

Connected TV Position Paper

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The **Networked & Electronic Media (NEM) European Technology Platform** is leading a move towards a European Technology & Innovation Platform geared around the grand societal challenges. We are an industry initiative launched in 2004 and representing 800+ organisations that cover the whole innovation value-chain. This includes large industries, academics and SME's, telecom operators, equipment manufacturers and software companies, and also content and service producers from many European countries. NEM delivers **sustainable European leadership in the convergence of media, information and communication technologies, by leveraging the innovation chain to deliver rich user/citizen experiences and services using NEM technologies to solve societal challenges.**

Out of the several NEM strategic activities, Connected TV is one of the most relevant topics because it will be a key evolution in the NEM sector for the delivery of innovative media content and services to mass consumer audiences in the connected digital economy.

The European Commission is currently planning a Green Paper on Connected TV for the beginning of 2013 (Refer to Neelie Kroes speech on Supporting the Cultural and Creative Sector on the 26 November 2012), this paper is the contribution of the NEM community.

I- Introduction

Definition

A **smart TV**, which is also sometimes referred to as "**connected TV**" or "**hybrid TV**", (not to be confused with IPTV, Internet TV, or with Web TV), is the phrase used to describe the current trend of integration of the Internet and Web 2.0 features into modern television sets and set-top boxes, as well as the technological convergence between computers and these television sets / set-top boxes. These new devices most often also have a much higher focus on online interactive media, Internet TV, over-the-top content, as well as on-demand streaming media, and less focus on traditional broadcast media like previous generations of television sets and set-top boxes always have had. Similar to how the Internet, Web widgets, and software applications are integrated in modern smart phones, the name "smart TV" is akin to "smart phone".

The technology that enables smart TVs is not only incorporated into television sets, but also devices such as set-top boxes, Blu-ray players, game consoles, hotel television systems, and other companion devices. These devices allow viewers to search and find videos, movies, photos and other content on the Web, on a local cable TV channel, on a satellite TV channel, or on a local storage drive.



A Connected (or Smart) TV set is not necessarily apt for truly hybrid interactive viewing experiences. While, in general, all Connected TV sets have two inputs: one for the broadcast signal (TV tuner) and one for the Internet (Ethernet/WLAN) connection, they do not necessarily offer converged services by making use of both distribution paths. Such a device is usually only equipped for access to proprietary portals for content and applications via the Internet. In addition, some include a slimmed-down browser for viewing regular Web pages, however, usually with limited functionality (which commonly leads to sub-optimal user experiences). This cannot be considered as converged equipment; 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 enabling a seamless user experience, 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 offered via the interaction channel, be it via Ethernet on DSL or via Ethernet on CATV or via mobile broadband networks such as LTE – or via any other IP connection. Truly hybrid systems, for example HbbTV or YouView provide such an engine enabling the necessary signaling within the broadcast transport stream.

The development of new technologies in this market, especially on IP networks, opens up many new opportunities for business, particularly in the NEM sector. For example, connected TV is becoming a rich open platform, where web style applications are projected to bring another wave of economic growth in the NEM industries. Connected TVs as an open platform will deliver a multitude of new applications and services to the home, particularly for the young as well as for the ageing population of Europe and globally.

II- Technical approaches to Connected TV

II-1. Introduction

There are a number of technologies that provide solutions for Connected TV for different markets and commercial models. These include YouView and MHEG-5 (Multimedia and Hypermedia Experts Group) in the United Kingdom, MHP (Multimedia Home Platform) in Italy and HbbTV (Hybrid Broadcast Broadband TV) in many European countries including Germany, France and

Spain with strong interest being shown by others. All the mentioned systems additionally compete with vendor-specific solutions.¹

Across Europe, countries are at different points in their evolution and use of Connected TV. Indeed, even the stage of deployment of digital TV itself varies from country to country. As a result of this and because of differing market requirements which seem hard to align, this has led to a number of diverging Connected TV initiatives with differing technical solutions. Even within a single market we find different technologies in use. In the United Kingdom for example, there is the recently launched YouView Connected TV platform and at the same time the Freesat free-to-air satellite platform is being extended with Connected TV capabilities (also known as Freesat '<free-time>'), which is partly based on HbbTV.

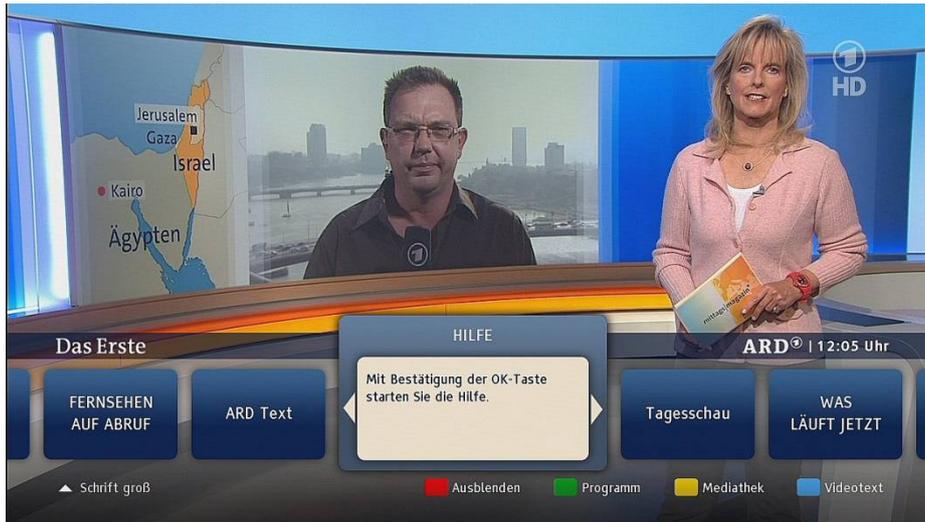
These different initiatives are, however, underpinned by many of the same core technologies and there is significant commonality between the technical specifications. Some initiatives striving for technology convergence can already be witnessed. The UK Digital TV Group (DTG) has published a second version of its Connected TV specification known as D-Book 7 Part B which aims for international harmonisation of the Connected TV landscape. It references the latest version of the HbbTV specifications and includes additional features to meet the requirements of UK service providers (including HTML5). The DTG intends to propose UK requirements to HbbTV for inclusion in its HbbTV version 2.

II-2. Overview of connected TV platforms and specifications

HbbTV (also referenced by **D-Book 7 Part B**) is an ETSI standard (TS 102 796) for interactive multimedia services that may be consumed via a TV screen. HbbTV applications can either be used "stand alone" or can be initiated via a broadcast service (a.k.a. "red button" services). HbbTV is a current industry standard providing an open and business neutral technology platform that seamlessly combines TV services delivered via broadcast with services delivered via broadband and also enables access to Internet only services for consumers using Connected TVs and set-top boxes.

The HbbTV specification in turn is based on existing standards and Web technologies including OIPF (Open IPTV Forum), CEA, DVB and W3C (see <http://www.hbbtv.org/>). The APIs for addressing the broadcast components by the HbbTV applications have mainly been defined in the Open IPTV Forum Release 1 specification, volume 5 ("Declarative Application Environment"). The broadcast signaling and the broadcast transport of applications complies to the DVB standard "Signaling and carriage of interactive applications and services in hybrid broadcast/broadband environments" (ETSI TS 102 809). HbbTV was developed in view of the DVB system family for satellite, terrestrial and cable broadcasting (DVB-S/S2, DVB-T/T2 and DVB-C/C2) as well as for DVB-IPTV networks. HbbTV services can be signaled within the digital broadcast signal.

¹ MHP and MHEG-5 are considered legacy systems and thus not taken further into account in this position paper.



Launcher application of HbbTV as styled by the German Television ARD

After pushing the red button on the remote control, this start page appears (provided the TV set or the settop box is connected to the Internet). By means of the cursor on the remote control, the consumer can select amongst the offered applications (e.g. EPG, enhanced videotext, catch-up TV, etc.).

YouView aims to integrate broadcast and IP-delivered content into a seamless viewer experience through a single programme guide that surfaces content from all content providers. To support this, metadata and images from content providers are aggregated and presented by the YouView guide running on the device. Once selected, IP-delivered content is presented by content providers' own applications which control the associated viewer experience. Doing so allows good end-to-end management of reliability and quality of service delivery and, ultimately, the user-experience.

There are also growing populations of varying 'SMART TV' receivers that implement relatively closed proprietary and vendor-specific portals. The user interfaces developed by major CE manufacturers are embedded in their own consumer products, which aim to connect viewers to services delivered via broadband Internet connections. These also act as gateways to content and services, but cannot really be considered as platforms in their own right in the same way as HbbTV or YouView which are true end-to-end platforms delivering services and content in a managed way so as to provide viewers with a well defined and controlled quality of service and user-experience.

A second type of rather closed (and partly proprietary) solutions is also aiming at much more vertical markets: Google TV and Apple TV. Both of these major US stakeholders have the potential to change the scene in Europe. Nevertheless, they are stepping into an entirely developed market segment and rely on the cooperation of content producers. The expectations seem to have calmed down considerably in the past few years.

