALLENGES &
OPPORTUNITIES



OUTCOME REPORT

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International Telecommunication Union

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1. INTRODUCTION

The workshop "[The Future of Television for Europe](#)" was held on 7 June 2019 in Geneva, Switzerland. It was jointly organised by the three sectors of the ITU, the Development Bureau, the Standardization Bureau and the Radiocommunication Bureau and continued the successful work of "The Future of Cable TV" (Geneva, Switzerland, 25-26 January 2018) and The Future of TV for the Americas (Bogotá, Colombia, 26 November 2018).

The workshop was conducted with support of the ITU Office for Europe, within the context of the European Regional Initiative approved by WTDC-17 on "Broadband Infrastructure, Broadcasting and Spectrum Management", whereby assistance is provided to countries in need on the assessment of dynamics, challenges and opportunities of diverse broadband technologies across Europe. The workshop was also supported by the ITU-R SG6 (Broadcasting service) and ITU-T SG9 (Cable broadband and TV).

The event provided an opportunity to discuss the future of television in the region with relevant European and international stakeholders, covering regulatory and policy frameworks, emerging and convergent ICT Infrastructures and services, as well as user interfaces and accessibility issues. It also provided an opportunity to discuss TV-related regional and international standardization and to share best practices and case studies on cable TV roll-outs and other new TV services.

Key topics covered by the workshop included:

1. Enabling Regulatory and Policy Environment (Session 1);
2. Integrated Broadcasting and Broadband (Session 2);
3. Making Television Accessible (Session 3);
4. Standardization, Future Spectrum Usage and Development Issues (Session 4);

Over 20 interventions were made by eminent speakers from regulatory bodies, government, industry, research institutions and academia, representing both ITU Members and non-Members. Details of the agenda and speakers are available at <https://www.itu.int/en/ITU-T/Workshops-and-Seminars/20190607/Pages/programme.aspx>

The main outcomes of the workshop are outlined in this report which is structured by presenting the key points emerged from each presentation and the results of the discussions closing each session.

2. PARTICIPATION

The workshop targeted all stakeholders involved in the development of the cable industry, in Europe and outside Europe. These stakeholders included ICT policy makers, National Regulatory Authorities (NRAs), broadcasting and cable industry representatives, cable companies, standardisation agencies and academia. Workshop speakers and participants came from Europe, the Americas, Middle East and Asia.

Over 90 participants from 30 countries took part in the workshop including high level representatives of national regulators from the ITU Europe region, the European Commission, the European Broadcasting Union and European Telecommunications Satellite Organisation.



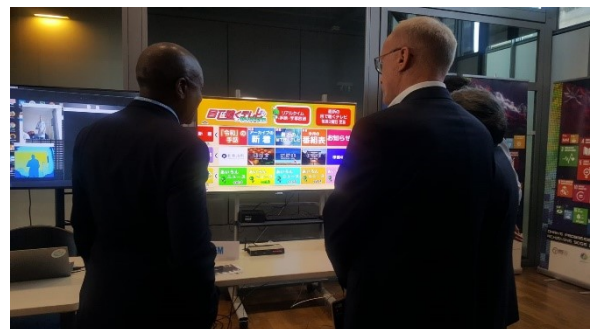
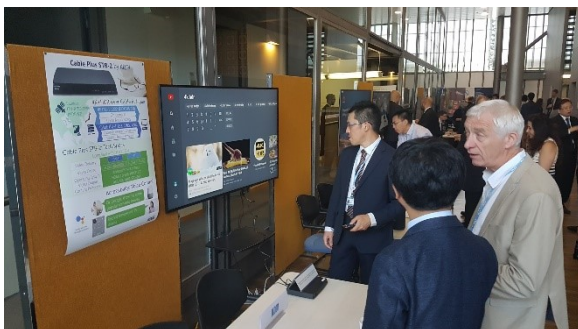
Figure 1: Group photo with speakers and participants of the workshop

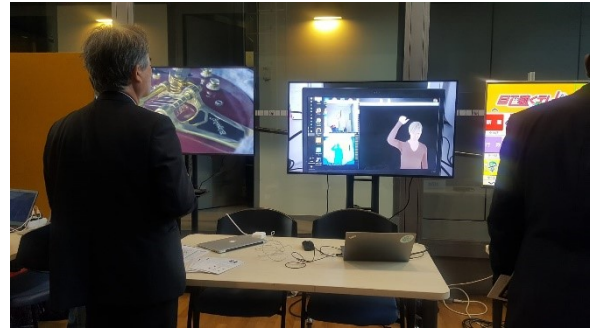
2.1 Programme Committee

The Programme Committee was composed by Rosheen Awotar-Mauree, Programme Officer, ITU Office for Europe, ITU; Istvan Bozsoki, Head, Spectrum Management and Broadcasting Division, BDT, ITU; Roberto Mitsuke Hirayama, ITU-D SG1 Vice-Chair and Rapporteur of ITU-D Question 2/1; Satoshi Miyaji, Chairman, ITU-T SG9, General Manager, KDDI Corporation, Japan; Stefano Polidori, Advisor ITU-T Study Group 9, TSB, ITU; Jaroslaw Ponder, Head of ITU Office for Europe, ITU; Walid Sami, Senior Project Manager, European Broadcasting Union (EBU); David Wood, Chair ITU IRG-AVA.

2.2 Exhibition

Throughout the day, participants could benefit from a number of exhibitions about the latest video-related technologies. Exhibitors included Hisilicon, KDDI, EBU, Keio University & ASTEM, UAIRT, Huawei, UAB, Iglor Soluciones Audiovisuales Avanzadas S.L..





Figures 2-5: Solutions presented by exhibitors

3. DOCUMENTATION

The workshop was paperless. Relevant documentation, including the agenda, presentations recordings and a background industry paper were made available on the event web page: <https://www.itu.int/en/ITU-T/Workshops-and-Seminars/20190607/Pages/programme.aspx>

The workshop was supported with captioning facility and the raw caption text is available on the event page. Video recordings of the workshop as well as this outcome report will also be made available at the above named event web page. In addition, four high level experts video interviews were conducted by the ITU and made available in the workshop website.

