REGIONAL INITIATIVES – ASIA-PACIFIC

Interactive multimedia services IN ASIA-PACIFIC: TRENDS AND INSIGHTS

Report

Telecommunication Development Sector

Interactive multimedia services in Asia-Pacific: Trends and insights

Asia-Pacific Broadcasting Union

Australian Government
Department of Communications

ITU

This report has been prepared by International Telecommunication Union (ITU) experts Peter Walop and Malcolm Webb, as well as Amal Punchihewa of the Asia-Pacific Broadcasting Union (ABU). This work was carried out in the framework of the ITU Asia Pacific Regional Initiative (2011-2014) on Digital Broadcasting with the objective of providing assistance in the field of interactive multimedia services to broadcasters, telecom operators and national regulatory authorities (NRAs). The report has been prepared in partnership with the Asia-Pacific Broadcasting Union (ABU) and with the support of the Department of Communications (Government of Australia).

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1 Introduction

In the converged industries of telecommunications and broadcasting, interactive multimedia services are not new. Even in the pre-convergence era, both industries developed and delivered these services. In Europe, broadcasters started delivering interactive 'Teletext' services as early as the 1970s, and the first attempts by telecom operators to browse the Internet and deliver web content over 'connected' televisions were recorded in the 1990s - the latter limited by Internet speeds and applications to access content.

With the widespread availability of broadband Internet[1] and powerful connected devices, the service propositions and traditional roles in the converged value chain have changed dramatically. This availability has made it possible to efficiently distribute and consume data heavy services (i.e. video or television like services) anywhere and anytime. Consumers now have a choice of watching video content over connected, smart television sets, set-top-boxes, tablets or smart phones. They can choose what, when, and where they would like to consume their audio-visual services, combined with services such as voice, text, Internet and social network access.

From the supply side, broadcasters and content providers have access to a wide range of networks and connected devices to deliver their content. Network and service providers can enter into content provisioning (more) easily as delivery networks have become (more) technically independent from the content they carry. This broadband development comes along with the digitization of the entire value chain, from content production to consumption, lowering unit costs and entry barriers. Market players now often have multiple roles, change their roles more easily and enter into multiple alliances for delivering interactive multimedia services.

In other words, the introduction and widespread availability of broadband, Internet access and connected devices is considered as a disruptive technology or 'game changer'. Incumbent market players have to reconsider their role(s) and new entrants will have to define a sustainable value proposition. Regulators will have to re-assess their regulatory framework as these are often defined on traditional value chain roles and technology/network characteristics.

Consequently this report focuses on interactive audio-visual service delivered by broadband Internet networks and, or combined with, traditional broadcast networks.

The ITU Asia-Pacific Regional Initiative (2011-2014) on Digital Broadcasting has the objective of the *Provision of assistance in the field of interactive multimedia services to broadcasters in the Asia-Pacific region*. This report contributes to this objective by providing insights into the trends in the field of interactive multimedia services to broadcasters, telecom operators providing broadcast services, and national regulatory authorities (NRAs). It covers market, technical and regulatory trends in this field and builds on the work carried out by ITU on digital broadcasting, broadband Internet, and convergence. In particular, it will build on the ITU *Guidelines for transition from analogue to digital broadcasting*[2], which provides information on policy, regulatory and technical aspects of digital broadcasting, including mobile television. Other ITU reports and recommendations, as well as works from other standardization and technical bodies, have also been considered in this report.

This report will help broadcasters, content and service providers, network operators and national regulatory authorities (NRA) to answer the following questions:

1. What are the elementary market dynamics and trends across the value chain of providing interactive multimedia services and what business model changes can we observe (especially for content, service and network providers)?

[1] No generally agreed definition is available for broadband, however broadband includes the aspect that the services is always-on (i.e. not needing to make a new connection to a server each time a user wants to go online) and high-capacity (i.e. above a certain download and upload speed value – which would have to be updated as technology progresses).

[2] See: www.itu.int/en/ITU-D/Spectrum-Broadcasting/Documents/Guidelines%20final.pdf

2. What are the key technologies and standards delivering these interactive multimedia services, what are their pros and cons (or limitations) and what are the trends (all/most services 'over-the-top' or managed networks remain pivotal in delivering high quality services)?
3. Given these market and technology developments, what needs to be (re)regulated and is there a necessity for new regulatory framework (or do the current concepts suffice but just need a different application)?

This report is structured as follows:

1. Introduction: context of interactive multimedia services is established, as well as a further scoping and categorizing of the wide range of services and delivery platforms has been carried out.
2. Market and business trends deals with the question of market dynamics and trends.
3. Technologies and standards provides an overview of the key technologies and standards for delivering these interactive multimedia services. It also provides extensive list of references to other useful technical documents.
4. Policies and regulations focusses on what are the possible regulatory issues and discusses the necessity to change or adapt regulations and the framework inter-alia.
5. Country cases includes more background information on interactive multimedia services and the regulatory framework in a range of countries in the Asia-Pacific region. The country cases also show how NRAs dealt with some of the addressed regulatory challenges.

1.1 Scoping interactive multimedia services

ITU defines multimedia services as "*Services that handle several types of media such as audio and video in a synchronized way from the user's point of view. A multimedia service may involve multiple parties, multiple connections, and the addition or deletion of resources and users within a single communication session*."[3]

The scope of interactive multimedia services considered in this report include audio-visual services intended for public distribution and consumption and does not cover user generated content (such as YouTube) or content that is not designed for consumption by the general public (such as intercompany broadcasts).

In principle, this approach is technology neutral as these services can be delivered by any telecommunication or broadcast network and consumed by any device, including television sets, portable and mobile devices. The concept of interactive multimedia is not new and many people are already familiar with interactive video services like the 'red button' or 'teletext' functionality embedded in television broadcasts and sets.

This report focuses on interactive audio-visual service delivered by broadband and Internet networks and, or combined with, traditional broadcast networks. Broadband and Internet networks include mobile networks (like IMT) and fixed networks (like HFC, xDSL and IPTV networks). Traffic management based on Internet Protocol (IP) remains the core technology across these networks. The traditional broadcast networks, in this study, include digital terrestrial, cable and satellite networks. These networks can have various transmission technology standards like ATSC, DVB, ISDB or DMB.

The scoping of interactive multimedia services includes services and applications like cable/IPTV offerings as well as content providers and broadcasters offering their video content over the Internet directly to the end-consumers (the latter also referred to as over-the-top (OTT)). This scoping also includes connected devices (like smart televisions and phones) offering access to audio-visual services over the Internet (often on the basis of device specific apps) and traditional broadcast networks (like digital terrestrial and satellite networks). Often device manufacturers have agreements with content providers for the delivery of these services on connected televisions, smart phones or other connected devices (like tablets and laptops).

[3] See ITU report ITU-T Q.1741 (11/2011).

1.2 Categorizing interactive multimedia services

The scope of interactive multimedia services as outlined in section 1.1 still includes many different services, applications and technologies and a further categorization may help to understand differences.

From a service perspective (i.e. the service offered to the end-user) interactive multimedia services can be split into two basic forms:

1. Linear services: the service provider schedules the audio-visual content, plays-out and distributes the audio-visual content accordingly. The most widely known example is linear television services from Public Service Broadcasters (PSB) and commercial broadcasters. This category also includes TV services whereby the end-user can temporarily pause and restart the broadcast or can restart the beginning of the broadcast. With this type of 'delay' or 'catch-up' features the essence of scheduled play-out remains unchanged. These features became possible with Personal Video Recorders (PVR) and also with PVR functionality sitting in the cloud (i.e. storage made available via the Internet) or broadcast network (e.g. IPTV network). Linear services can be offered free of charge[4] or on the basis of payment.
2. Non-linear services: the end-user determines what audio-visual content (often from a structured content library) and when this content is to be played out. A commonly known service in this category is video-on-demand (VoD)[5]. VoD like services are often paid services and providers can dice and slice the video content in many difference ways and apply different payment arrangements (e.g. Pay per View –PPV or periodical subscriptions) but they leave the end-user in command for scheduling the audio-visual content. These non-linear services also include time shifting the content. Time shifting is intended to view the content at the viewer's convenience. It can include pausing and rewinding linear television services (i.e. live television) as well as playback of the content after the initial broadcast.