II-3. Technical elements

The area in which there is the greatest commonality is in the format of A/V media. H.264/AVC video and HE-AAC audio are supported on each of the aforementioned initiatives.

Media delivery has also significant commonality. HTTP progressive download (also known as HTTP streaming) is widely supported with content packaged in MPEG-2 transport stream or MP4 file format. The aforementioned platforms and specifications have also adopted (or are in the process of adopting) the MPEG DASH (Dynamic Adaptive Streaming over HTTP) standard for Adaptive Bitrate (ABR) delivery.

. MPEG DASH can be used in a number of different ways (also known as profiles) depending upon the different Connected TV specifications which have imposed constraints on its use . Through liaisons between the various standardisation groups, some of these constraints (aka

profiles) have already been eliminated. However, whether content can be created such that it can inter-operate with all the different flavours of platforms remains still to be proven.

Platforms also differ in their approach to content protection with different DRM systems being used. The use of common media encryption schemes adopted by MPEG DASH, even where DRM systems vary, does offer the hope of allowing content to be created and distributed once, even if the devices that play it do not share the same DRM system.

Connected TV platforms support the ability to run applications. Many in the industry hope that HTML5 can become a standard authoring format for Connected TV; but whilst some current platforms support a flavour of HTML, this is not yet HTML5 and there remain differences between the various specifications. HbbTV is currently the only known formally standardised browser-based connected TV system. HbbTV is based on the OIPF Declarative Application Environment (DAE) which in turn uses a basic browser profile derived from CEA-2014 revision A (CE-HTML). It is widely expected that future versions of HbbTV will build upon HTML5. However, the consequences of changing underlying technologies need to be carefully evaluated as every modification poses the risk of rendering existing Connected TV devices useless by making them incompatible. Due to cost pressures, CE manufacturers are mostly reluctant to invest in updates of earlier product lines.

II-4. Future

The existing Connected TV standardisation groups (HbbTV, YouView, etc...) are in liaison among them so that the underlying media formats and delivery mechanisms continue to converge. This should further help achieve the goal of allowing content to be created once for delivery to many connected TV platforms.

However, commercial models will continue to differ and a universal path to a single European content market seems very long.

Working towards greater commonality between application formats on Connected TVs and between Connected TVs the HTML/JavaScript world of the web offers clear benefits for content providers wishing to distribute content via different platforms to many different flavors of Connected TV devices. However, the fast pace of development of the latter makes this very challenging in practice.

A first step towards extending the functionality of HbbTV has recently been made by submitting a new version of this standard to ETSI. This version, Version 1.5, supports, amongst other new features, adaptive streaming (in line with MPEG-DASH). Currently, work is underway towards HbbTV Version 2.0. The features of this version are not yet defined in detail, but the adoption of the recent HTML5 browser standard is on the agenda as well as a number of features extending HbbTV to allow more connectivity in the home network or with personal devices like smartphones or tablets. Also storing and recording scenarios will be extended.

III- Social impact of connected TV

A Connected TV device linked to the internet would be used in a number of different ways supporting applications such as from simple internet access or watching TV to on-line shopping and gaming, social networking, home monitoring, as well as many sophisticated applications that the flexibility of the various standards will enable.

The unlimited possibilities open up by Connected TV - as a family device - could also help in solving one or several Grand Societal Challenges as explained in the following.

III-1. Current status

Following the Lund declaration, six main Societal Challenges were identified for the European Community :

Global warming : Due to air pollution (industry, cars, home heating, ...) CO² is beating the earth protection layer against sun. This implies an increase of the overall temperature which will have big impact in our future life (storms, under sea area extension, dry area extension, ...).

Tightening supplies of energy : Fossil energy will be less and less available, there is a need to find some new resources but also a need to save energy.

Water and food : Due to the enlargement of the world population, it is and it will be more and more difficult to have sufficient food and water for everybody.

Ageing societies : Due to medical advances, people are living older and older and there will be need to help people improve their way of living .

Public health, Pandemics : It is in our basic instinct to live longer and longer, medicine is making great progress but there are always new virus arising, that need great effort in research but also in public infrastructure which increasing costs become linearly difficult to fund.

Security : Due to unemployment, burglars and bad boys are getting more numerous which imply crime development.

From these Grand Challenges the Information Society & Media clusters have identified 5 main areas where ICT could contribute :

Smart energy grid : Energy grids will increasingly face risks of congestion and blackout. Internet connectivity, computing power, digital sensors and remote control of the transmission and distribution system will help to make grids smarter, greener and more efficient,

Smart environmental information system : the use of sensor networks for collecting real or near real time environmental data is a growing field of application. It requires Internet connectivity for data management, dissemination and integration in complex information systems

Smart systems for transport and mobility : Putting 'intelligence' into the roads and cars with Intelligent Transport Systems (ITS)– with e.g. sensor networks, radio frequency tags, and positioning systems offer a promising alternative. The internet provides a solution to interconnect these diverse technologies and bring more efficiency to mobility through real time management of public and private transport resources, traveller information and decision-making tools, way beyond the capability of current solutions

Smart healthcare systems : Current research experiments aim to develop technologies for 'ambient' environments capable of assisting patients and satisfying their information and communication needs. These technologies combine devices (sensors, actuators, special hardware and equipment), networks and service platforms to harness information about medical conditions, patient records, allergies and illnesses

Smart culture and knowledge : European culture is very rich and European people are so creative that we will be soon overflowed by information and archives. Albeit search engines become more and more powerful, there will be a need to help people into content management including helping people to "clean" their information wherever it is stored

III-2. Future directions

Analysing these challenges with regards to the Connected TV concept, we could make the assumption that such a device should contribute to :

Smart Energy Grid : this new device should not add new consumption as far as it should replace the existing TV screen but with its internet connection, it should be able to inform in real time about the home energy consumption using specific sensors. A web service could also provide to its users with energy consumption forecasting analysis and provide suggestions on how to decrease it.

Smart environmental information system : Environmental sensors will be more and more numerous and will be connected to the internet collecting information.. This sensor information will be analysed and if necessary public authorities could alert citizens about a potential environmental risk. These alerts could also be sent to Connected TV, in particular this information could be displayed over-the-top on the content.

Smart systems for transport and mobility : Similarly with the previous item, Connected TV could provide access to a specific channel where people could access information on traffic (car, public transport, plane, ...)

Smart healthcare systems : This has the objective to help people achieve and maintain a better state of health and also to reduce the cost of medical service. One of the main points is the “hospital at home” concept where people stay at home and are treated remotely. In this field, connected TV should provide a great help as far as it could provide individual coaching by displaying specific content. It could also provide video conference services between patients at home and doctors at hospital.

Smart culture and knowledge : This topic is obviously the key sector for connected TV, in that at its core is a TV able to display content. This challenge addresses mainly the culture heritage preservation (storage, security, ...) but as far as this content is preserved, it could be accessed by anyone. This content will take several forms in the future (2D, 3D, HD, and beyond to Ultra HDTV and other immersive formats ...) and connected TV should have a central role in this field.

Connected TV brings new opportunities for the provision of a wide range of new services but also new challenges, including technical, societal and commercial/business ones. One of those is about possible changes in existing distribution models and distribution arrangements/agreements.

Broadcast platforms, which remain highly efficient at delivering the same content simultaneously to large audiences (especially for major national and international live events) are facing an increasingly challenging environment, and it's quite probable that in the future more and more distribution of services to the Connected TV will be done via the Internet to smaller niche and fragmented audiences. Internet based distribution models are principally characterized by its bi-directionality, its return path, its capacity for interaction and its ability to collect information about the habits and preferences of individual users.

Digital revolution and Internet have already had a great impact on “good old” TV, generating new platforms and standards (content delivery, video streaming, user interfaces) and making available new TV services, such as Catch-up TV. In fact, the digital revolution during the last several years was all principally about making linear conventional broadcast material available live, on-demand and through multiple Internet devices. It was mainly based on re-presenting and distributing existing forms of content and distribution model rather than generating new forms of digital content enabled by new platforms and distribution model.

Exploitation of this new “bi-directional” environment on Connected TV need also new forms of content for interactive platforms shifting the principal characteristic of that content from being live, linear or on-line to being “living” during the whole life cycle. Creating, assembling, editing discovering, presenting, consuming content in the new environment will involve social recommendation, other forms of social participation and curation with a much more influential role, but creative confidence, respect, trust, ownership, provenance and rights management should be guaranteed too, and many of the systems and processes for these in the new digital age, remain to be fully developed. Involvement of creative, cultural organizations and communities such as creative artists practicing new ways to tell stories, educators dealing with new learning techniques, various fan communities could be a way to keep relationship with multiple, fragmented and targeted audiences. Content consumption can become a collective and participatory process, part of a collective intelligence influencing/reshaping popular/mass culture.