4. OPENING ADDRESS AND SETTING THE CONTEXT

The workshop opening address was conducted by Malcolm Johnson, ITU Deputy Secretary-General.

Mr Johnson greeted the audience by reminding that the European television sector generates 84 billion turnover per year, involves 1 million workers and reaches 800 million people in the region. Since the first ITU standard for television developed in 1949, ITU has supported the growth of broadcasting and content production.

The Deputy Secretary-General remarked that emerging technologies have always constituted an important feature of ITU's approach to the television sector, *"And now that we have artificial intelligence coming along, we're also looking at how to make the best of that opportunity for the future of television, and of course, address the challenges that brings both for businesses and policymakers."*

Last week the ITU held the AI for Good Global Summit, the main UN platform for discussing Artificial Intelligence in the context of the Sustainable Development Goals. ITU-R has recently published a [Report](#) outlining how AI can be used in the production and distribution of television and radio content.

While it will be important to observe the outcome of WRC19, it is already time to look ahead. *"We need to prepare well in advance for these conferences and the sector is already preparing for the following WRC which will be in 2023, and in particular looking at the possible impact of decisions on the UHF band and use of that band for our television broadcasting in Europe."*

Turning to the standards sector, ITU-T Study Group 9 is creating a lot of partnerships with world leaders to enforce its work. *"We're seeing new members joining the Study Group 9 now but also some companies and organizations that were participating some years ago are returning, for example US Cablelabs"*. Moreover, ITU is continuing to ensure that standards meet all the criteria of accessibility

for persons with disabilities as well as for older people, making use they can all benefit of the advanced services provided by the future TV.”

ITU-D is also looking at these issues in the context of ITU-D Study Group 1, which has recently published a report on new trends in broadcasting.

In this context, Deputy Secretary-General called for a number of questions to be discussed in the workshop:

- How to ensure the WRC-23 results will not compromise the existing deployment and future development of the broadcasting TV? What are the various policy makers doing to continuously adapt effective regulation and take strategic decisions to maintain and further enhance an inclusive enabling environment for television to thrive?
- What are the new or transformed services that the providers are pursuing?
- How can we ensure accessibility of the television, regardless to the technologies used for content distribution?
- What are the updated technical standards needed to enable service delivery?

The discussion should help progress the work of the Radiocommunication, Standardization and Development sectors and inform ITU-T Study Group 9 which is currently meeting in co-location to the workshop and will be able to act straight away. Cooperation between all the sectors of ITU is very important and there are a number of internal groups focusing on this of which the ITU’s Regional Office for Europe is a good example, also considering the importance of the European region with as many as 46 [member](#) countries.

This is the third event regarding the Future of Television and is a series which ITU wants to see continuing in the future. The ITU is looking for organizing a similar event for Asia Pacific in February 2020 as well as another for Africa in September 2020. The Deputy Secretary-General, Mr Johnson, then thanked experts, panellists and moderators for participating and expressed the hopes that the Workshop would provide *“interesting and informative exchange and identify some issues that we can really pick up in the study groups in the three sectors.”*

Deputy Secretary-General Malcom Johnson was thanked by Head of Office for Europe Jaroslaw Ponder for his insightful words. Mr Ponder also thanked the three sectors for participating, the sponsors and Mr Polidori for coordinating the Workshop’s programme.

5. SESSION 1: ENABLING REGULATORY AND POLICY ENVIRONMENT

The objective of this session was to identify the key enablers for successful and impactful future television services by providing a space for European government institutions and regulators to address emerging trends, industry challenges and opportunities.

Session moderator: Jaroslaw Ponder, Head of ITU Office for Europe, ITU.

5.1 Presentation 1: The Revised EU Audiovisual Media Rules

The session was initiated by a presentation titled *“The revised EU audiovisual media rules: creating modern regulatory environment for all media services”*. It was presented by Audrius Perkauskas, Deputy Head of Unit, Audiovisual and Media Policy, European Commission, DG Communications Networks, Content and Technology.

The full presentation is available on the event web site and the following observations were made:

- To address the rapid changes in the TV landscape, the European Commission in 2015 began a process of regulatory revision to adapt the Audio Visual Media Services Directive (AVMSD) which was guided by principles of (a) having similar obligations for comparable services and (b) responsible behaviour for platforms so that there is a level playing field for broadcasters and on-demand services providers;
- The first level playing field element was to introduce reinforced obligations for on-demand services such as the protection of minors and the rule that 30% of catalogues must be dedicated to European audiovisual works;
- The second element of the level playing field was to ensure greater flexibility for traditional broadcasters in terms of advertising and signal integrity;
- The AVMSD also contains obligations in terms of accessibility and requires Member States to regularly report to the Commission on their action plans explaining how they intend to lead audio/visual service providers to improve accessibility;
- User content is difficult to regulate because platforms are not directly liable. The Directive introduces rules for protecting minors, protecting from illegal or violent content or requiring platforms to introduce mechanisms that allow other users to report inappropriate content;
- The Directive provides the obligation for Member States to encourage co-regulation and create favourable conditions for self regulation, but also leaves space for stakeholders to create ITU-wide codes of conduct;
- The revision of the EU rulebook has been significant and accompanies the development of TV markets. Implementation of the new AVMSD will need to occur before September 2020 and in the meantime, the European Commission will continue to keep a close eye on the TV market and see how things will go forward.

5.2 Presentation 2: Future of Television for Europe

The second presentation, titled *"Future of Television for Europe-Enabling regulatory and policy environment"* was presented by Sarah Turnbull, Senior Legal Counsel, EBU.