The above service categories can be offered in many commercial arrangements and they don't differ in this aspect. However they may differ in how standard service levels, i.e. service availability and picture quality are managed by the provider of the interactive multimedia service. The focus here is on service levels of the audio-visual or video service. Two basic forms can be distinguished:

1. Video services with managed Quality of Service[6] (QoS): in this category the service provider sets, manages and offers end-users (minimum) picture quality and service availability levels. The classic example is a Public Service Broadcaster (PSB) that distributes its television service over its own terrestrial broadcast network. However, it is also possible that the service/content provider distributes over third party networks. The service/content provider agrees to the (minimum) service levels with the network operator in a distribution agreement or contract. Such a contract may include guaranteed service levels whereby a form of financial compensation is agreed in case of underperformance.
2. Video services with unmanaged QoS: the service/content provider does not set/manage service levels and consequently does not offer any to end-users. An example that falls in this category is content providers offering their audio-visual content over the Internet. The Internet service provider (ISP) that offers the Internet access to the end-user manages service levels. However the ISP does not manage picture quality and service availability specifically for the individual service/content provider.

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[4] A well-known form is free-to-air (FTA) television services. FTA refers to the content provider or broadcaster not charging the end-user directly. They finance their business on the basis of advertising income and/or licence fees. However the network operator may charge the end-users for receiving a bouquet of FTA services.

[5] Near video on demand services whereby the content is played out in a carrousel (e.g. the film starts every 15 minutes) can be considered as a linear service. Such services are possible on traditional one way broadcast networks.

[6] The wider notion of quality of experience (QoE) is not used here as this includes many other aspects (like customer care, billing, etc.).

Considering these two basic forms of QoS management, a recent market development is relevant, whereby content provider (like Netflix) agreements with ISPs include service levels (i.e. minimum download speeds) and financial compensation[7]. The content provider can set minimum service levels and offer their clients packages with different picture quality levels (e.g. 'Silver' and 'Gold' packages). It could be argued that these content providers move towards audio-visual services with managed QoS and that these services are no different from television services over, let us say, IPTV networks.

The last dimension for categorizing interactive multimedia services is the technical platform carrying these services. As discussed in section 1.1 and focusing on video services there are two basic forms:

1. Traditional broadcast networks: these networks are specifically designed and deployed for distributing audio-visual services. They are based on international transmission standards (such as ATSC, DVB, ISDB and DMB) and are essentially one-way networks. They can offer a semi-interactive component by broadcasting content in carousels (for example Teletext). They can be wired and wireless, including respectively coax cable networks and satellite, terrestrial and mobile networks. The latter referred by as Mobile Television (MTV).
2. IP-based networks: these networks route traffic (i.e. data) over routers to addressable end-user equipment. These networks are two-way (i.e. duplex) and switched networks whereby traffic is managed by IP protocols. The data can represent audio-visual services. They include networks like HFC and IPTV networks but also the Internet as offered by ISPs. Again they can also be wireless like IMT or IMT-Advanced, e.g. HSPA, LTE and LTE-A.

These platforms come with different end-user equipment (or one could say with different network terminating equipment). The traditional broadcast networks require transmission standard compliant receivers such as set-top-boxes (STB) or Integrated Digital Televisions (IDTV). For IP-based networks the range of end-user equipment is much wider and range from smart phones, tablets, phablets, laptop/desktop computers to game consoles. However receivers from both platforms can be integrated into one single device, combining broadcast and IP functionality. The two most prominent examples are connected or smart televisions and mobile phones with ISDB-T/DMB-T receivers[8]. The HbbTV standard has been developed for connected televisions for integrating broadcast and Internet services. The standard enables content/service providers to develop manufacturer independent applications for offering a seamless customer experience. Such a standard is (still) absent for MTV services.

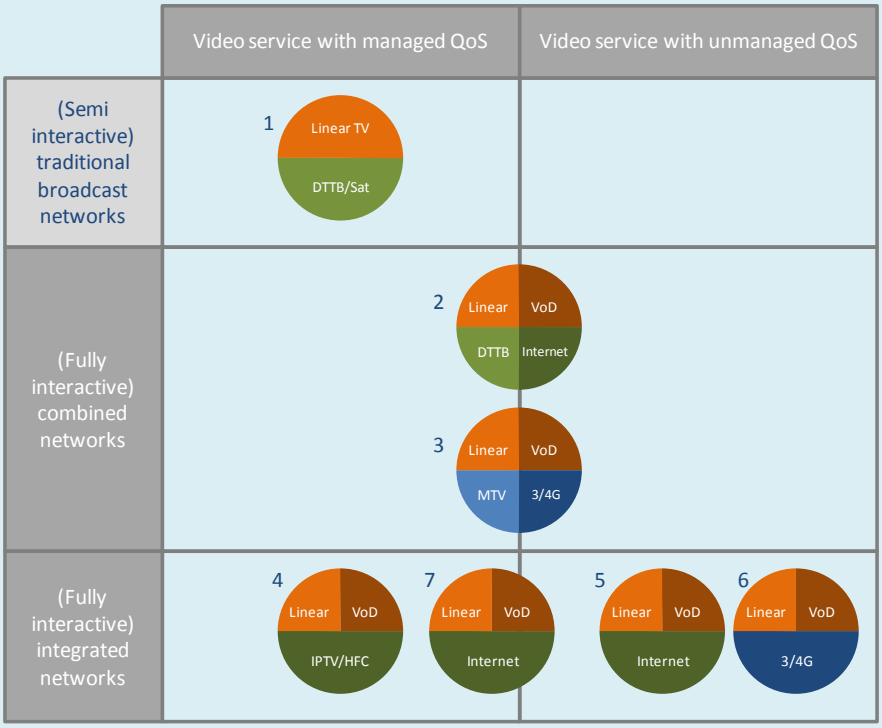
A recent development in end-user equipment is the introduction of a wide range of devices that can (re)distribute television/audio-visual services to any IP device at home or anywhere in the world. Examples include Chromecast and Roku dongles converting simple televisions into connected televisions and also 'Slingbox' devices redistributing a (paid) television stream over the Internet to anywhere in the world where the end-user logs in with an IP connected device.

Figure 1 shows the different types of interactive multimedia services categorized along three dimensions: the platform dimensions comes back twice as network and device are interrelated on the vertical axis of the grid and the bottom half of the circles. The top half includes the type of service; linear (TV) and non-linear (indicated with VoD).

[7] These agreements can either be paid peering agreements or transit agreements.

[8] ISDB-T and DMB-T enabled mobile phones are widely available in Japan and Korea respectively. DVB-H enabled mobile phones were available in Europe but services have been discontinued. However DVB-T2 Lite is a newly developed standard for the purpose of offering MTV services (for example for mobile phones but also tablets).

Figure 1: Categories of interactive multimedia services



Source: ITU

Observing Figure 1, the following market examples can be given for each of the circles:

Type 1. BSkyB or FreeView television services over a digital satellite (DVB-S2) or terrestrial television networks (DVB-T/DVB-T2) respectively, the latter also referred to as Digital Terrestrial Television Broadcasting (DTTB). These are semi interactive as viewers can access the red-button or Teletext services. QoS are set, managed and offered to the end-user by the service providers (for example by offering HD services). Network services are provided by contracted third parties (i.e. SES Astra/Eutelsat and Arqiva). As stated in section 1.1 this type of services is not the focus of this report[9].

Type 2. Linear TV services from national PSB/commercial broadcasters and the Netflix type service. All services are received with a connected television. In this example the linear broadcast service is delivered over DTTB. It is also possible that the linear broadcast service is carried over a digital satellite network. Netflix is made available over the Internet and through a proprietary app on the connected television. Apps for this type of audio-visual services can also be made available on the basis of the HbbTV standard[10]. QoS of the linear TV service is managed as under service example 1. For the VoD service QoS is unmanaged. The Internet and digital terrestrial television network delivering both services are independently managed form each other.