IV- Business impact

At the recent CES (Consumer Electronics Show) held in Las Vegas in January 2012, as well as IFA in Berlin and at IBC in Amsterdam (August and September 2012, accordingly) manufacturers and publishers have revealed their latest Connected TV innovations.

The future of television, connectable and connected, will fundamentally revolutionise broadcasting and new media through the desecration of the original TV signal.

With the future of television, traditional TV players have to share the screen, which will completely change usage and business models. Both, use-cases and business models will need to be re-invented.

Connected TV contributes already to audience fragmentation; and videos arriving directly through the Connected TV do not contribute to finance content creation. Both items are considered, especially in France with its “cultural exception” (*exception culturelle*) and legal obligations for TV channels to co-finance content productions, as a risk for traditional television.

To understand and anticipate the business impact of Connected TV, we gathered some documentary research that reflects the changing media ecosystems, then we provide an overview of the current status with respect to existing services and usage and conclude by indicating some future directions based on market forecasting figures and perspectives.

IV-1. Changing ecosystems

Connected TV heralds profound changes through the collision of two worlds organized and regulated separately. The challenge is to operate tomorrow’s “crystallization” of viable business models through the whole value chain, converge the interest of concerned (key) players and respond to (potential) multiple users’ interests.



The Connected TV revolution should be understood as more complex and a lot larger than the new Smart TV currently offered by manufacturers.

It affects different industries and converges towards multiple partnerships between different market sectors: broadcast, production, IT, telecom, web, consumer electronics, video games, media and advertising.

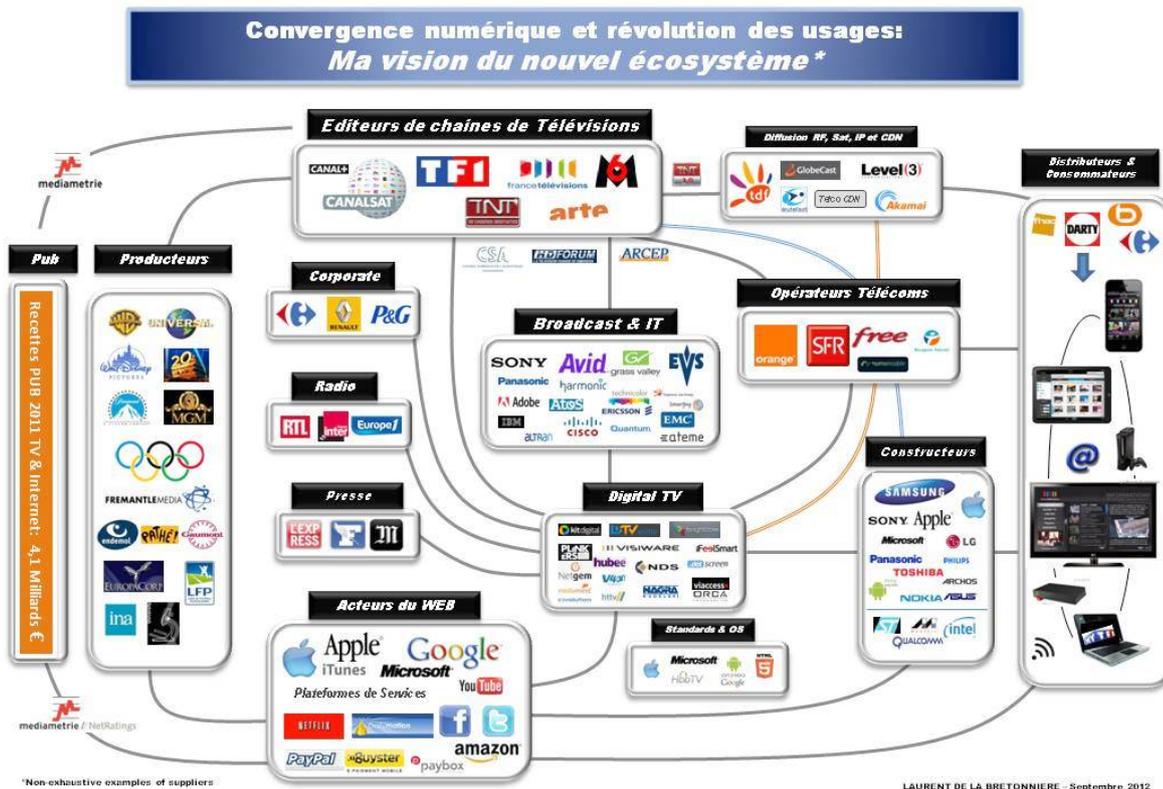
Competitions vary, financial stakes are enormous and business opportunities and innovations grow steadily. A new model of multi-screen interactive television is to be built to accommodate changing uses and impacts. At the same time, the advertising model of linear TV is surrendered by social networks and consumption on mobile screens and tablets.

The transformation underway will certainly favour leaders of tomorrow: those who offer the “best mix of content, services, networks, prices, terminals and user interfaces.”

Today, no single player alone represents all values of the chain and partnerships are therefore essential. Especially TV channels must rely on innovative solution providers to build new models of television media.

As the playground is changing transformation strategies are being/need to be deployed. It is therefore important to consider the role and influence of each stakeholder within the new ecosystem under construction²:

² <http://www.la-television-connectee.fr/ecosysteme-tvconnectee/#more-2900> accessed October 2012



Going one step further to favour various innovation and industry deployments, it is necessary to question creative and content financing: (1) What is the market's ability to finance the explosion of cross media content, services and applications? And (2) As brands and advertising finance parts of the audiovisual industries, how will they increasingly contribute to content production?

The upcoming interactive advertising on Connected TV raises also business and ethical questions like where the potential goes in terms of mass media models *and* the individual power of internet (profiling, CRM, personalization, geo-location, "big data" potential, socio-demographic and behavioural surveys/data mining) and the consumer protection.

The following highlights some considerations of where we stand and where we go.

IV-2. Current status

Connected TV is already a "reality" in the sense that services are being developed and consumers are buying Connected TV sets. The next section will focus first on examples illustrating what Connected TV is all about and secondly we put together some indicators about changing video consumption habits.

IV-2.1 Existing connected TV services and usage

Connected TV is not just for CE manufacturers with ambitions to provide a gateway to online content. New connected TV configurations go from linear broadcasting to on-demand consumption, integration and exploitation of Internet services used on other devices, personalized user experiences, social networking and user participation. A selection of screens gives an example:

NEM Position paper on Connected TV



Google TV by Sony: a search engine as overlay system to traditional channels



Interactive fitness applications on connected TV



At least four VOD services (offered by Smart TV LG)



Integration of Twitter within a TV program (Panasonic)

Connected TV has introduced so far 5 main innovations with interconnectivity, interactivity, social networking, open environments and innovative content and services³:

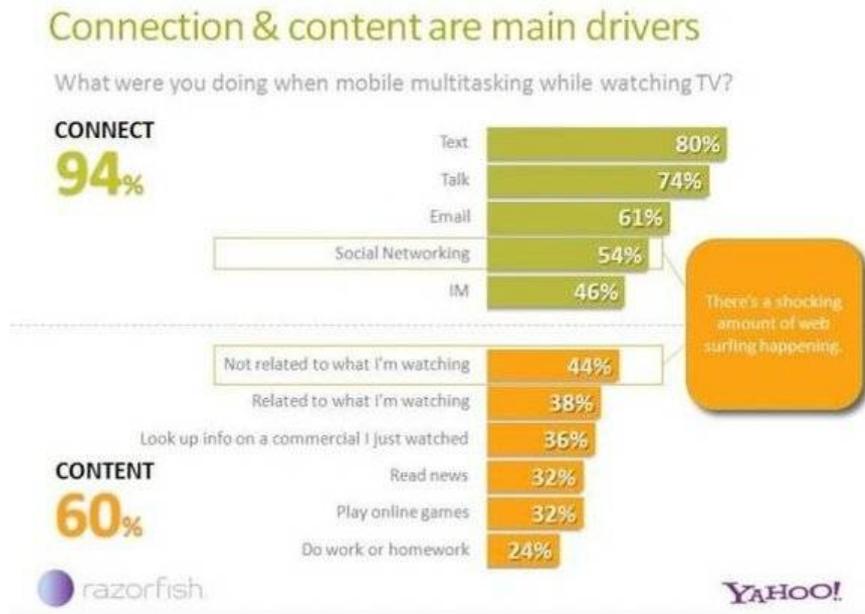
- (1) It is interconnected:** currently it is possible to connect more devices to the TV set, to connect it more easily to the Internet, but also wireless communication technologies between electronic devices are evolving (DLNA, AirPlay, WiFi). That makes television more receptive to content from all sides. 27% of TVs are now DLNA compatible, supporting sharing of cross media devices for all family members such as movies, photos and Internet consumption,.