The full presentation is available on the event web site and the following observations were made:

- European broadcasting is the driving force of the European creative sector. With the industry changing quickly, there are concerns in terms of safeguarding national culture, social cohesion and democracy through public service media content;
- As the European media ecosystem goes online, it is important that Public Service Media (PSM) have their role in online spaces and enable citizens to access high-quality content;
- The European Union's regulatory approach is welcomed by the broadcasting community as it reinforces important values such as media freedom, pluralism, cultural diversity and minor protection.
- It is important that the AVMSD requires all media service providers to give additional information on harmful media content;
- A key feature of the AVMSD is the recognition of the independence of AVMSD national regulators from national governments, which ensures the integrity of media service providers;
- The European code of practice on Disinformation is an important example of co-regulation between the Commission and large digital platforms. Close monitoring in the context of European Elections will enable to assess whether regulatory measures are needed;
- The "platform to business" regulation, which introduces more transparency with regard to platform's conduct with other businesses is also welcomed by the broadcasting industry in Europe;

- The European broadcasting industry welcomes the progress made by the Commission and that this will be monitored in the coming months. However, it is important not to legislate everything because the landscape is changing on a daily basis.

5.3 Presentation 3: Television 2019 – Challenges and Opportunities

The third presentation, titled *“Television 2019 – Challenges and opportunities”*, was presented by Piotr Dmochowski-Lipski, Executive Secretary, European Telecommunications Satellite Organization.

The full presentation is available on the event web site and the following observations were made:

- Television is strongly driven by revenue since each additional dollar in revenue generates more profit than each dollar of reduced cost. This means that any change in product popularity has significant impact on revenues streams;
- Crucial factors for the television industry are delivery, programming, technology investment and the regulatory environment, all dominated by the United States. The European industry is strongly dependent on the US;
- The revenues in the TV market typically come from advertising, subscriptions, pay-per-item, public financing and merchandising, which differ depending on the country under consideration; global TV advertising constitutes almost 50% of the whole pie but the trend is in favour of the internet;
- The current challenges are constituted by the shift away from linear TV (2h 44m per day consumption for “baby boomers” and 1h 28m per day consumption for “Generation Z”). By contrast, there is a slow but steady growth of online pay TV, and there is more competition posed to television in general by other free time services;
- Despite the growth of OTT, there is a strong case for advertisers to advertise on linear TV, as this is still the most comprehensive channel for audio visual media delivery;
- Regarding satellites, traditional GEO business still derives most of the revenues from TV. However, considering there is almost no growth there and manufacturers are consequently going towards data transmission services (Broadband, mobile, OTT);
- In emerging markets, revenue from television is still strong and will be more so in the future as these countries often don’t have terrestrial infrastructure such as optic fibre;
- From the perspective of satellite operators, despite the lack of growth of the television business, its volume and the attractiveness from the advertising standpoint are such that it would be premature to say that the industry is in decline. The industry needs to reinvent itself and make the most of new technology.

5.4 Presentation 4: Hungarian Roadmap and its Regulatory Background

The fourth presentation, titled *“Hungarian roadmap and its regulatory background”*, was presented by Peter Vari, Deputy Director General, National Media and Infocommunications Authority, Hungary.

The full presentation is available on the event web site and the following observations were made:

- In Hungary, 60% of households have access to cable TV, whereas 20% use digital television. Hungary has 12 free channels, 47 pay-TV channels and 4 public radio channels.
- The changing landscape generates the necessity of redefining spectrum management from a state perspective, with 4 main challenges: (a) meeting the demand for increased mobile broadband; (b) meeting the demand of terrestrial audiovisual broadcasting; (c) meeting the demand for narrow and broadband PPDR (Public Protection and Disaster Relief) applications; and (d) preserving non-civilian radiocommunications;
- The 700MHz band will be freed for 5G as decided by the European Union. There is a necessity to create a roadmap on how broadcasting can be handled after the loss of the 700MHz band;

- As operating rights for existing networks will expire on 5 September 2020, the Hungarian Communications Authority has launched a new tender for the operation of 5 networks for 12 years. The main requirements are no subscription fees, ensuring continuous service and granting unchanged quality;
- Operators will have to avoid putting any financial burden on the population. For instance, free channels must adopt the existing DVB-T MPEG-4 AVC set-top box instead of DVB-T2 HEVC set-top box which may only be used for subscription services;
- The solution for Hungary is to encourage operators to use efficient technologies and plan larger coverage areas. This strategy will be accompanied by mandatory technical specifications for network implementation.

5.5 Presentation 5: The Changing Landscape of European TV

The fifth presentation, titled *"The Changing Landscape of European TV"*, was presented by Tom Morrod, Research Director, Consumer Services and Technology, IHS Markit, UK.

The full presentation is available on the event web site and the following observations were made:

- Until 2012, linear viewing was growing and connected devices were at par with traditional TV. In the past few years this status quo has changed with OTT now representing 20% of viewing and growing 2% per year;
- The other trends are that now most consumer devices are connected and media capable (there are more smartphones and consoles in china than there are TVs in the world) and that Online is capturing all viewing growth and almost all subscriber revenue growth;
- New subscribers in 2018 show that IPTV is growing a little bit, but Online subscriptions have seen more than 20 million subscriptions (32% growth);
- These changes in the sector led to major company consolidations in the media industry. The rationale was (a) merging distribution and content, (b) scaling up content and production, (c) convergence, and (d) geographical diversification;
- Beyond TV operators, platforms are entering the TV market in order to diversify revenues from their core business. Platforms do not need to make money in a particular industry, but when they get in it they have a tendency to dominate it;
- The online share of total video advertising is going to be 23% online in 2023, up from less than 5% in 2014. Similarly, the share of online platforms' content production spending is increasing rapidly;
- The TV industry is not driven any more by traditional economics as the growth of platforms in terms of content and distribution illustrate, which raises concerns about public access, local culture and privacy;
- The traditional industry should be supported by governments in order to compete with these companies.