Type 3. As example 2 above, here the services are offered on a mobile device with a MTV receiver (for example on the basis of the ISDB-T standard) and 3G/4G functionality. For example NOTTV, a Japanese company of the NTT Docomo group, can broadcast their linear TV services and make the catch-up-TV app available on the 3G/4G platform. Both services can be offered in an integrated manner allowing the end-user to seamlessly switch between platforms/services.

9 See: www.itu.int/en/ITU-D/Spectrum-Broadcasting/Documents/Guidelines%20final.pdf

10 See also EU commissioned project 'TVRing Open Connected TV' and www.hbbtv.org and section 3.2.

Type 4. Telecom or cable network operators (like Telstra, Comcast, Orange or Telecom Malaysia TM - HppTV) offering triple play services including linear TV services, VoD, telephony and Internet access or quadruple play (with further addition of mobile to fixed voice, Internet and Video) . All service levels are actively managed and controlled (including picture quality but also Internet access speeds). All services are carried over a single integrated network.

Type 5. As service example 4 but all services are offered over the Internet. The end user subscribes to Amazon Prime or Hulu and watches linear TV from the Dutch PSB (NPO) over any IP connected device (for example an Xbox or AppleTV box). Picture quality and availability is not guaranteed of any of the services. Another example is TONTON of Media Prima in Malaysia, a commercial broadcaster operating an OTT service.

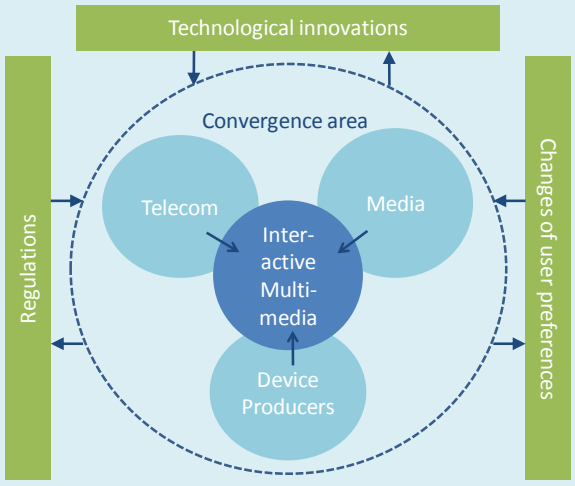
Type 6. As service example 5 but the connected device is a 4G enabled smartphone. All audio visual services are delivered over the Internet. Although Internet access and speeds are managed by the mobile network operator, the operator does not manage picture quality and service availability specifically for the individual service/content provider. On-the-Go service from Astro, a commercial content service provider in Malaysia, is an example of mobile OTT.

Type 7. As service example 5 but the content provider (e.g. Netflix) has agreed contracts with ISPs whereby service levels (i.e. minimum download speeds) and financial compensation are agreed. Not included in Figure 1, but another service can be where VoD services are offered on a mobile 3G/4G platform whereby the content provider agrees to dedicated Internet speeds with the mobile operator.

2 Market and business trends

This Chapter provides an overview of the market trends in the converged era of media, telecommunication and device industries. In this converged market, the interactive multimedia services have a prominent place. It will also focus on changes in consumer preferences and technological innovations and how this impacts the market in terms of service changes as well as business models and strategies. For changes in the regulatory framework please refer Chapter 4.

Figure 2: Convergence area and key drivers



Source: Convergence Consulting Company

2.1 Service changes

As described in section 1.2 interactive multimedia services can be categorized in several groups. This categorization reflects the current status and this section identifies the overall future trends in terms of services and how these are driven by consumer preferences and technological innovations.

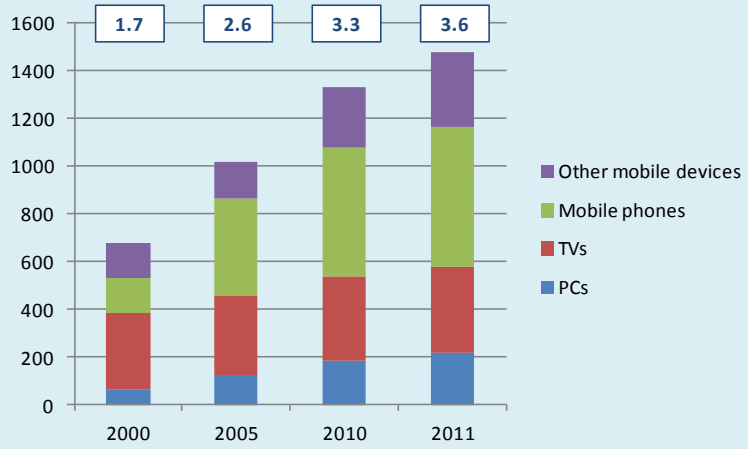
The bottom line of identified service changes is often whether these changes reflect fundamental consumer change and indicate an upcoming replacement of the traditional services. Or alternatively, the identified service changes are merely an add-on or an enhancement of the incumbent services. Three dominant service trends can be identified:

1. service anywhere and anytime;
2. service tailoring;
3. video quality enhancements.

2.1.1 Service anywhere and anytime

With the widespread availability of broadband Internet and powerful connected device users can consume their interactive multimedia services anywhere and anytime. For the consumption of interactive multimedia services, a device with a video screen and enough processing capacity (for video and audio encoding) is essential. The number of these devices or screens, as well as the usage of these screens, per user has gone up steadily over time. These screens enable the user to consume their interactive multimedia services anywhere and anytime. Figure 3 shows the average number of screens per user and the total number of installed screens (in millions) in Western Europe over the past 10 years.

Figure 3: Average number of screens per user and total installed (in millions)

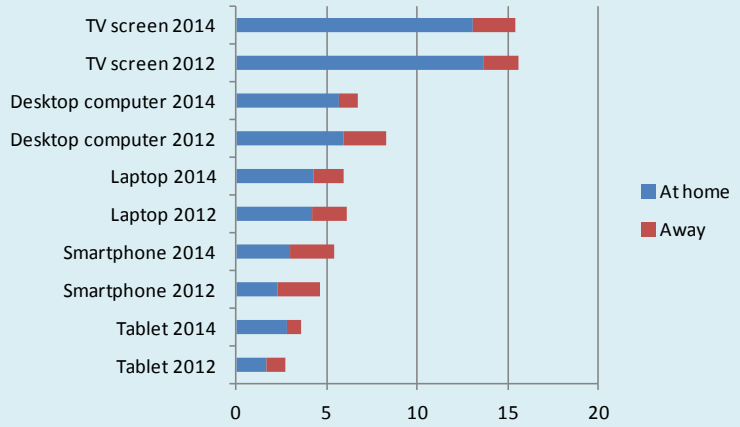


Source: Arthur D. Little, BNP Paribas

Other research shows that consumers use more screens to watch television and video services (i.e. multi-screen). Figure 4 includes the hours per week that consumers actively watch television or other video content on a number of screens, both at home and away.

Observing the numbers in Figures 3 and 4 the trend is clear; new devices are added to the traditional television screen for consuming televisions and video services. However as Figure 4 shows, the dominant screen is still the television screen. Other data suggests that the other screens like smartphones and tablets are add-ons, enhancing the television services delivered to the television. They have not yet replaced the traditional television screen. Two factors seem to be driving this, multi-tasking and leisure time.

Figure 4: Hours per week watching TV and video services per screen type



Source: Ericsson ConsumerLab TV & Media Study 2014

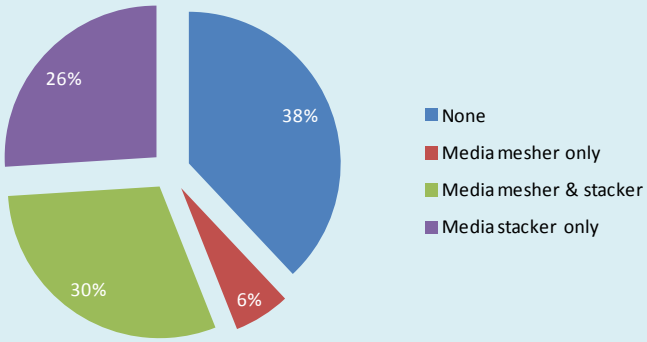
Multi-tasking

Over the years consumers have become more and more multi-taskers, spending (near) simultaneously time between various services or devices. This phenomenon of multi-tasking is not new. Early research has already shown this multi-tasking trend between different media like television, computer and music, especially the young.