³ This part is largely borrowed from ideas of: Pascal Lechevallier, La télévision du futur: connectée, sociale, interactive, ZDNet.fr, 19 February 2012, in: <http://webcache.googleusercontent.com/search?q=cache:VsJ6uwZDxFAJ:www.zdnet.fr/blogs/digital-home-revolution/la-television-du-futur-connectee-sociale-interactive-39768728.htm+&cd=9&hl=fr&ct=clnk&gl=fr>



- (2) Interactive:** the introduction of remote controls (i.e. on mobile devices through a simplified keyboard and a trackpad) facilitates exchanges between the viewer and the TV channel. Navigation interfaces are becoming more and more intuitive, facilitating the switch from a programme to a service, from a TV show to an application. Increase use of PopUps in most popular channels open up new opportunities to inform, entertain, advertise and sell new services. The ability to interact with an advertisement for example (directly on the TV screen or via a second screen) can lead the user to discover and access a (personalized) commercial offer, which strengthens the relationship between the target audience (user, consumer) and the originator (commercial brand / advertiser or TV channel itself).
- (3) Social:** social networks are increasingly integrated into strategies of programme producers and TV channels. Whether on the main screen reserving a space for social networking or simultaneously on a second screen, it strengthens the link between programmes and viewers, brands and consumers. Social networks allow sharing content, comment and voting. The simultaneous monitoring of the Timeline (through overlay on the TV signal) on a tablet or a smartphone seems now obvious. This is why all manufacturers now offer to integrate not only Facebook and Twitter into their interfaces, but also Skype and probably very quickly social networks like Pinterest or the highly visual Pearltrees.
- (4) Open:** connected TV is a phenomenon that breaks with past closed TV models, independently of whether they are broadcast, IPTV or ISP models. Users watch television while doing something else, not necessarily directly associated with the programme they watch. This "multitasking" requires that traditional broadcasters open their environments, that producers think and integrate multitasking in the content production process across all devices. Connected TV means:
- sharing images on different screens,
 - inserting additional information, not just video, on the TV screen,
 - reinforcing or strengthening the link/relationship between a programme, brand and viewer.

Connection and content are main drivers of new usages:



Multitasking in numbers: connected TV, shared TV

(5) Innovative: through the ability to deliver new services and experiences directly on TV screens, connected TV opens the door to innovative content and services, for example:

- a. **Video on demand services:** already well implemented on IPTV and on game consoles, they now appear on Smart TVs. In the United States, major services are delivered through Netflix, Hulu, Vudu, CinemaNow, offering consumers thousands of movies and TV shows. In France and Europe, major VOD services are present. Looking to the future, it could be possible that right holders may offer their own catalogues on Connected TV, without intermediaries. (Especially if major content producers, such as US movie studios, are divisions of multinational organisations that also include consumer electronics companies)
- b. **Interactive fitness services:** manufacturers have developed highly sophisticated services allowing users to do programmes of physical exercises, instructing them directly on the TV and monitoring performance via the big screen.
- c. **Applications galore:** reproducing the mobile app store systems, TV equipment providers open the doors of television to all publishers/editors who want to promote their content as if it is on TV.

Sharp and its ecosystem SmartCentral



LG Android Market



- d. **Transmedia search engines:** Google TV and Sony's Connected TV focus on an interface, which allows users to search for transmedia content, and which gives search results that combines broadcast and Internet sources. For example, it is possible to get, for a particular movie:

- all TV channels, where the film is being broadcasted,
- the list of all corresponding trailers on Youtube,
- a link to websites that offer DVD sales.

This is a kind of going away from intermediation and desecrates the TV signal. Nevertheless, Google TV is not a broadcaster as such (and indicates it does not intend to become one); they position themselves as a TV search engine in personalizing the research results and guiding users where to find and watch their choices.

- e. **TV Channels on demand or the emergence of Brand Content:** brands have realized the importance of being able to build a personal relationship with their customers directly on the TV. The bank BNP Paribas has launched, within the

MSTV trial⁴, its own channel, both on terrestrial broadcasting **and** on SmartTV portals of Toshiba, Samsung and Philips. Another example is the website Féminin.com who partnered with LG to open a dedicated TV channel for the brand. Regularly, brands or advertisers aim to establish video offerings for Connected TVs, because Connected TV allows brands to establish a direct relationship with their customers, which comes in addition to their mass communication through TV advertising.

“Eco TV”, the Brand Content TV Channel of BNP Paribas



Screenshot of Brand Content TV Channel Au Féminin.TV



All these innovative services and applications question industry players' strategies, legislators, regulators and future directions:

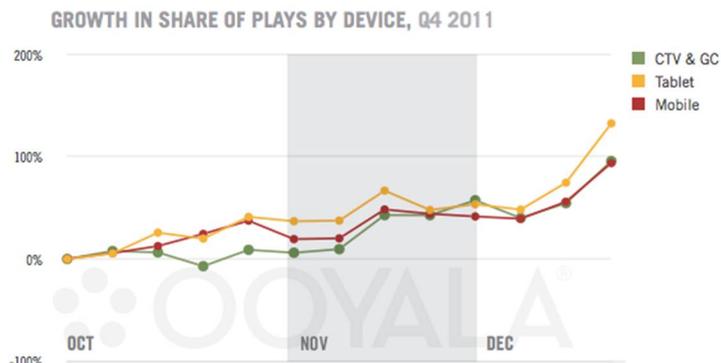
- How to ensure TV signal integrity in an interactive and personalized environment?
- What standards should be favoured to ensure interoperability between devices?
- How to qualify the new editors of nonlinear services with regard to the SMAD status?
- How to deal equally TV channels and newcomers based on Internet services concerning non authorized areas on TV advertising?
- What positioning for national or regional TV channels facing Internet giants operating internationally?
- What kind of consumer protection?
- Who will pay what tomorrow?

Simultaneously to these existing Connected TV services and applications, viewing habits are fundamentally changing. In the following, we will give some indicators as an overview of the changing landscape of video / media consumption.

⁴ www.messervicestv.fr

IV-2.2 Indicators for Changes in video watching

(1) Raising video plays across all media devices: Video plays on tablets, mobile devices and Connected TVs nearly doubled in Q4 2011 compared to Q4 2010, according to the American digital video analyst and OVP (Online Video Platform) Ooyala⁵.

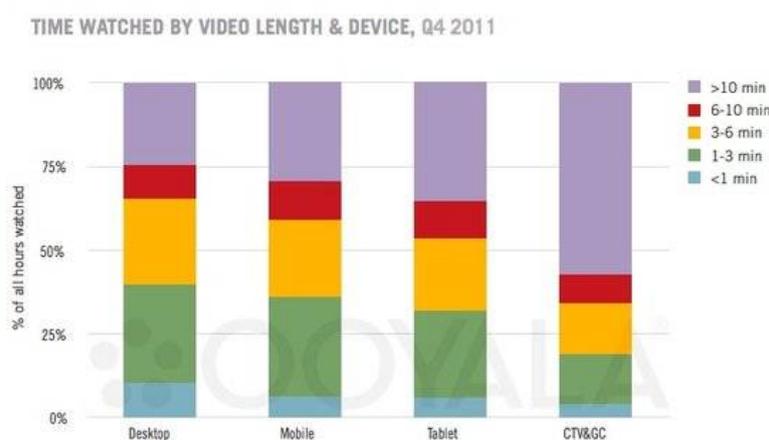


Ooyala's report found that viewers watching on Connected TV devices and game consoles were the most engaged in Q4, completing videos at a rate of 47% followed by tablet viewers at 38% of videos completed.

(2) Simultaneous cross media usage: Looking more closely at engagement, tablet owners watched 21.9% longer per video in Q4 compared to Q3 suggesting that users are becoming more comfortable watching long-form content on the device. Audiences are also increasingly consuming enhanced content on companion screen devices, either additional content associated with the main (connected) TV screen; or content that is independent of the main screen.

However Connected TV is still the king of engagement, with long-form video accounting for 57% of the hours watched on a Connected TV or games console.

The data also shows that connected TV and games console users watched 28% longer per play on average than desktop viewers.



(3) Social video sharing: Ooyala also looked at how viewers are sharing content through social media. Facebook is far away the most popular platform for sharing content with more than 10 videos shared for every one on Twitter. Their data set covers apparently video plays across more

⁵ www.ooyala.com and <http://econsultancy.com/fr/blog/9025-video-plays-on-tablet-mobile-and-connected-tv-doubled-in-q4>

than 5,000 domains in more than 130 countries.

(4) Increasing VOD watching: Whether in the United States⁶, or in France⁷, 85% of pay-TV customers watch their VOD programmes on their TV. And while watching a VOD movie, they do not watch TV. Interestingly, the (physical and dematerialized) video market brings to the audiovisual programme market a turnover of more than 1.5 billion Euros per year. Thus, sharing the screen is profitable for the entire industry, even for TV channels that have diversified their activities towards video and on-demand services. TV channels learned to “keep control” of the signal for linear and non linear services. The channels are no longer directed to viewers only, but started to personalize services to the user in front of their television, computer, tablet, or smartphone. The brand's digital arms for example record more views via Internet rather than on TV. French first channel TF1 i.e. recorded 100 million videos viewed in October by 8 million users.