5.6 Presentation 6: Call for a Single Market for Audiovisual Products and Services

The sixth presentation, titled *"Call for a Single Market for Audiovisual Products and Services"*, was presented by Pascal Chevallier, Director, Technical Affairs, DIGITAL EUROPE/AFNUM.

The full presentation is available on the event web site and the following observations were made:

- Europe should tackle regulatory fragmentation and bring to completion the digital single market in order to counteract protectionist forces and proceed towards an inclusive world digital single market;

- Market access should be simplified, market surveillance improved and more harmonisation efforts need to be undertaken;
- Product interoperability is becoming very complex, especially because the AVMSD and the EEC allow for national regulatory personalisation. This may result in 27 different flavours of the same rules and raises concerns for the industry;
- To achieve a real single market, and therefore to compete with the US and China, European stakeholders and institutions should engage to ensure that implementation at MS level does not have hidden technical impacts or that the various regulations do not have overlaps or disproportionate burden;
- Any regulation should consider enhancing the mutual communication between services and products so that consumers are aware of what they can expect from both.

5.7 Presentation 7: The Future of French DTT Platform

The seventh presentation, titled *"The future of French DTT Platform"*, was presented by Jean Mahé, Chairman, French Forum AudioVisuel Numérique (FAVN).

The full presentation is available on the event web site and the following observations were made:

- In France, IPTV is the first platform to provide TV in the French territory, closely followed by DTT;
- DTT has historically been strong in France and the law regulating it has been amended many times since 1986 to support its growth;
- CSA, the French regulatory authority, has published a roadmap to 2024 to modernise DTT. This includes standards for equipment and shifting from DVB-T1 to DVB-T2 based on HEVC. Also standards for sound (NGA), resolution (4K) and motion (HFR), contrasts and colours (HDR+WCG) will be improved;
- Following the request from CSA, industry operators have agreed on a draft technical specification for the modernization of DTT with UHD. A new law on DTT is also in the process of being drafted;
- France is showing that DTT will have a future in television in Europe.

5.8 Discussion and questions

The question asked to all panelists was "would you agree that the AVMSD provides enough freedom for the European television industry?"

- The new directive gives freedom and opportunities. Member States can opt to be stricter;
- The absence of rules does not provide the environment for growth. Rules provide trust and reasonable rules such as AVMSD are a good way forward;
- It is important that the state has the possibility to handle the appropriate information through the role of public broadcasters;
- The paradigms are changing, but traditional operators are still safe for the moment. These operators must find a way on how to deal with OTT. As far as the AVMS is concerned, it is important that freedom is given to the players and that core values are protected.
- AVMSD is being copied in Brazil because it levels the playing field appropriately. However this does not account for competition and more macro global equilibria;
- Audiovisual content and viewers will stay but the delivery mode will change quickly and we need to make sure that legislation does not reflect what we think will happen but remains as open as possible. On the other hand, it is important to have a stable regulatory landscape.

6. SESSION 2: FUTURE INTEGRATED BROADCASTING AND BROADBAND (IBB)

The objective of this session was to explore and discuss experiences of integration between broadcast and broadband services in the European region in the context of NGN.

Session moderator: Peter MacAvock, Senior Manager of Delivery & Services, EBU.

6.1 Presentation 1: Seamless Service Integration

The first presentation, titled *"Example of seamless service integration between Broadcast and Broadband"*, was presented by Xavier Redon Hernandez, Senior Product Manager, Cellnex Telecom, LOVEStv Spain.

The full presentation is available on the event web site and the following observations were made:

- The revenue composition of TV distribution systems in Spain shows that FTA DTT accrues 75% and Pay TV 25%. Within pay TV, OTT is still a minor part;
- HbbTV penetration in Spain is 24% with 1/3 of all TVs sold every year being HbbTVs. HbbTV started in 2010 on a national level but there are also regional and local broadcasters;
- In 2018, three providers allied to compete against the growth of IPTV services coming from telecommunication operators which were making use of HbbTV by providing new features (such as pausing and viewing past broadcasting);
- In order to ensure interoperability across systems and devices, there is a constant conversation with the manufacturers. Manufacturers are often not interested in updating the software of devices they sold recently and this creates frictions with broadcasters who want to get new services to market;
- The alliance is measuring results closely in order to plan future operations. Plans include adding more channels, more features, more TV sets and more devices.

6.2 Presentation 2: What Does 5G Really Mean for Video?

The second presentation, titled *"What does 5G *Really* mean for video?"*, was presented by Adam Davies, Product Manager, mobile, advertising and analytics solutions, Synamedia.

The full presentation is available on the event web site and the following observations were made:

- Video consumption is changing dramatically. Mobile video traffic consumption will be 9 times larger in 2 years and will constitute 82% of IP traffic by 2020. Millennials consume twice as much mobile video as 25-39 year olds and mobile data traffic will be 75% video by 2021;
- 5G will bring extensive, intelligent and competitive alternatives to current terrestrial services. The opportunity is to have whatever content, whenever and wherever;
- IoT is a straight forward use case for 5G but right now it is too expensive: two SIMs per connected vehicle which must be paid per month could amount at more than €600 in cost per year;
- Low latency will bring network slicing and provide dedicated bandwidth for content and media generation. An example is 5G content captured at the Olympics in Korea;
- Multi-Access Edge Computing will mean that there will be better network capacity and performance with less network congestion as content will be produced and distributed locally. This will bring concrete benefits such as battery life and enhanced security as well as improved B2B services;
- Cable and 5G will be integrated in a unique network just as business models are integrating (e.g. traditional telecommunications companies are integrating traditional and OTT services);

- 5G provides an opportunity to improve the entertainment services already in place with better quality, new and various options and better use of experiences.

6.3 Presentation 3: DVB-I: Broadcast in an OTT World

The third presentation, titled "DVB-I: Broadcast in an OTT World", was presented by Peter Siebert, Head of Technology, DVB.