With the availability of more screens, the multi-tasking has increased. A new aspect has recently been introduced; *media meshing*. Media meshing is conducting activities or communicating via other devices while watching television and these activities are related to the television programme being watched. The simplest form could be discussing with friends a television programme being watched, using a chatting application on a smartphone. More elaborate forms are television programme *embedded* applications, allowing the viewer to comment, interact or vote on programme events, using the 'second screen' on a tablet or smartphone. The definition of multi-tasking should therefore be redefined to include media meshing and *media-stacking*. The latter is the traditional form of doing several activities which are not mutually related, or for this report more relevant, not related to watching television services.

Ofcom research data shows insights on multi-tasking whilst watching television. Six in ten UK adults are multi-taskers when watching television services. However most of these multi-taskers are media-stackers, as illustrated in Figure 5. Only six per cent of all adults are media meshers (only).

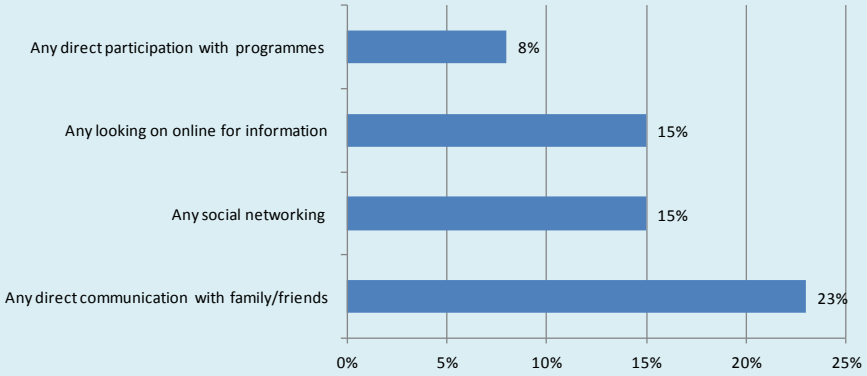
Figure 5: Multi-tasker types in the UK



Source: Ofcom, 2013

From the perspective of an interactive multimedia service provider or broadcaster, the media meshing activities are of special interest as they can potentially result in new revenue streams or greater customer loyalty by having users directly participate with the programme or service. Of the reported media meshing activities (see Figure 5) the majority constitute chatting, talking or searching information about the television programme being watched. These activities are loosely related to the television programme. Only a small percentage of media meshing involves activities that are directly related to the programme. Figure 6 provides an overview.

Figure 6: Media meshing activities



Source: Ofcom, 2013

The activities directly related to programs, as included in Figure 6, are activities like participating in a programme (e.g. voting or entering a competition) or participating using a programme specific application (e.g. for on a tablet or second screen). Although still a small percentage, it can be expected that with the increasing number of sold connected televisions and hybrid broadband/broadcast standards[11] these media meshing activities would grow significantly in the near future. Especially considering that latest research showed that watching videos over the Internet are mostly done with connected televisions (either with smart TVs or using dongles). Apparently, connected televisions take a dominant position in providing interactive multimedia services.

In summary, television anywhere and anytime is driven by people multi-tasking on different screens and does not replace traditional television watching. The 'second screen' is (yet) an add-on with the current technology available. With new technology becoming available and spreading media meshing will prove to be an opportunity for broadcasters as well as new market entrants.

Leisure time

Independent of how leisure time is defined, either any activity not related to work or activities we enjoy doing, many studies point to one thing, people have more of it. Over the past 40-60 years, about 45 to 60 minutes a day of extra leisure time have been gained. Research shows that for every additional hour we get free, 30 minutes goes into watching television,[12] and now we can also add watching video or other VoD services. In other words enjoying interactive multimedia services takes up a large proportion of our leisure time and this time is increasing every decade. Figure 7 shows how Americans spent their leisure time on an average day in 2012. It also shows the dominant position of watching television and this is not only in the USA. For example in the UK the total television viewing is equivalent to all time spent on all social networks worldwide, i.e. in total 6.5 billion viewing hours[13].

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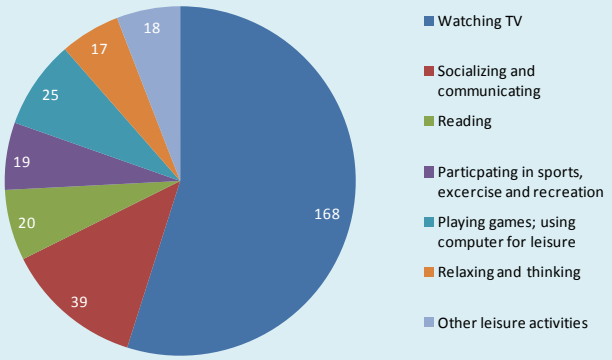
[11] Like the HBBtv standard. For more information see sections 1.2 and 3.2.

[12] See "Having More Leisure Time" of the Federal Reserve Bank of Boston, "Measuring Trends in Leisure: The Allocation of Time over Five Decades.

[13] See Deloitte research, "TV-Why?" 2012.

Figure 7: Leisure time spent per category on average day (in minutes)

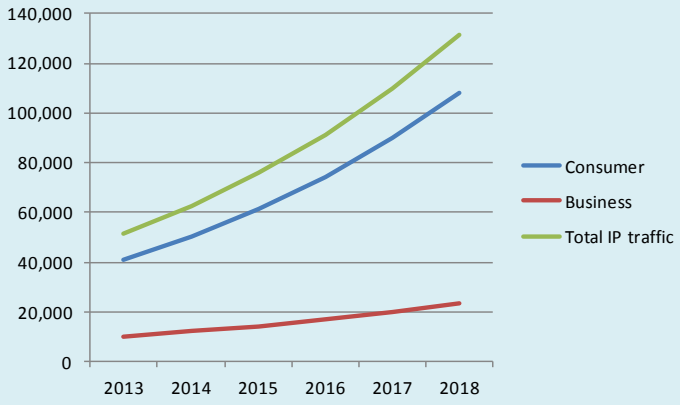


Source: American Time Use Survey, 2013

In addition, leisure time and technological innovations have become more and more intertwined in several ways. One way is that leisure-time activities and leisure-time mobility have broadened its range through the use of technology. For example the availability of smartphone and tablets allows users to spend leisure time on the move. Also, with the introduction of digital television the number of services went up significantly and therefore there was more content to be enjoyed[14]. In addition, technologies that had originally been developed for commercial, scientific or military purposes have been (and will continue to be) developed for leisure-time use. The classical examples here are the development of the Internet and Global Positioning System (GPS).

This increase in leisure time and the distribution of associated content (i.e. video content) is also reflected in the Internet traffic forecasts. In nearly all forecasts the IP traffic increase is driven by consumer demand (as the majority of all IP traffic is consumer driven) and demand for video content distribution. Figure 8 shows the Cisco global IP traffic forecast for the years 2013 to 2018, split between consumer and business demand.