All changes of user and consumption habits through new services will inevitably question market changes and lead to new market impact and business models.

IV-3. Future directions

Generally dramatic forecasts show growing Connected TV market indicators. In the following we put together some estimated market figures from different sources to give an overview about expected perspectives.

IV-3.1 Market figures and perspectives

According to a report on the new forms of television, published by institute Idate⁸ in July 2012⁹, some major trends appear as follows:

(1) The world television market is estimated at €340 billion in 2012 and expected to experience a steady decline in growth up to 2016. Nevertheless, the most structuring element is evidenced by the success of OTT video offerings in the United States, either with Netflix streaming 22 million subscribers in Q1 2012 (+9% compared to Q4 2011, for an income of more than 500 MUSD in the quarter) or Hulu, which periodically saves more than 1.5 billion ad views streaming video per month, Hulu Plus reaching 2 million subscribers in Q1 2012 (+33% compared to Q4 2011)¹⁰. Europe has no similar case for the moment. For example the beginning of CanalPlay Infinity appears mixed in France with 25,000 subscribers in Q1 2012, the weight of the USA strengthens its global market for OTT (Over-The-Top) video, and therefore on the Connected TV issues.

(2) In 2020, the Connected TV market is expected to represent a significant part with 63% of the new services for the OTT market, the PC becoming then a minority.

⁶ See analyst group NPD

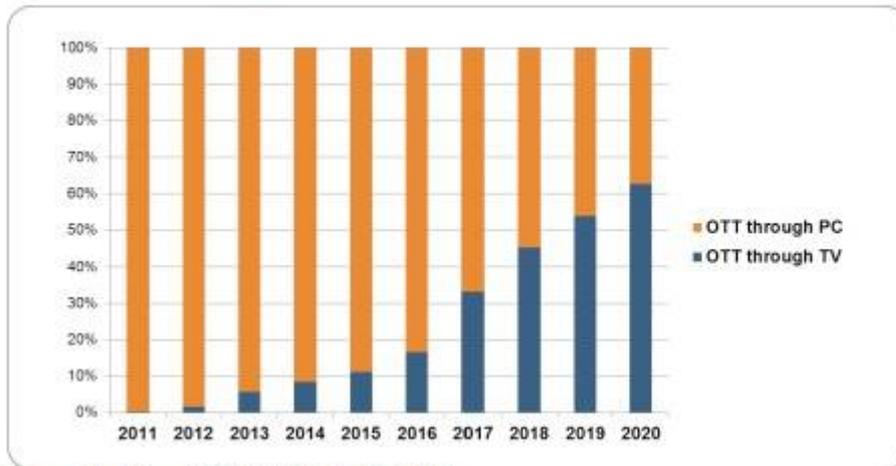
⁷ See GFK and CNC

⁸ www.idate.fr

⁹ Next Gen TV 2020, Idate, July 2012, annonce in : www.idate.org/en/News/Next-Gen-TV-2020_745.html, see also: <http://blog.idate.fr/?p=2806/lang-pref/en/>

¹⁰ <http://blog.idate.fr/?tag=tv> accessed October 2012

Breakdown of the global OTT services market between the PC and the TV – 2011-2020



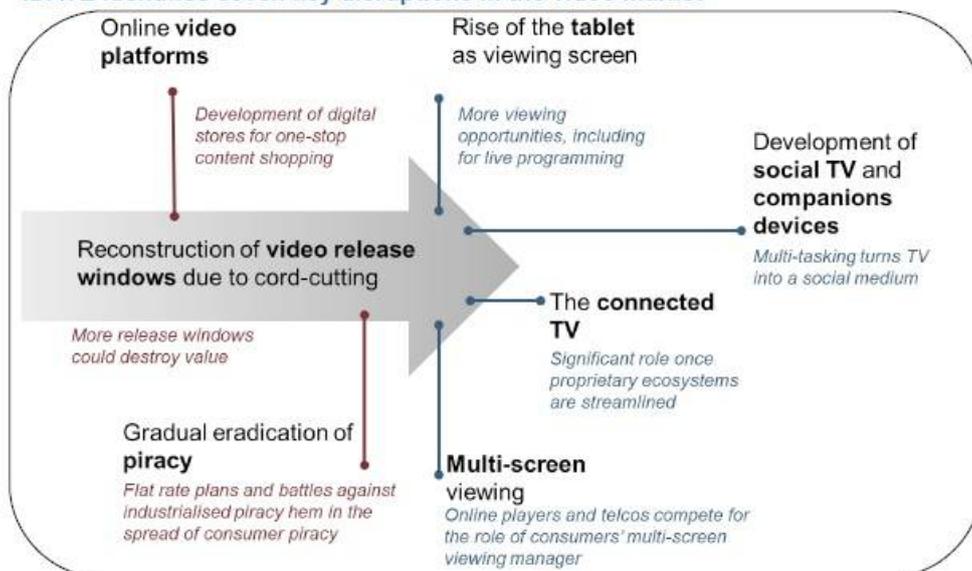
Source: Next Gen TV 2020, IDATE, July 2012

(3) The study also indicates that "the proportion of new on-demand services will grow by 3% of the global market for video services in 2011 to 12%, and in 2020, with a much higher level in industrialized countries".

(4) Furthermore, the study identified 7 disruptive key elements within the video market for the coming years:

- reshaping of the TV/media exploitation windows,
- gradual containment of piracy,
- video distribution platforms on the Internet,
- tablet screen usage as video player,
- TV going increasingly connected,
- multi-screen use,
- development of social TV and "companions devices".

IDATE identifies seven key disruptions in the video market



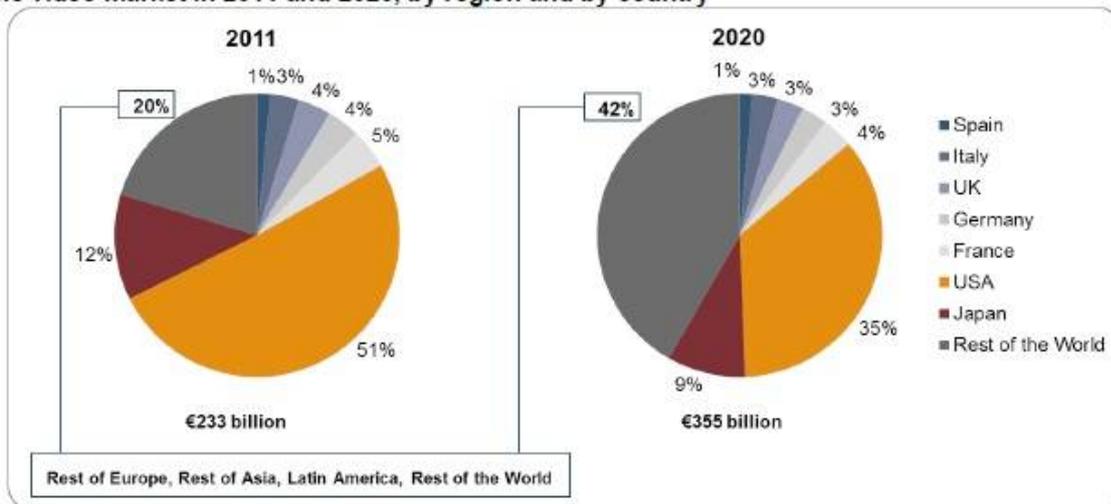
Source: Next Gen TV 2020, IDATE, July 2012

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(5) Moreover, according to the forecasts of the Institute, the global video market should be worth 355 billion Euros in 2020 against 233 billion in 2011, an average annual growth of 4.7%. The study notes, however, that this growth will be heterogeneous across geographical regions. Thus, while the five major European countries, Japan and the United States accounted for 80% of the video services market in 2011, their share is expected to fall to 60% by 2020, as new markets emerge and grow.