The full presentation is available on the event web site and the following observations were made:

- Broadcasting is resilient and has disproved predictions of dismissal over time. In Europe, TV viewing time remains stable overall at around 3h 40m per individual;
- In the UK, between 2014-2016, live broadcasting has progressively decreased in favour of online viewing, with young people leading this change;
- The TV set is becoming the main screen for streaming as opposed to the computer. Smartphones and tablets are keeping a stable share;
- The distribution between live viewing and time-shifted viewing is still 80% and 20% respectively. Considering current trends, time-shifted viewing will not surpass live viewing before 2036;
- The media landscape may be shifting but old patterns remain. Just as the Cinema experienced a boom, a decline and a consolidation, the same is expected for linear TV. Traditional broadcasters will have to adapt but are well-placed to do so;
- Transition to OTT is an evolutionary one, not revolutionary. OTT have challenges too in terms of establishing a trusted brand and providing the same quality of experience;
- DVB-I (Internet) is an initiative that adds to terrestrial, cable and satellite TV. It attempts to bring broadcast and OTT together and help overcome the challenges that both are facing;
- Typically OTT services are deployed through apps. Problems arise when users have to install many apps and broadcasters need to maintain them on multiple platforms. DVB-I does for IP services what DVB-T/C/S did for the passage from analogue to digital;
- A standard will be finalized by September and the first DVB-I demo will be presented at the International Broadcasting Convention (IBC) in Amsterdam.

6.4 Presentation 4: The Smart TV Operating System

The fourth presentation, titled "*The Smart TV Operating System*", was presented by Haifeng Yan, Principal Engineer, Hisilicon, China.

The full presentation is available on the event web site and the following observations were made:

- UHD is developing fast in China from a regulatory, technical and market perspective. Customers are recognising UHD and the emerging services such as VR/AR, Online education or UHD games;
- In China, there is a big problem of fragmentation within the terminals as middleware or hardware specifications are not harmonized. This means that it is costly to develop new services and difficult to deploy them, and there is no unified security scheme;
- TVOS aims to build a smart media terminal operating system that solves issues and grants service extension efficiency, UX consistency, development efficiency, cross-hardware platform, security and sustainability.
- TVOS Architecture is based on multiple layers to grant maximum interoperability;
- TVOS embeds broadcast and broadband features to grant the same user experience whatever is the service to be accessed;
- TVOS is building a large community (120 members) of institutions, operators, software vendors, device vendors and chip vendors to develop and implement TVOS in China;

- TVOS also has industry standards in China and is pushing for establishing international standards through ITU-T SG9;
- The next steps for TVOS are commercial promotion, full open source, internationalisation and application ecosystem construction.

6.5 Discussion and questions

- The reason why Google, Apple, Facebook and Amazon (GAFA) are winning is not the standard but the users and their wishes. Personalisation and user experience are the prerequisite to compete;
- Relationship between TVOS and DVB-I? TVOS is an interesting development and gets support by the Chinese government and industry. DVB-I specifies the interfaces whereas TVOS is more focused on implementation. TVOS is an open system and therefore can be made compatible with other standards such as DVB-I; HbbTV etc.
- Can TVOS be implemented in Europe? It is up to the manufacturers to find an agreement on the delivery arrangements, but as long as receivers comply with recommendations there wouldn't be problems;
- Are there any less optimistic views on 5G for the future? There will be challenges before the full potential of 5G (low latency, mass usage and high bandwidth) is achieved, but its deployment will gradually bring many benefits;
- Europe is shifting from traditional broadcasting, to hybrid, to OTT (broadband only). What is the situation in Japan? In Japan the main OTT service is provided by a broadcaster and it is combined under a platform. Personalisation of hybridcast is currently being studied, but not yet deployed;
- Personalisation in Europe? The mindset is that many broadcasters think that they know the users and know what the users want, but the transition to non-linear makes this more difficult. OTTs are able to present fresh content every day whereas traditional broadcasters have a lot of content which, however, is sitting in the archives. If this can be opened, it will be key for personalisation for traditional broadcasters;
- Who is going to develop the algorithms for broadcasting? Some are already open source but need to withstand editorial judgements because the way in which the algorithm retrieves and catalogues content will have to follow some editorial line.

7. SESSION 3: MAKING TELEVISION ACCESSIBLE

The objective of this session was to examine how future accessibility systems will advance in future television systems and how can stakeholders develop common systems for all delivery media.

Session moderator: David Wood, Co-chair, ITU IRG-AVA (Audio Visual Accessibility)

7.1 Presentation 1: New W3C Accessibility Systems

The first presentation, titled *"The New Accessibility Systems developed and being developed in the W3C"*, was presented by Nigel Megitt, BBC, UK.

The full presentation is available on the event web site and the following observations were made:

- Web standards are becoming part of television because of the transition from broadcasting to online. The web standards for accessibility are now relevant for TV, not the contrary;
- The web is a highly layered architecture where each layer has its own specification and each layer can offer different opportunities for accessibility (e.g. different semantic data and rules for HTML or CSS);

- Different guidelines make accessible different layers: content accessibility (WCAG 2.1), accessible rich internet apps (WAI-ARIA), user agent accessibility guidelines (UAAG 2.0), authoring tools accessibility (ATAG 2.0);
- When it comes to media accessibility, guidelines are contained in the Media Accessibility User Requirement (MAUR) which covers, video, text and audio description elements;
- There is more work to do. Future areas of work include text track synchronisations, audio description standard support, live subtitle contribution, AR/VR presentation of subtitles and, more generally, subtitle presentation mechanisms. There are also a lack of harmonization due to API, privacy, and customization divergences to be solved;
- For implementers: it is a tough job to implement accessibility standards considering the multiple layers in question, but it is nevertheless very important;
- For content providers: content must be perceivable, operable, understandable and robust, otherwise audience will be lost.
- For consumers: consumers need to be vocal and express their needs, perhaps through direct participation;
- For regulators: regulators need to recognise the moral case under the UN UCRPD, but, more importantly, they must provide an economic rationale. Along this line, support should be given to research, implementers and consumers.