Figure 8: Global IP traffic forecast 2013-2018 (in TB/month)

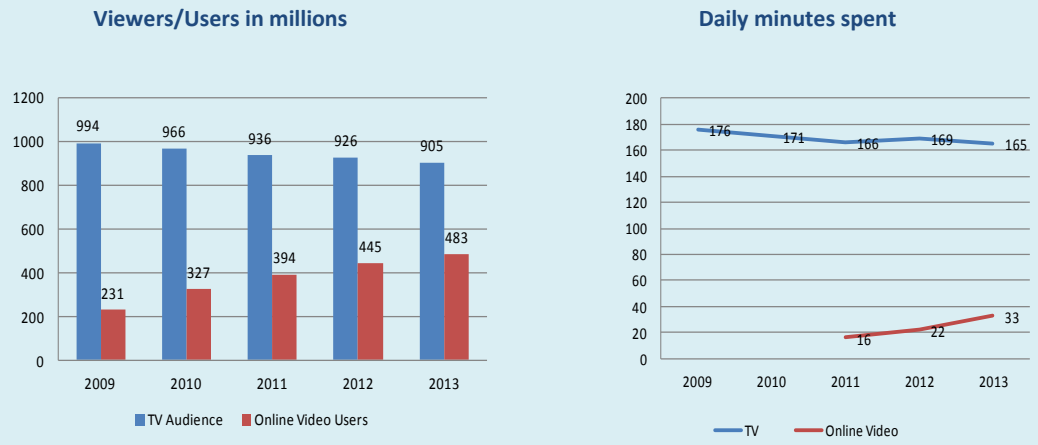


Source: Cisco Visual Networking Index

[14] See Hong Kong, China, and India in respectively sections 5.2 and 5.3.

As Figure 8 shows, consumer IP traffic goes up (21 per cent CAGR) more rapidly than that for business related IP traffic (18 per cent CAGR). Most of that traffic increase is video related. This global trend is no different for the Asia-Pacific region. For the period 2013-2018, Cisco forecast 19 per cent CAGR of IP video traffic for Asia[15]. Figure 9 shows the online video trend in China, where online video users and online video minutes are increasing steadily (TV audiences and TV minutes are dominant but declining).

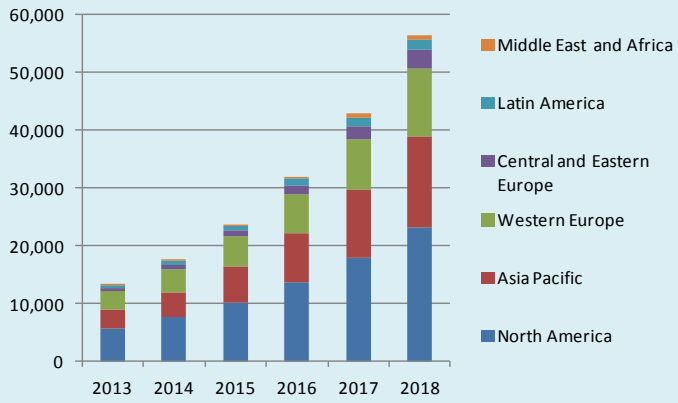
Figure 9: TV users and online video trend in China



Source: GAPPRFT, CMR, CATR

Another indicator of this increasing demand for video traffic is IP traffic carried over content delivery networks (CDNs)[16]. With the emergence of popular video-streaming services that deliver Internet video to televisions or other smart devices (i.e. OTT services), CDNs have prevailed as a dominant method to deliver such content. Cisco forecasts that globally 55 per cent of all Internet traffic will be carried by CDNs by 2018, up from 36 per cent as compared to 2013. And more precisely, 67 per cent of all Internet video traffic will cross content delivery networks by 2018, up from 53 per cent in 2013. This CDN trend is illustrated in Figure 10.

Figure 10: CDN traffic forecast by geography (in TB/month)



Source: Cisco Visual Networking Index

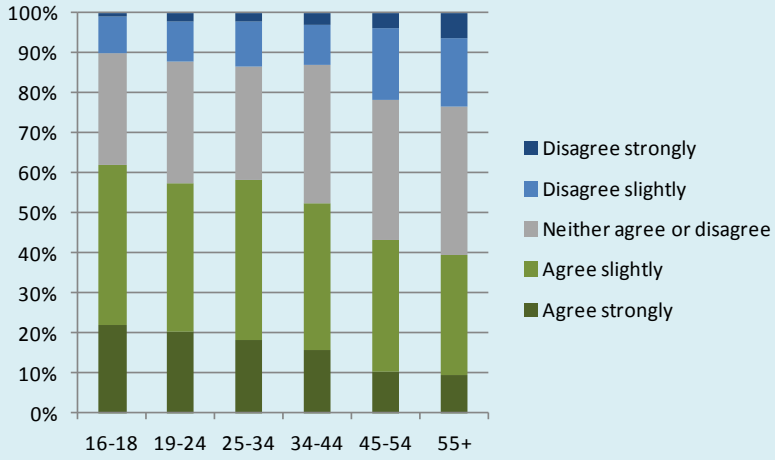
[15] Excluding China, India, Indonesia, Japan, and the Republic of Korea. See Cisco VNI Global IP Traffic Forecast 2013-2018.

[16] A CDN is a large distributed system of servers in multiple data centres across the Internet, designed to deliver rich media content, like television and video download services. CDN operators get paid by content providers (such as Netflix) for delivering video content to their audiences. CDNs offload the traffic from the content provider infrastructure by duplicating the rich media content across the CDN multiple data centres, resulting in possible cost savings for the content provider.

In summary, the service trend of interactive multimedia services anywhere and anytime is driven by a continuing consumer trend (i.e. more and more multi-tasking, especially media meshing, and increasing leisure time) and technology advances facilitating that trend (like smartphones, tablets and multi-channel digital television). Amidst this trend, traditional television watching remains strong and interactivity is added to enrich this favourite leisure-time activity. It has been demonstrated that television viewing has an important social role in our lives. It binds us and we like to talk about television programs, for example the next day at the office or by chatting whilst watching the programme.

While television remains a strong viewing device, the rise of online video consumption is a growing trend (see Figure 9). On the other side, research carried out in the UK shows that amongst the young the social aspect of television viewing is not different, but even stronger. Figure 11 shows that 16-18 year-olds value the social aspect of watching television much more than, let us say, 55+ year-olds. The survey question was how much interviewees agree with the statement "watching TV with others is much more enjoyable than watching on my own". The same research also showed that younger people significantly chat more about the programme being watched than older people. In addition, watching television is a relaxing and leisure time activity, produced and delivered by a professional industry.

Figure 11: Social aspect of watching television



Source: Deloitte, TV why research, 2012

2.1.2 Service tailoring

With service tailoring the end-user is tailoring the interactive multimedia content to its personal needs. As mentioned earlier, the technology is there to facilitate these individual needs. Both network and device technologies are providing a wide range of options to do so. The tailoring of content can be categorized into two basic groups: video on demand, and time shifting.

Video on demand

The essence of video on demand (VoD) services is that viewers can select video content or a broadcast event from a structured content library and have the content played out at a moment they like. From a viewers' point of view it does not matter where this content is stored, either locally (on a PVR) or on a server in the network (e.g. in the 'cloud' or IPTV network), as long as the system response times are acceptable[17].

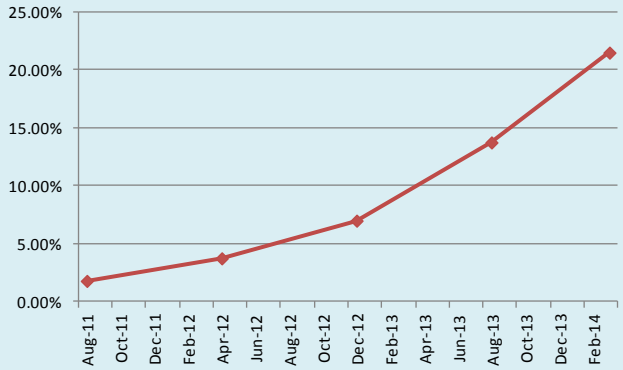
[17] A combination of local and network storage is possible too. A broadcast technology can be used to download the most popular content to local storage (on a hand-set or STB). Less popular content can be requested over a switched network. A good example of this mixed system architecture is the NOTTV service in Japan which uses mobile broadcast technology (i.e. ISDB-Tmm standard) for file downloading.

It is important to recognize the different type of VoD services. VoD services can be broken down into the following sub-categories:

1. television and film services (like Netflix or Hulu);
2. long form video clips, streamed or downloaded[18] (like catch-up television, including a full episode of a television programme);
3. short form video clips, streamed or downloaded (like YouTube).