The video market is estimated by zone and country as follows:

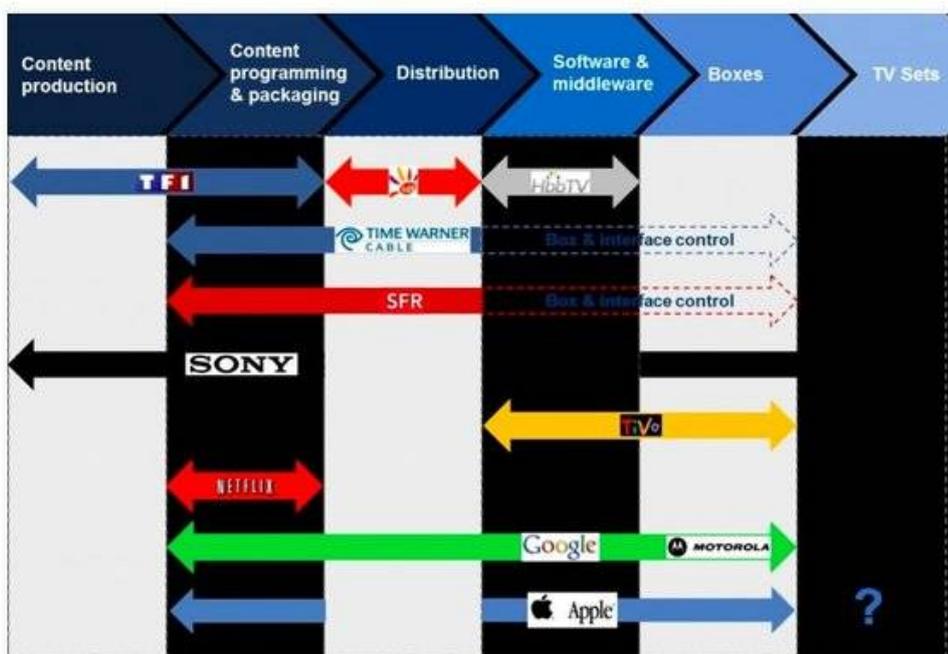
The video market in 2011 and 2020, by region and by country



Source: Next Gen TV 2020, IDATE, July 2012

IDATE also forecast an explosion of services on Connected TVs, which will inevitably lead to restructuring the markets and a re-positioning of (namely traditional) market players. Forecast revenues for services on Connected TV are estimated at 3.4 billion US\$ in 2015, of which 24% concern the European countries (816M€).

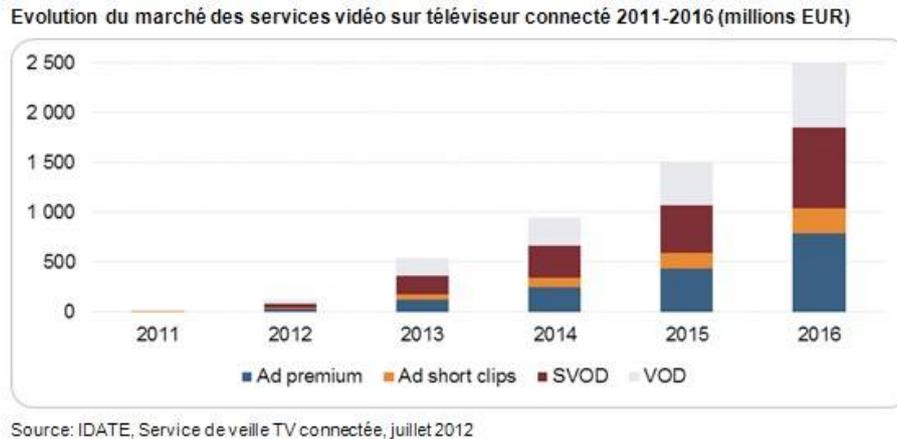
OTT & Hybrid distribution chain: war-time?



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According to IDATE, the global market for connected TV services will reach EUR 2.5 billion in 2016. This market represents 16.8% of the OTT video market and about 1% of the global market for fixed video services. These figures are said to fit their overall analysis of the deployment of connected TV services that anticipates a market launch in 2013.

The slip from content to the devices is questioning the distribution model, as television, connected to its environment, becomes a new area of expression opening perhaps future directions we probably ignore today.



IV-3.2 Towards pay-services

Even a number of Pay TV platform operators are now using this model to introduce new services and target a wider market, via broadband, than would be possible relying on existing cable or IPTV infrastructures.

Some satellite operators who already have national reach are using Vonconnected TV devices to target free-to-air homes. Will there be a trend for standalone VOD packages that compete with online movie aggregators, or even reduced versions of the full Pay TV bouquet? May they become one of the driving forces for Connected TV?

There are a number of things that are stopping the Pay TV industry from taking Connected TV even more seriously. There are still fears about content protection and Quality of Service (QoS) for Internet delivered video. Like everyone, they are also monitoring the reward-to-effort equation and they would move faster if there were more devices in the market that were connected and development of applications was easier. Moving forwards, rationalising the development environment is a priority for everyone.

For online content publishers, including niche video services, Connected TV is now a proven route onto the television that most of them could not have afforded through traditional distribution. It seems clear that when the CE vendors get together with online publishers or with broadcasters it is a win-win situation. But Connected TV platforms initially threatened the Pay TV industry by competing as the point of entry to entertainment services, and by providing consumers with other paid viewing options, some of them compelling.

Leading online VOD providers are demonstrating the great potential for this model. Meanwhile, it is hard to see how broadcasters can lose once they take their compelling linear channel content, package it into non-linear formats and make it available where people really want it: on the TV rather than the PC. And if they want to diversify their businesses with some paid VOD, the television seems the place to be.

The impact on the global market for audiovisual Pay TV¹¹

Idate believe that the development of OTT offerings in general, especially the Connected TV market will impact on linear television, in different proportions in different territories.

In the United States they expect almost no growth in the market for linear television, particularly as a result of lower rates of pay television subject to competition from OTT offerings. On average over the period, they anticipate a similar trend in the overall market (linear television and new services) in common, but probably negative in real terms.

They anticipate a more favourable situation in Europe. On the one hand, in developed European markets, there is still growth potential for pay TV and the price levels will limit the impact of competition on linear OTT offers. On the other hand, the countries of Central and Eastern Europe have a strong growth potential.

IV-3.3 Advertising and brand involvement¹²

Advertisers and brands are looking closely to the evolution of connected TV. They develop dedicated websites for brand content and connected TV, which certain players already consider as the direct marketing distribution channel of the 21st century.

Interactive advertising questions traditional value chains and may provoke recompositions as to reach consumers, advertisers and their agencies can deal independently from regulated audiovisual services with distributors, OEMs, web sites or application and software providers. Access to consumers is split between operators; brands develop a direct (one-to-one) relationship with the consumer via the Internet, and also geolocation and personalization of services. There is also the issue of consumer protection and management of personal data.

Most devices rely on a dedicated channel or a "mini-site" that belong to the advertiser, and where the viewer is directed when clicking on a banner in the operator's interface (programme guide services, information such as weather, news) or on a banner, which is superimposed on an advertising spot on the TV screen. The largest advertisers in the United States (who are advanced compared to European advertisers), such as Procter & Gamble, Johnson & Johnson, Unilever, Kraft Foods, integrate increasingly interactive advertising TV campaigns. Nevertheless all distributors/operators have platforms with different technical specifications. Therefore the interactive advertising development involves solving problems of technical interoperability, business models, and also regulatory affairs.

Three major trends concerning interactive advertising on Connected TV are as follows:

- (1) **TV and Geomarketing** allow new tactical options for campaigns with more focus oriented and better targeted services. TV goes from mass media communication towards local and personalised in-depth consumer information. Both approaches are complementary, with an economic equation probably more favourable for channels with few audiences.
- (2) **Personalization through customization** means that brands go towards real "customer relations" (CRM): the advertiser is able to maintain brand preference in pushing offers that match with the interests of the viewer/consumer (expressed directly by them or implied by the analysis of their behaviour). Furthermore it allows measurement of the impact of new forms of engagement close to direct marketing. Finally, it represents the continuity / extension of domestic SoLoMo (Social, Local and Mobile) services: check-in at home with

¹¹ <http://blog.idate.fr/?tag=tv> accessed October 2012

¹² More detailed information and issues in the following report : Hadmut Holken, Publicité Interactive sur TV connectée, issu des groupes de réflexion menés au sein de Think Digital, le Think Tank de Cap Digital, July 2012, in: http://www.capdigital.com/wp-content/uploads/280912_Synth_Pub-interactive_V9.pdf

targeted (local) advertising messages. Advertisers clearly express that they want to accompany their (potential) customers to take a purchase decision, when getting in dialogue with them.

- (3) **Personal data management.** We do not insist here on already existing regulation/legislation or initiatives of co-regulation through deontological charts. Advertisers expressed that they want to set “win-win” strategies, when collecting the data and when pushing the personalized advertising to the viewer/user, according to their wishes. The combination of personal data collection and navigation behaviour opens the way to very precise and strong personalized customer targeting. This raises the question, where the (technological and regulatory) balance should be established between consumer protection, trust, and economic viability? To answer this questions there are still many discussions, negotiations and workshops under way, and business models need to be re-invented.

In terms of regulation, Connected TV raises questions that should be also addressed from a technological point of view:

- audience fragmentation of traditional channels with eventually declining revenues and less financing for audiovisual creation,
- (perceived) unfair competition from Internet players for channels who participate in the financing of production, Co-financing of a creative / artistic work (to be invented): any company that makes income from creative exploitation should participate somehow in financing the creation,
- Different access possibility to various ads (many limitations for broadcasters)
- No specific rules for FAI on media chronology
- Consumer and especially minority or youth (and children’s) protection,
- Co-regulation can help to reach agreements between traditional players and major Internet operators.

To reach at least professional consensus to make Connected TV markets happen is one of the player’s goals. They are looking for rules that should be applied at least at a European level, but also at deontological charts.

To respond to such expectations the French regulatory body CSA set up 5 commissions/ working groups¹³ about “monitoring Connected TV”: business and competition, financing and creation, protection of sensitive (personal) data, new advertising formats and technological skills.