7.2 Presentation 2: New Concepts for Accessibility Systems in Europe

The second presentation titled *"The New Concepts for Accessibility systems being developed in Europe"*, was presented by Pilar Orero, CEC.

The full presentation is available on the event web site and the following observations were made:

- 3 pieces of legislation will shape the future of television in Europe in terms of accessibility. First is WCAG 2.0. Standard embedded in the European Web Accessibility Directive; then is AVMSD, which includes provisions that require accessibility for all broadcasters, traditional and online, whether they are private or not; the third piece of legislation is the European Accessibility Act;
- In Europe, there are more than 200 languages and three ways to translate. Clearly, accessibility is not an issue confined to disability only. Europe is therefore an amazing testbed for accessibility because the audience for accessibility is broadening and goes beyond people with disabilities;
- The normalization of accessibility in the European landscape is a very good news;
- Accessibility by design: The workflow of accessibility production must be shifted to the design of the product and the very production of the content rather than requiring the broadcaster to implement accessibility features;
- In the past three years, Europe has pushed forward from a regulatory perspective but also from a funding perspective: R&D (Horizon 2020), Training (Erasmus+) and Content-generation ("Media");
- Accessibility now horizontal in Europe and not only confined to disability. Refugees for example need to be integrated in the European culture and language;
- Danish broadcasters have established a system of accessibility icons that allows to recognise accessibility features which could be standardized internationally;
- Europe has foreseen what was going to happen with accessibility since the passage from analogue to digital. The more technology changes, the more must be done on this.

7.3 Presentation 3: Accessibility Systems in ITU-R SG6

The third presentation, titled *"The Accessibility Systems in ITU-R SG6 for broadcast delivery"*, was presented by Andy Quested, Chair ITU-R Working Party 6C.

The full presentation is available on the event web site and the following observations were made:

- Access to media is a right, not an inconvenience. So many people still see this as a burden but we have to go further. ITU resolutions are moving the work forward but it is not enough;
- ITU-R SG6 on broadcasting service is looking at the issue from many perspectives including functional sub-titling, signing or “clean audio”. It is also working to find ways to enhance understanding of broadcasting media content and better help users interact with the content;
- ITU-R SG6 seeks to identify enablers that will better help achieve such objectives. In the Report ITU-R BT.2447 (May 2019), ITU-R SG6 has outlined how automation can foster the development and application of access systems and services;
- Current ITU-R SG6 is also producing a number of technical Reports and Recommendations for adapting current systems to standards of accessibility;
- ITU-R WP 6C will create a sub-WG dedicated to accessibility and its content should be made accessible to the public so that all stakeholders can participate in the process of developing the future framework for accessibility. Participation across all ITU sectors (for example through IRG AVA) is important;
- Another important issue is that of including people with disabilities in the sessions and ensuring the sessions too are easily accessible to all.

7.4 Presentation 4: Accessibility Systems in ITU-T SG16

The fourth presentation, titled *“The Accessibility Systems in ITU-T SG16 for IPTV and Internet delivery”*, was presented by Masahito Kawamori, Rapporteur Q26/16.

The full presentation is available on the event web site and the following observations were made:

- ITU-T has elaborated standards for IPTV which can easily be used for OTT as well, since the standard covers all services;
- Accessibility is strongly related to universal design, the process of creating products that are usable by the widest possible range of abilities. This takes place at the design stage of a product or a service;
- ITU-T Rec. H.702 defines the profiles (main, enhanced and basic) for accessibility in the realm of captioning, sign language interpretation and audio description. Many devices and some governments are already using this standard in IPTV and this can be extended to OTT operators;
- FSTP.ACC-AI: Guidelines on the use of AI for ICT accessibility are being discussed in ITU-T SG16.

7.5 Discussion and questions

- Can H.702 be applied to broadcasting? Yes because broadcasters are going towards IPTV.
- Can H.702 be passed to WP 6C or SG9? There wouldn’t be a problem, just some customization issues. ITU-T SG9 expects a liaison with WP 6C on accessibility and the Danish proposal for standardizing the signs. ITU-T SG9 is trying to update the cable architecture so is very open to collaborate with work done outside the group;
- ITU-D is also looking closely at digital inclusion from a variety of perspectives including financial possibility (e.g. equal access to assistive technologies). ITU-D is directly working through Study Group 1 (Question 7) on the issue;
- Implementation of the AVMSD must occur before September 2020 and ITU-D is supporting member states in the implementation process, helping them develop their own accessibility strategies;
- “Accessible Europe: ICT for all” taking place on 4-6 December in Malta is an important event that will facilitate discussion, allow to share best practices and leverage the capacity of the audience.

- The accessibility spectrum in terms of disability may be broadened to focus types of disability which haven't received as much attention so far;
- Open source projects to develop software for accessible services should be initiated and encouraged.
- New technology brings possibilities but it is easy to go on the other side and increase exclusion instead of inclusion. The design phase is crucial. In this regard, using AI for captioning may include biases which may exacerbate exclusion;
- It should be recognized that the growing aging population makes accessibility systems ever more necessary, and work should be planned accordingly;
- It should be recognized that the needs of persons with disabilities with 'interactional media' as well as conventional media are becoming important;
- How is it possible to ensure spreading technologies which do not necessarily create revenue? Media business is based on revenue, meaning that an additional dollar in revenue generates more profit than a one dollar in costs so we shouldn't be afraid of demanding accessibility, because this demand can be picked up by business;
- The accessibility spectrum must go beyond the 10-15% of population which has some form of disability. A NASA-ESA study shows how situational impairment may require many accessibility features;
- Global platforms are investing in accessibility features and are promoting heavily accessibility features because they see this as a business opportunity, and also to enter the Audiovisual Media Market;
- At the implementation level there is a huge challenge because accessibility policies sometimes require substantial changes to existing laws. There should be more cooperation within countries, across countries and at EU level and between stakeholders, especially incumbents;
- Overall, the community expects significant improvements in the accessibility of media in the near future.