The global demand for VoD service is rising, especially on mobile devices like smartphones and tablets. Of all videos played on connected devices (i.e. desktops, smartphones, tablets and connected TVs) the share of time played on mobiles and tablets combined, has risen to over 20 per cent over the past five years.

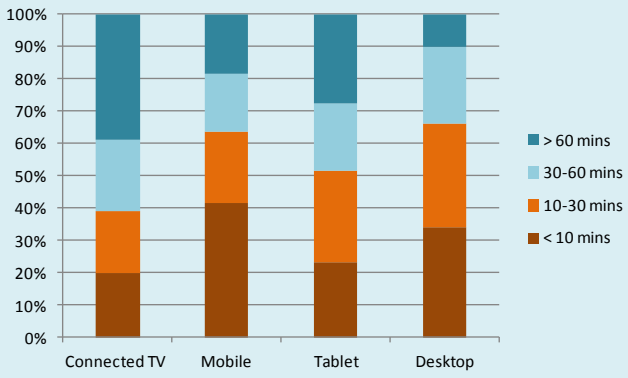
Figure 12: Share of time played on mobiles and tablets combined, 2011-2014



Source: OOYALA Global Video Index Q1 2014

This trend is also observed in the Asia-Pacific region[19]. However it is important to analyse the different categories of VoD played as it clarifies what consumers are doing on their interactive multimedia devices. Figure 13 shows the global figures for the share of time watched by device type and video length.

Figure 13: Share of time watched by device type and length of video



Source: OOYALA Global Video Index Q1 2014, adapted

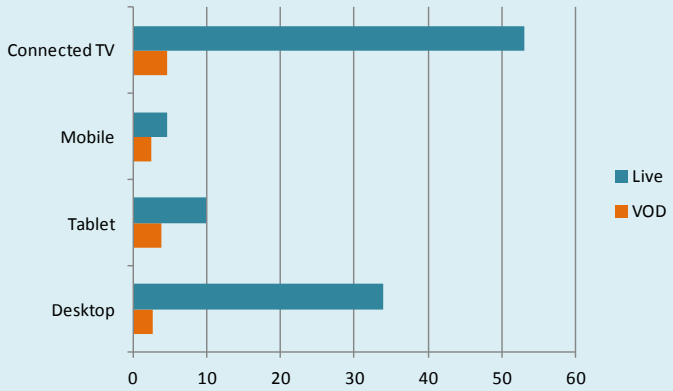
[18] From a consumer perspective streaming or (progressive) downloading is mostly irrelevant as long as the viewing experience is the same. With downloaded content it is however possible to play back (part of) the content at a later time. Currently the difference between the two technologies is mainly driven by available network capacity and protection of content rights. It is expected that these differences will become less and less relevant in the future.

[19] See for example the Country Case Australia and Hong Kong, China respectively in sections 5.1 and 5.2.

Considering the categorization of long form video to include catch-up television (including an episode of 30 minutes or more), it is clear that connected televisions and tablets are mostly used for this type of video services. Mobile smartphones are more used for short form video although with the increasing screen sizes and processing power this type of connected devices move more and more towards tablet use. Figure 13 also shows that for television and film services (like Netflix and Hulu), having video lengths of over 60 minutes, the connected television is the key delivery platform.

Live content (e.g. sport events or news) can be streamed on connected devices. For example with a connected television or a tablet the user can stream a linear television broadcast over its broadband Internet connection. Figure 14 shows the global figures of the average watching time of live content per session compared to VoD per session.

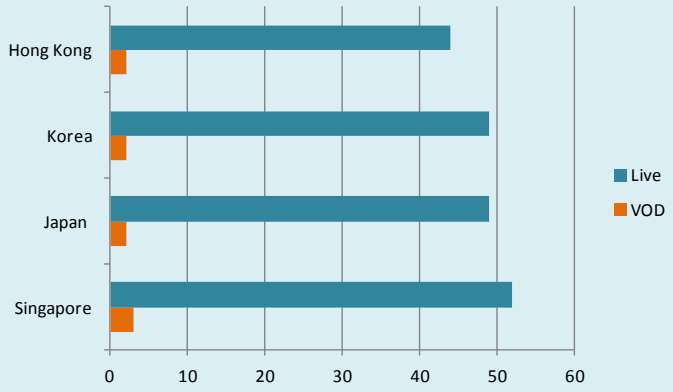
Figure 14: Average watching time (in minutes) per type of content



Source: OOYALA Global Video Index Q1 2014

Figure 14 clearly shows that the attention span of viewers (or customer retention) is much longer for live content than for VoD type of services. On connected TVs, the ratio of live to VoD is over 10. This indicates that the implied advertising value around live content is significantly larger than for VoD content (see also section 2.2.1). Remarkably for the Asia-Pacific region, the live/VoD ratio is significantly higher for economies like Singapore, Hong Kong (China), Japan and Republic of Korea. Figure 15 shows the average watching time of live content per session compared to VoD per session for these countries. The live/VoD ratio in these selected countries is over 20. This is likely to be explained by the high penetration and good quality broadband in these countries. When considering broadband as just a facilitator this indicates that consumer preference remains strong for live content/linear broadcast services.

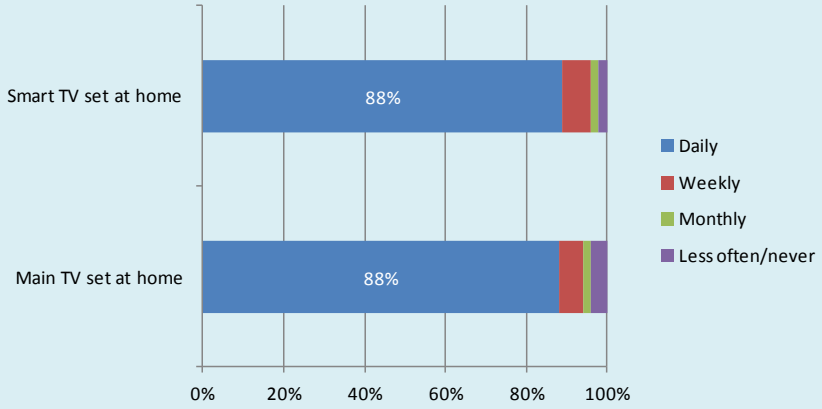
Figure 15: Average watching time (in minutes) per type of content in selected Asia-Pacific economies



Source: OOYALA Global Video Index Q1 2013, adapted

Figure 12 to Figure 15 cover video consumption, including live content, delivered over the Internet. Live content can also be delivered over broadcast networks (see Figure 1). When considering all live content watching, regardless whether it is delivered over the Internet or broadcast networks, linear television services are dominant. In the UK, Ofcom research showed that watching linear television is the dominant media activity, even when people have a connected television, and that there is no significant difference of viewing linear television services between connected and traditional television set owners (Figure 16).

Figure 16: Frequency of viewing linear television service by device



Source: Ofcom, 2013 (adapted)

In the same Ofcom study, the most-cited reason for using VoD services on either the Internet (i.e. OTT services) or as part of a broadcasting platform (e.g. IPTV) is to catch-up on missed programmes or films. Even for VoD services on the Internet, 62 per cent of the viewers say they use these services to catch up on missed television programs[20]. This finding is in line with Figures 14 and 15.

With the number of connected televisions rising[21], one can easily conclude that long form (including catch-up television) and TV and film services can be expected to rise rapidly. This trend is an opportunity and a further incentive for the broadcast industry to offer more VoD services and develop better TV-apps[22]. Also with catch-up television being such an important part of the VoD service domain, traditional broadcasters have a pivotal position in this domain.

Time shifting

As mentioned in the Introduction section, time shifting is intended to view the content at the viewer's convenience. It can include pausing, catching-up and rewinding linear television services (i.e. live television) as well as playing back parts of the content after the initial broadcast.