IV-4 Smart TV – Smart Home – Smart Energy – Smart City

Converging trends

Smart TV should be considered related to Smart home – smart energy and smart city developments -, because the digital world and the four? screens are omnipresent. These keywords were stars at last IBC (Amsterdam) and IFA (Berlin) shows.

Smart TV will become one of the key user interfaces for any services as PC, Smartphone or web tablets are today. So, considering all the future services belonging to Smart City, Smart Home, Smart Energy, Smart xxxx, domain that will be available thanks to IPV6 (sensor addressing capabilities), it is obvious that Smart TV will be used to access to such a service if the ergonomics are attractive.

¹³ Announcement: <http://www.csa.fr/Etudes-et-publications/Les-dossiers-d-actualite/Une-commission-de-suivi-pour-la-television-connectee>

Video announcement: <http://www.csa.fr/Espace-Presse/Conferences-de-presse/Installation-de-la-commission-de-suivi-des-usages-de-la-television-connectee>

IV-5 Accessibility and Media: personalized services for all

IV-5.1 Strong Mass Market Opportunities

According to [ITU's focus group](#) on audiovisual media accessibility, an estimated 15 % of the world's population lives with a disability. If family members or care-givers are included, one quarter of the global population is directly affected by disability. Adding the ageing population means that more people than ever will be living with a disability in the future. According to ITU, *"information and communication technologies (ICTs), embedded in apparatus, are already transforming the lives of many disabled people, through aids to mobility, speech and hearing, and the performance of everyday tasks. For its part, ITU strives to ensure that ICTs as a means of communication – and the myriad and multiplying benefits and opportunities they bring are accessible to all, including those with disabilities"*.

[EDF](#) (the European Disability Forum) counts 80 million people with disabilities throughout Europe¹⁴. [Age Platform Europe¹⁵ refers to 100 million ageing people throughout Europe. As a mix, this represents an estimated 40%+ of the European population. These indicators will increase with the European ageing population. Ageing people represent market segments towards 60, 70 or 80 year-old people¹⁶ possibly interested in or in the need of personalized services. At the same time, different impairments require different personalized services.](#)

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.

Legislative constraints¹⁷ may even be perceived as a strong lever, creating added value for users and stakeholder communities by moving from obligation to opportunity and real market visions. All together, accessibility is expected to bring new opportunities for the value chain and especially end-users benefits, whether they have impairments or not.

In the above mentioned ITU text, the organisation encourages development of products and services aimed at increasing accessibility, such as the "Total Conversation Service", a flexible interface that merges voice, video and text telephony. Like user representatives, ITU also promotes the principle of "universal design"¹⁸.

As they underline, "the need for "accessibility" is not confined to people with physical or mental disabilities. Anyone can be permanently or temporarily "disabled", for example, if they try to receive a phone call in a noisy environment or speak a language for which there are few internet resources. Rather than treating accessibility as important solely for addressing the needs of people with disabilities, elderly people or those with temporary impairments, we should regard accessibility as a universal requirement that aims to ensure that ICTs of all kinds can be used with ease by people with the widest range of capabilities. In this way, all the world's people, whatever their individual abilities or disabilities, stand to benefit from an "accessible ICT world".

¹⁴ Nadège Riche, Media4D [presentation](#), Paris, 30/03/2012

¹⁵ [AGE Platform Europe](#) 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."

¹⁶ Michel Riquier, Introduction discourse, Media4D conference, Paris, 30 March 2012

¹⁷ The Commission set up a legal framework in 2007 with the ["European i2010 initiative on e-Inclusion - to be part of the information society"](#); 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 Directive](#) in 2010

¹⁸ This is defined by the UN Convention as the design of products and services to be usable by everyone to the greatest extent possible, minimizing the need for special adaptations or different devices for people with disabilities.

IV-5.2 Individualization and Personalization of Connected TV Products and Services

With respect to 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 prime screen (or prime loudspeakers, respectively) or can be consumed via a second screen. The beauty is that these services can be made adjustable to the individual needs of the users. The technical challenge (not yet standardised) is to time-synchronize the broadcast and the IP delivered content.

The following depict such solutions for a show case of HbbTV:

In principle, HbbTV can be used to provide any access service required: Signer video, audio description, spoken subtitles, multi-lingual text subtitles, multi-language sound tracks or additional sound tracks with clear(er) audio dialogues, etc. Today, HbbTV is already of help to people with viewing difficulties as the new text-services provided by HbbTV are much better to read than the conventional videotext service and, in some instances, already offer personalisation options for further improving readability through extended font sizes and various colour options (adapting colour contrast to individual needs). Further access services like, for example, an application which allows for individual configuring of subtitles in terms of their size, position or background are in experimental or pre-operational stage.



The inscription says: Via Internet, a signer video is available for this programme – switch it on now?



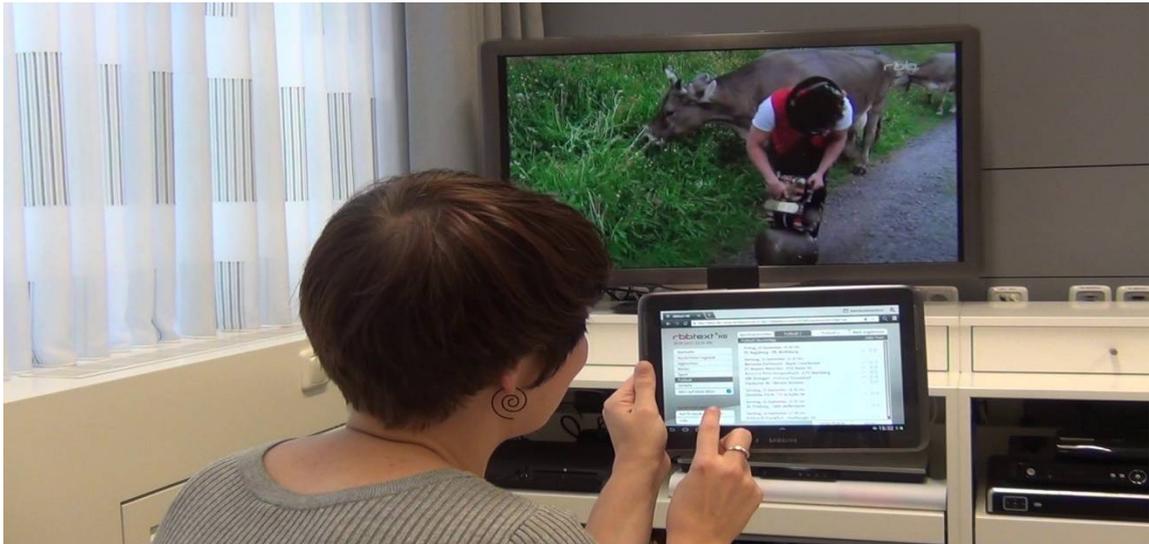
Example of a signer video (delivered via the Internet) superimposed with the main broadcast video



Selection of personally adjustable subtitles from the start page (launcher application) of HbbTV



Menu to select size, appearance and position of subtitles



Example of 2nd screen usage (IRT demo in cooperation with rbb – shown at IFA-12)

The HbbTV application can be switched from the main screen to the second screen (in this case a tablet PC) – The broadcast TV signal remains on the main screen, also an ideal solution for additional audio services such as audio description, clean audio or spoken subtitles (with or without the mixed original sound)

IV-5.3 Future Research Activities on Connected TV to improve accessibility – for all

Especially from the user perspective, it seems to be interesting to develop the research on accessibility to connected TV in the following ways:

1. Automatic translator to the sign language

The translation into sign language for the TV broadcasting and also for telecommunication purpose is very costly. There are not enough translators to meet the needs of hearing impaired users. It would be useful to make research on this matter. It is even more difficult to turn a text or a speech to sign language than turning a text to speech. It requires a kind robot on the screen speaking the sign language. Being able to reproduce gestures and signs on the screen automatically requires long research on linguistic and expression by signs. It could be interesting also for other purposes.

2. Accessible universal remote control

Currently blind users cannot get access to the menu of their TV. It would be costly to equip each receiver with text to speech menus. The user idea is to set a universal remote control with text to speech menu. This remote control should be able to be connected to all receivers and DVD players meeting some common standards to be defined allowing the users to go through the menu and use all the functionalities available on their device. Users can have their own personal remote control to use when they are moving for example in a hotel.

3. Screen reader enabling the visually impaired viewers to read subtitles

None of the existing screen readers that we use on a computer are able to read the subtitles on TV, on a DVD or on videos available on the Internet. So the user's idea is to develop software allowing to turn the subtitles on the speech or in braille when the user has a braille displayer as it is possible on the computer.