A consolidated list of suggestions on the future of accessibility systems, from panellists from session 3, were collected and made available in ANNEX to this report

8. SESSION 4: STANDARDIZATION, FUTURE SPECTRUM USAGE AND DEVELOPMENT ISSUES

The objective of this session was to analyse broadcasting and content delivery from the viewpoints of broadcasting spectrum management in the context of WRC-23 as well as regional and international standardization in the context of 5G for broadcasting and security.

Session moderator: Istvan Bozsoki, Head, Spectrum Management and Broadcasting Division, BDT, ITU

8.1 Presentation 1: Broadcasting Spectrum in the Focus of WRC-23

The session was initiated by presentation titled "*Broadcasting Spectrum in the focus of WRC23*". It was presented by Elena Puigrefagut Coarasa, Senior Project Manager, Technology & Innovation, EBU.

The full presentation is available on the event web site and the following observations were made:

- The audiovisual media value chain depends on spectrum, from the production, to contribution and distribution;
- The first challenge is that the TV quality requirements are increasing in terms of video and audio resolution as well as the development of more efficient codecs (MPEG2, MPEG 4, HEVC);

- The second challenge, and interlinked with the first one, is the reduced availability of spectrum. Since RRC-06, spectrum availability has been reduced by more than 48%: the upper 700 MHz band and the downlink in the C-Band 3400-3800MHz are not available anymore in Europe for TV;
- The two challenges combined have spurred the broadcasting industry to develop more efficient distribution standards such as DVB-T2 and DVB-SX2;
- A number of WRC-19 agenda items relate to broadcasting but none of them is particularly problematic for the broadcasting industry. The only one that could create some problems is agenda item 10, the preliminary agenda for WRC-23 which might include the revision of the 470-694/960 MHz band;
- Europe must already prepare for WRC-23 and ensure win-win solutions. Flexibility in the use of the 470-694MHz band and continued access to C-, Ku- and Ka-bands is fundamental.

8.2 Presentation 2: The DTT Roadmap

The second presentation titled *"The DTT roadmap"*, was presented by Jean-Pierre Faisan, Vice-chair Broadcast Networks Europe.

The full presentation is available on the event web site and the following observations were made:

- Television keeps Europe together and DTT is a great European success which is evolving through innovation. DTT penetration in Europe was 42 % in 2018, up from 5% in 2005;
- DTT is popular and has an important cultural function which is supported by the political power since the European Parliament Decision 2017/899 has secured sub 700 MHz band for DTT until 2030 at least;
- 80% of European content is funded by broadcasters. Through spectrum, states can put requirements based on cultural and industrial policy, thus ensuring that European values are reflected in content;
- Clearing the 700 MHz band is a significant project (30% reduction in spectrum) that must happen quickly (mid-2020), minimize the impact on the users while also providing space for improving the user experience;
- As long as DTT provides excellent service it will be here to stay. Moreover, there is much more that can be done in developing countries now that almost 99% of countries have DTT plans;
- DTT is a success story. To ensure the virtuous circle continues, DTT will need spectrum and regulatory certainty until 2030, innovation to improve the user experience, and regulatory stability in the 470-694MHz band.

8.3 Presentation 3: 5G Promises for Broadcasting

The third presentation, titled *"5G promises for broadcasting"*, was presented by Kishigbayar Dushchuluun, Head of Radio Systems institut für Rundfunktechnik GmbH (IRT), Germany.

The full presentation is available on the event web site and the following observations were made:

- Why 5G is related to broadcasters? Because user behaviour and expectations have changed towards video on demand, and this can be accessible on mobile and portable devices, thus generating demand;
- National and international research cooperation projects are working to bring 5G broadcasting to smartphones and tablets;
- Further evolved Multimedia Broadcast Multicast Service (FeMBMS) was finalised in 3GPP release 14 in summer 2017 and is now the world's first dynamic single frequency network (SFN);
- IRT is working with 3GPP to lay the ground for 5G broadcast deployment;

- What is needed are technical evaluations and requirements as well as extensive field tests in various countries, not only in Germany. It is also recommended to push forward on standardisation, regulation and preservation of UHF TV broadcasting spectrum.

8.4 Presentation 4: New ITU-T SG9 Standardization Initiatives for Advanced Services Delivery

The fourth presentation, titled *"New ITUT-SG9 standardization initiatives for advanced services delivery"*, was presented by Eric Wang, Q9/9 Rapporteur, Huawei.

The full presentation is available on the event web site and the following observations were made:

- Video service requirements drive the network advancement. Currently, the direction is of providing ultimate experiences, massive bandwidth and hyper connectivity;
- ITU-T SG9 is facilitating advanced videos through existing platforms and set top boxes (STBs). Examples are the standardization work on cloud-VR/AR video delivery or artificial intelligence functionalities;
- Study Group 9 isn't only working on smart platforms but also smart RGW (Question 6), including IoT services. Other areas of work include Gigaband network, security and TVOS;
- Study Group 9 aims to evolve to the extreme experienced TV/Video and ultra fast broadband era.

8.5 Presentation 4: Advanced Ecosystem for Content Protection

The fourth presentation, titled *"Advanced Ecosystem for Content Protection"*, was presented by Jens Johann, Senior Manager, Standardization and Broadband Services, Deutsche Telekom, Germany.