However, time shifting is not new. Video cassette recorders (VCR) already provided such functionality although with limited options and were less consumer-friendly. Now with DVRs (or PVRs) and time-shifting services available in the broadcasting network, the functionality is much wider and people can operate the service with the same remote and on-screen interface.

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[20] On broadcasting platforms, it is as high as 76 per cent. See Ofcom Communications Market Report 2013, p140.

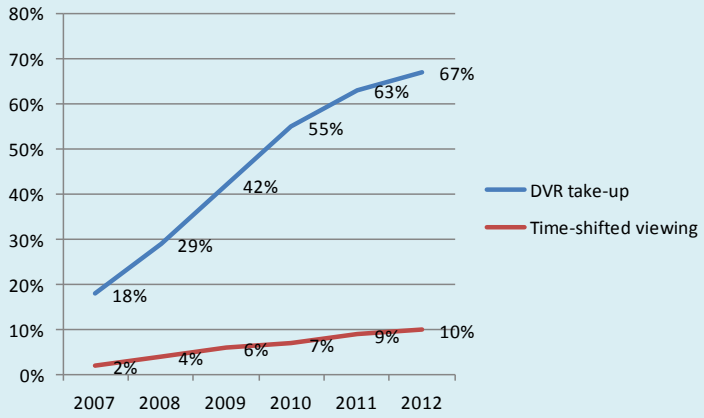
[21] A 2013 study by Parks Associates found that smart TV adoption increased by 31 per cent in one year, implying that in 2013 one-third of US broadband households have a smart TV (and 70% of households connect their TV). However this figure represents a steep increase one should consider the replacement cycle of televisions (between 5 and 8 years) and the fact that many people recently replaced their SD for an HD TV.

[22] TV apps are mostly proprietary and device dependent. Standardization of these apps will improve consumer acceptance and take-up. For more details on APIs for integrated broadcast broadband television services see section 3.2.

The availability of time shifting devices and services is clearly growing, as reported by the Australian Communications and Media Authority (ACMA) in its 2012 Online Video Content (OVC) services report. The ACMA reports that the market for time-shifting video devices, a portion of which are supplied as part of a subscription television or IPTV service, increased by 22 per cent in one year under television homes with (broadband) Internet access[23].

Similar trends are reported in Europe. However the official bureau for viewing statistics in the UK (BARB) reported that despite the growth in households having an increasing number of DVRs, time shifting of live broadcasts did not increase at the same pace and remained relatively low. Figure 17 shows the disparity between the uptake of DVRs and time shifting of television services.

Figure 17: Time shifting viewing and number of DVRs (% of all homes)



Source: BARB, 2013

Figure 17 seems to suggest that consumer do have the time shifting functionality at home but don't use it (often). This may indicate that DVRs lack functionality or are not user friendly enough. The recent introduction of time shifting services embedded in broadcast networks may provide better functionality and a further rise in actual time shifting viewing can be expected. However it may be too early to tell.

In summary, VoD and time shifting services are facilitated by technological innovations and are on the rise. (Traditional) broadcasters have a pivotal role as VoD services are (partly) popular because of television catch-up services. One could say with less linear broadcasts there would also be less VoD. Time shifting seems promising but it still too early to say what their impact will be on linear television viewing.

From a consumer behaviour perspective, one could say that this VoD/time shifting trend matches the consumer trend of household sizes getting smaller. The average household size is continuously decreasing because of an increasing number of single households[24]. In these single households there is less 'family' TV watching and therefore more room for individually tailored content. In other words, service tailoring is driven by a fundamental change in consumer preferences. Despite the social aspect of watching television, as illustrated in Figure 11, this trend of having more single households may impact (slowly) the position of traditional linear television viewing.

[23] See ACMA Communications Report 2011–12 series, report 1—Online Video Content services in Australia, October 2012.

[24] United Nations Population Fund (UNFPA) reports that household sizes are declining in many places around the world, linked to processes like urbanization. For more detail see www.unfpa.org

2.1.3 Video quality enhancements

Picture quality improvements are part of a continuous process which started with the introduction of black and white television services, colour television and recently High Definition (HD) services[25]. This seems to be mainly a technology driven process. After product development and production, the enhanced products are marketed and directly sold to consumers. Device producers have an important position in this process as they continuously seek to launch new products. New products tend to have higher margins as amongst early adopters there is more willingness to pay.

One could say that the content production and distribution parts of the value chain have to catch-up with the technological innovations at the device/receiver side of the value chain. For example, the introduction of HD televisions had major implications for content producers as SD studio cameras had to be replaced by HD cameras and their studio feed capacity (to distribution platforms) had to be increased. Still in many countries only a part of the video and television services are produced in HD quality as content producers are still upgrading their studios.

The next picture quality improvements have already been introduced and announced:

- Ultra High Definition; and
- 3D television.

Ultra High Definition

Ultra High Definition Television (UHDTV) aims at providing viewers at home and in public places an enhanced visual experience. Two image formats have been specified with UHDTV[26]:

- UHDTV1 with 3840 x 2160 pixels (also commercially referred to as the 4K system);
- UHDTV2 with 7680 x 4320 pixels (also referred to as the 8K system).

UHDTV picture quality is not only enhanced by increasing the resolution but also by means of a wider viewing angle of up to 100 degrees (while with HDTV the viewing angle is no more than 30 degrees). UHDTV also has an improved colour and audio representation.

Interestingly, 4k UHDTV televisions are commonly available[27] even though broadcasters and distributors are still in the trial phase. The availability of UHDTV TVs and content distribution platforms (either Internet or broadcast networks) are currently limited [28]. This situation supports the argument that device producers set the market. They expect that consumers will adopt the new technology without UHDTV content. Apparently there is an inherent need for better picture quality and consumers buying patterns are better explained by emotional factors (i.e. 'social status' and 'me too').

With prices expected to drop significantly the sales forecasts are promising, despite the lack of content and distribution. Figure 18 shows an industry forecast for the sales of 4K TVs.

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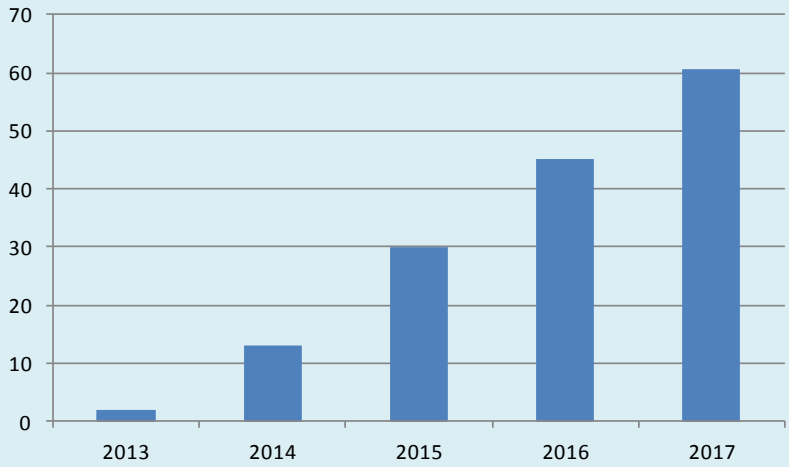
[25] Two basic HD variants are currently available. Both variants have the same picture resolution (1920 x 1080) but a different frame rate. The most common variant has 25-30 Hz. The other variant, considered as a variant for a nice market, has 50-60 Hz. Although the latter delivers better picture quality it is expected that it will be overtaken by Ultra HD variants.

[26] See ITU-R, ITU-R BT.2020-1.

[27] Today, 4K TVs from leading brands with 55-inch screens are available for USD 2 300 in the US retail market. Some forecasts predict UHDTV prices to fall below USD 1 000 in China and for the worldwide average to remain over USD 1 100 and close to USD 2 000 in North America.

[28] For example Netflix already gears up to make a selection of their content available in 4K. However the growth is expected to be slow as the bandwidth requirements are stated to be 15 Mbit/s, being twice the average bandwidth available to US broadband households. Also it can be claimed that 15 Mbit/s is not enough to really provide a UHDTV/4K service. 40 Mbit/s is more an acceptable rate for true UHDTV/4K.