In other words, although there are already some mature technologies that at the moment need only be taken up by broadcasters, there remain still a number of topics, which require further attention from the research community:

- Need to develop synthetic speech modules for spoken subtitles in less spoken European countries (text to speech technology).
- Development of robust language transcription modules for less widely spoken European languages to ease live subtitling and use of automatic transcription tools.
- Promote technical development of Computer Generated Sign Language.
- Standardisation of delivery mechanism of closed access services on connected TV to allow devices to be able to render access services from different Content providers.
- Research of mechanism to allow creation of content with the access services so that they can be delivered on multiple platforms without being reformatted (COPE - Create once publish everywhere).
- Development of transmission and synchronization technology in connected TV for access services (eg. Closed signing).
- Tools for cost effective creation of second screen applications for providing personalised accessibility services. When watching television together with a group accessibility services, e.g. audio descriptions, are sometimes turned off even if available because they are perceived to negatively influence the viewing experience of those who would not benefit from these services. Companion devices could provide personalised services alongside the communal activity of the broadcasted media.
- Interfaces and systems for accessible control of the “domestic” connected TV ecosystem (especially relevant for visually impaired people).
- Accessible broadcast services for asynchronous viewing.
- Exploring business models (through pilots) for the provision of accessible Connected TV in order to facilitate buy-in by key stakeholders.
- Protection of the personal end-user data that can be collected by the portal owners and by linked applications.
- Investigate new scenarios (multi-screen, multi-modal, networked home) in studies with disabled and elderly users, to better understand requirements.
- Study the opportunities of novel interaction paradigms (multi-modal - speech, gestures, remote control, etc.) for providing improved TV accessibility.
- Going from guided manual system configuration to automatic user profile-based configuration.
- Achieve adaptive service front ends that enable individual configuration and dynamic (contextual) adjustments, without confusing the users.
- Better education of ICT developers in terms of user-centred design and accessibility.
- Tools for creating adaptive/personalisable TV services, and/or to better consider user requirements at design time (the growing importance of HTML5 may be a good chance).
- Consolidate available TV design guidelines, simplifying and improving access to design knowledge for developers.
- Develop more relevant services for disabled/elderly users (e.g. TeleHealth etc.) or in general for non-technically savvy people, while exploiting the available technical TV platforms.
- Develop ways to escape the arbitrary and crippling limitations introduced by big brands to protect their business silos at the expense of the users, specially the non technically savvy users: any service should be accessible on any device or sets of devices. Good tools for this include fostering the development of open and secure service platforms, based on royalty-free web technologies, allowing the creation of services that will run on any combination of TVs, phones, tablets, PCs of any

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brand. And this requires supporting the development of more free and open web standards.

- Accessibility evaluation tools / schemes for TV-based/-centred services.

Future research and development activities should also explore how the features of Connected TV can be used to improve multimedia accessibility. Two main challenges are highlighted:

1. How to take advantage of the broadband channel to provide new accessible content and services, overcoming current problems such as latency or synchronization. The personalization of Connected TV, which is one of the main characteristics of this technology, can be used to provide access services in a closed way (i.e., available just for the users that select them). This is an old aspiration of TV operators to provide the signing service. A wide variety of new services for the elderly or people with disabilities can be implemented taking into account the mentioned characteristics of Connected TV: personalization, multimedia, and interactivity.
2. How to achieve that the new connected services (such as video on demand applications or integration of social networks on the TV screen) are accessible and available for as many users as possible. If, as mentioned, accessibility must be seen as a universal requirement, Connected TV should be deployed according to the design-for-all principle from the concept phase.

Therefore social reasons and social innovation stand at the beginning to promote overall multimedia accessibility. As mentioned in this section, accessibility users represent a huge market that also demands and should offer every kind of services and products enhancing access to content and services. Providing more accessible media is an opportunity that should be considered as an investment.

IV-6 Business issues on future research

Together with the traditional activities of content generation/acquisition and broadcasting, new elements should be added from a technological point of view:

- **Asset management:** The generated content has traditionally been considered as the core element in the value chain. The new Connected TV concept requires a significant investment to enhance the work-flows to include new capabilities for content processing, distribution through multi-format devices and channels, metadata extraction, secure storage, and efficient access/retrieval.
- **Security for content protection,** handling of copyrights and (preservation of geographical market licenses
- **Privacy in personal data, personal profiling and personalized content distribution.**
- **Effectiveness of audience accounting & measurement,** considering the different formats, delivery channels and modes of consumption that the new Connected TV may offer, currently and in the future.
- **Transparency on audience accounting & measurement** and, even more, recognized protocols for audience measurement verification by independent entities. Confidence in this activity is crucial, as it represents the cornerstone of the advertisement incomes.
- **3D stereoscopic development**

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The current dependency of the business model on the audience accounting and content protection is currently an important limiting factor in the widening of the Connected TV model.

New reinforced and multi-format audience measurement systems should be developed, able to accurately log not only consumption, but also interactivity through any device and channel. New measurement models will be required to effectively cater for a diversity of modes of consumption, many very different to those previously encountered with traditional linear television services.

The current working flows should be enhanced to allow easy widening of the number of distribution channels and formats, including automatic procedures for personalized distribution and pushed social consumption.

Social projection of Connected TV is still a concept to exploit. Its implications on the business models are still to be defined, together with the technical services that will allow new ways of social and shared experience through senses.

V- Conclusion and recommendation from NEM

Connected TV will have a great impact on European industry as well as to European citizens. Even European industry is not leading TV market, service providers could take advantage of such technology in order to offer advanced innovative services to users.

For that purpose, there is need to continue investing in innovation with the objective to propose new forms of content and services, but also to influence the next generation of connected TV, to meet societal and commercial requirements.

Most of the future services will be in the cloud and Connected TV will be, as web tablets and smart phones, one of the key interfaces. If Europe wants to position its industry on cloud-based technologies and architectures, we need to be able to develop services on these devices and as a consequence we need to master all the related technologies. For that purpose, the best way is to develop end-to-end services and test them on real user communities all over Europe.

Another key point is the openness of connected TV in order to allow a real competition between all the device suppliers avoiding a few vertical actors (Google TV, Apple TV, ..). That's implies open standards even regulation.

Connected TV (and its components) are standardised in a number of places such as MPEG and ITU-T but European Commission should take in consideration in enhancing the European profile in Connected TV related standardisation activities that play an instrumental role for the successful deployment of Connected TV services.

V-1. Technical challenges that have to be addressed now

As far as most of the Connected TV manufacturers and players are not in Europe, we need to focus our research on services to the end users. As said, we need to use such an environment to develop innovative services.

Connected TV should become a **rich open platform**, able to bring another wave of economic growth, delivering a multitude of new applications and services, for the young as well as for the ageing population of Europe and globally. The existing Connected TV standards groups and platforms (HbbTV, YouView, etc...) should achieve the goal of allowing content to be created once and then to be delivered to many connected TV platforms having underlying media formats and delivery mechanisms converging.

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However, commercial models will continue to differ and a universal path to a single European content market seems very long.

The growing populations of varying 'SMART TV' receivers that implement closed and vendor-specific solutions developed by major CE manufacturers together with rather closed and partly proprietary solutions such as Google TV and Apple TV are aiming at much more vertical markets and have the potential to change the scene in European market.

The end of the traditional remote control: a special glove for TV remote control. To avoid the use of devices (iPad, iPhone, ..) such as intermediate, the viewer should be able to manipulate the TV screen by a light source called "virtual touch" or further by BCI (Brain Computer Interface).

To prevent the locking of users into the vertical silos of well-known brands, while fostering the development of a rich ecosystem of services that are independent of any particular brand or device, open platforms running adaptable services, that may require multiple devices to discover each other and cooperate, should be developed on the basis of open, royalty-free technologies and web standards.

So from a technical point of view we have to address the following challenges:

1/ User interface :

- Navigation and ergonomics
- remote controller (what should it be? voice recognition? brain computer interface? smart phone? web tablets?)
- accessibility for all

2/ Multi-Cloud secured connectivity

3/ Immersiveness (3D, holographic ...)

4/ Interpersonal communication compliance (voice/video over IP – SIP)

5/ Aggregation of application stores

6/ Next HbbTV standard including HTML5 support

7/ Connected TV in any device

8/ Standardisation consistency

V-2. Societal challenges that have to be addressed now

All these innovative services and applications enabled by Connected TV platforms question industry players' strategies, legislators, regulators to find the best way of integration of two worlds organized and regulated separately (Internet and TV).

From a societal point of view, at least the following important issues have to be addressed:

1/ What **positioning for national or regional players** (broadcaster and service providers) (already subject to well defined regulation), facing competition with Internet giants (particularly OTT players) that operate globally, internationally and thus with less regulation?

2/ What kind of **consumer protection** (especially youth and children's)?

2/ How Connected TV will be able to continue to fund European content creation and cultural exception?

3/ How to **guarantee transparency on audience accounting & measurement** and recognized protocols for audience measurement verification by independent entities. New reinforced and multi-format audience measurement systems should be developed, able to accurately log not only consumption, but also interactivity through any device and channel.

4/ Privacy (audience measurement, personal data management).

5/ Second screen content regulation.