The full presentation is available on the event web site and the following observations were made:

- Content protection is a key feature for distributors. Content aggregators and service providers are seeking to develop content protection in linear TV and VoD, but fragmentation, poor interoperability and high costs constitute substantial obstacles;
- Between 2014 and 2018, representatives of the value chain called for development of a standardized solution in collaboration with ITU-T SG9 and ETSI, which led to the Embedded Common Interface (ECI);
- Critical components of ECI are the Virtual Machine, which creates the software environment in which the ECI client is executed, and Advanced Security layer;
- The ECI Trust Authority oversees all players, such as platform operators, security vendors and manufacturers, to ensure that stakeholders collaborate and trust each other;
- Beyond the ECI Trust Authority, ITU-T SG9 is working on recommendations and supplements which complement the ECI Ecosystem;
- The ECI ecosystem offers standardized advanced security hardware support which can be easily implemented in today's CPE chipsets and can be applied to broadcast and broadband environments, thus offering the consumer flexibility for choice of services from different content providers and platform operators;

8.6 Discussion and questions

- What kind of innovative services are expected for the cable TV? Among others, ITU-T SG9 is developing a new recommendation on cable DTT which defines the basic requirements and interfaces between cable TV operators and OTT providers;
- What are the main areas in which AI can be involved in the broadcasting sectors? All areas are being explored, including AI being used for scheduling, leveraging archives or text to speech accessibility. AI is mainly being used to detect errors and to ensure compliance with regulations;

- Does 5G broadcast represent the future considering there are some barriers such as the difficulty of sharing spectrum between DTT and 5G? Still lot of issues to be solved and some which may be unknown. The goal would be to find business models that can accommodate mobile and DTT operators;
- In the US, mobile and satellite operators are finding market solutions to sharing the C-band (If the FCC approves such agreements). Is this replicable in Europe? Probably not. The C-band cooperation that is currently being discussed in the US will hardly be replicated in Europe.
- Is ECI compliant with specifications from Movielabs? ECI is found not compliant with specifications from Movielabs, but ITU-T SG9 is open to review these specifications to address concerns, if any.

9. CONCLUDING REMARKS

All stakeholders were thanked for their contributions to the workshop and were invited to participate in upcoming activities related to this key topic. The outcomes of the workshop will advance implementation of the European Regional Initiative aiming at assisting countries in need of Cable TV related matters, and bridge the requirements and needs of the various countries with the standards community. It will also contribute to the workflow of several ITU study groups including:

- ITU-T Study Group 9: Broadband Cable and TV;
- ITU-D Study Group 1: Enabling environment for the development of telecommunications and ICTs;
- ITU-D Study Group 2: ICT Services and Applications for the Promotion of Sustainable Development;
- ITU-R Study Group 6: Broadcasting Service.

The workshop concluded with an evening networking reception hosted by Hisilicon, China.

ANNEX A: A CONSOLIDATED LIST OF SUGGESTIONS FROM PANELLISTS FROM SESSION 3 ON THE FUTURE OF ACCESSIBILITY SYSTEMS

Access to the media by persons with disabilities is a 'right', not a 'privilege'. The social model tells us that a disability arises when the environment does not support a person's capabilities. Whilst this is especially important for people who generally need adaptations to the environment, such as those who have difficulties hearing, moving or seeing, a consequence is that accessibility features are used by all people at different times (including older persons, refugees, illiterates, or based on specific needs or circumstances of any users); for example the number of people who will use subtitles is now actually three or four times the number with severe hearing loss.	The application of accessibility tools
ITU should recognize that accessibility can provide business opportunities that can help pay for services. A key concept that must be taken into account is financial viability of accessibility propositions. Further, it should be recognized that the growing aging population makes accessibility systems ever more necessary, and work should be planned accordingly.	The application of accessibility tools
It should be recognized that the needs of persons with disabilities with 'interactive media', in addition to conventional media, are becoming important.	The application of accessibility tools
The media needs of persons with cognitive differences, for example 'neuro-atypical' people should also be incorporated in the related accessibility work developed by the ITU.	The application of accessibility tools

The process of creating accessibility services can begin at the design/script stage in programme making, given this is practical	Production Workflow
The potential need for accessibility services for 360VR should be recognised and developed.	Accessibility Standards
ITU-T Rec H.702 should be circulated to ITU-R SG6 and ITU-T SG9 for possible incorporation in their broadcast and cable systems. H.702 has many features including closed sign language, and a system of video relay to provide telephone calls for the deaf.	Accessibility Standards
The ITU should investigate automatic subtitling systems and methods of slowing down audio playback rate to make it more understandable to the aging population.	Accessibility Standards
The relevant accessibility requirements documents of the W3C should be circulated in the ITU groups concerned for possible adoption, e.g. W3C work on Audio Descriptions (TTML).	Accessibility Standards
Open source projects to develop software for accessible services should be initiated and encouraged.	Accessibility Standards
The ITU should consider adopting a global standard set of icons for different accessibility systems (e.g. the icon set developed for use in Denmark).	Icon standards
Increase the participation of PwDs in the standardisation process. Standardisation should always be done in consultation with stakeholders and end users representatives	Standards making procedures
ITU should provide accessible remote participation in meetings. It should also look into providing automatically subtitling all meetings, and possibly also automatic signing.	Standards making procedures
All ITU (study) groups should coordinate and examine the related Recommendations it agrees to for accessibility implications.	Standards making procedures
Though the ITU-D does not develop standards, ITU-D SG1 Q7 should become a member of the IRG-AVA, perhaps as an observer, to ensure appropriate coordination of related accessibility work among ITU sectors.	Standards making procedures
We must recognize that convergence of media organisations and media technology is occurring, and this should guide our thinking.	Standards making procedures
Standards developed originally for the web (e.g. W3C standards and WCAG 2.1 requirements) are taking over in all media, and this needs to be recognised for all media. This is the manifestation of 'convergence'.	Standards making procedures
The ITU should provide appropriate ICT accessibility policy and strategy advice and develop and/or make available appropriate resources (including through enabling forums of discussion, raising awareness, sharing good practices, building capacity, develop specific tools and guidelines) – to help members to implement the UN CRPD.	Capacity building
The ITU should consider developing and/or offering training course in development and remediation of digital accessible content, and promote the existing video tutorials made available by Digital Inclusion in BDT	Capacity building