Figure 18: Global sales forecast for 4K UHDTV TVs (in millions)



Source: NPD DisplaySearch (adapted)

Although Figure 18 shows a sharp increase in sales figures, the absolute numbers are relatively low when compared to a combined global sales level of around 250 million television sets. In addition, connected TVs bought today have an average product life cycle of about seven to eight years. So the take-up of connected televisions may slow down the sales of UHDTV sets. The timing of the UHDTV introduction seems to be critical. However, from a device producer investment point of view, investments in R&D and production lines are already sunk costs. With dropping price levels, consumers seems to be likely to adopt UHDTV.

3D television

Like with UHDTV, stereoscopic or 3D technology seems to be promoted into the market by the device producers. With 3D or stereoscopic television, displayed images are filtered for perception by the left and the right eye. Two methods exist that accomplish the stereoscopic effect. The first method is by means of a binocular optical device (3D glasses/spectacles) producing two images near the viewer's eyes. With the second method the viewer does not need 3D glasses and the two images are directly projected by the television screen for the viewer's left and right eye[29].

In most cases, 3D glasses are needed (first method). However, there are also 3D TVs in which the second method is applied[30]. Although 3D functionality is already provided by a wide range of connected TVs the actual usage is limited. This is caused by the requirement to wear glasses, the limited availability of 3D content (i.e. limited to feature films) and that not all content is best suited or displayed in 3D.

In summary, picture quality improvements come onto the market but it is a gamble for the device producer whether consumes adopt the new technology. UHDTV take-up may be slowed downed by the relatively long product life cycles of connected televisions. In addition, for the widespread adoption of UHDTV services some important technical distribution barriers need to be broken down. This applies for both the Internet as for broadcast networks. Further encoding and transport efficiency will be needed[31].

[29] Glasses-free 3D is more difficult to display, especially on television screens, because the ideal viewing angle for such televisions is usually fairly narrow, limiting the viewer to roam around in the room.

[30] For example Sharp demonstrated an 85-inch 8K glasses-free 3D television at the CES 2014. Also see Dimenco, a 3D screen producer, at www.dimenco.eu

[31] This applies mainly for UHDTV as 3D requires only limited extra bandwidth capacity as the extra 3D data contains only 'depth information'. This is also the reason why 3D television services have a certain degree of backward interoperability with existing HD services. 3D television services can be watched as a 2D service on a (U)HDTV screen.

For example, with the current DVB-T2 transmission and encoding technology, it is only possible to carry one UHDTV/4K service (of 40 Mbit/s) in one multiplex and on average a DVB-T2 platform has five to six multiplexes. This transport efficiency is the same for satellite or cable networks, although satellite transponder capacity and cable network capacity can be extended (against great costs though).

2.2 Business model and strategy changes

In section 2.1 the key service changes have been identified in the convergence area and were related to technological innovation and changes in consumer preferences. In this section the impact of these service changes on business models and strategies (i.e. especially service bundling and market access control) are being addressed.

Some technological innovations directly impact applied business models. For example, the introduction of conditional access systems (CAS)[32] made it possible to efficiently introduce pay models for offering exclusive content. CAS technology made it possible to dice and slice multimedia content in any way the content provider likes and provides the flexibility in pricing it. For example, pre- paid cards can be used to buy access to single sport events or feature films next to a basic FTA offering. In addition, pre-paid (CAS based) television offerings are common in Africa. This technology makes it possible for unbanked people to enjoy television content while reducing bad debt related risks.

2.2.1 Business model changes

In the converged market of interactive multimedia services two elementary business models prevail; the pay and the advertising model. The pay model is based on the principle of offering exclusively content or service which can only be accessed or used after (agreeing to) payment. The advertising model is based on the principle that the user can access the content or service but needs to accept exposure to advertising. In the broadcast industry the two classic examples of these two business model variants are the pay-TV and FTA model.Telecom services (like telephony and Internet access) are typically offered on the basis of payment[33].

Impact on advertising models

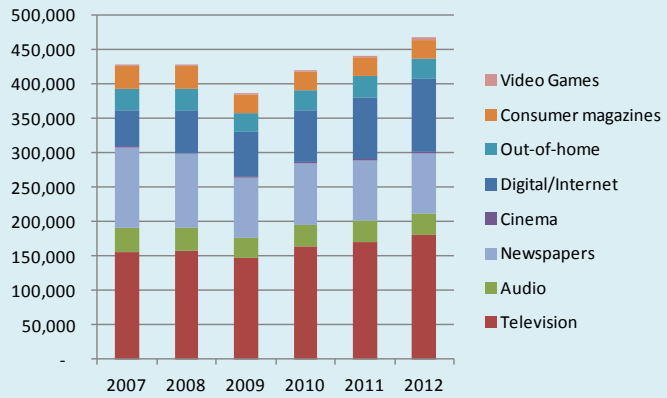
In the domain of interactive multimedia services, the most pertinent question is whether all these service changes of having content anywhere, any time and tailored to individual needs will impact the advertising model of traditional broadcasting. This is a very significant question as the media advertising market has been and is still dominated by traditional television advertising, despite some shift of advertising money to Internet based advertising.

Figure 19 shows the resilience of television advertising expenditure (ADEX) over the past years across the world. Advertising expenditure is highly sensitive to economic growth and hence the (temporary) dip in the year 2009 (as the nominal GDP growth fell to -10 per cent around that time).

[32] CAS is a system developed by the broadcast industry but a similar technology was introduced in the (mobile) telecommunication market labelled Digital Rights Management (DRM) system which is based on SIM card technology.

[33] Some market trials have been conducted with advertised based telephony services, offering users to call free of charge after listening to adverts.

Figure 19: Global media advertising expenditure (in million USD)



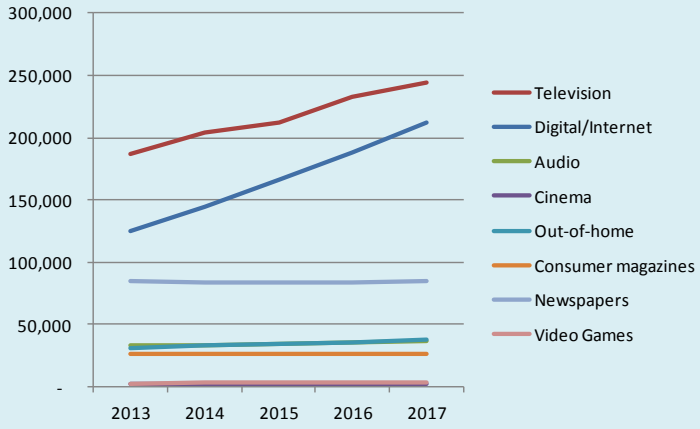
Source: McKinsey, 2013 Global Media report

The television ADEX figures as shown in Figure 19 reflects the fact that advertisers (still) consider linear television broadcasting as the most effective way of getting their message across. Television advertising can deliver audiovisual messages to (national) audiences in millions. There is as yet no other medium that offers equivalent reach and quality of message[34]. For this reason, even Internet start-up companies rely on television advertising to create awareness. In other words, the Internet has not risen to the power of linear television viewing (yet).

With people spending so much time on watching television (section 2.1) and only accessing a fraction of the total content on offer (i.e. not accessing the long tail of other television services), one can say that the only way to finance such amounts of content is by advertising. Public resources, i.e. Public Service Broadcasting (PSB), and pay-TV cannot possibly finance this wide range of content broadcasted each day. So as long as content diversity is a 'must have' the advertising model will remain strong.

Therefore television ADEX forecasts all point in one direction; television ADEX keeps growing[35]. Figure 20 shows a global forecast of the media spent across the different media.

Figure 20: Media ADEX forecast 2013-2017 (in million USD)



Source: McKinsey, 2013 Global Media report

[34] These is why some NRAs feel that broadcasting platforms may still have a dominant position and needs to be (extra) regulated. See for example OECD policy paper on 'Competition issues in Television and Broadcasting', dated 2013.

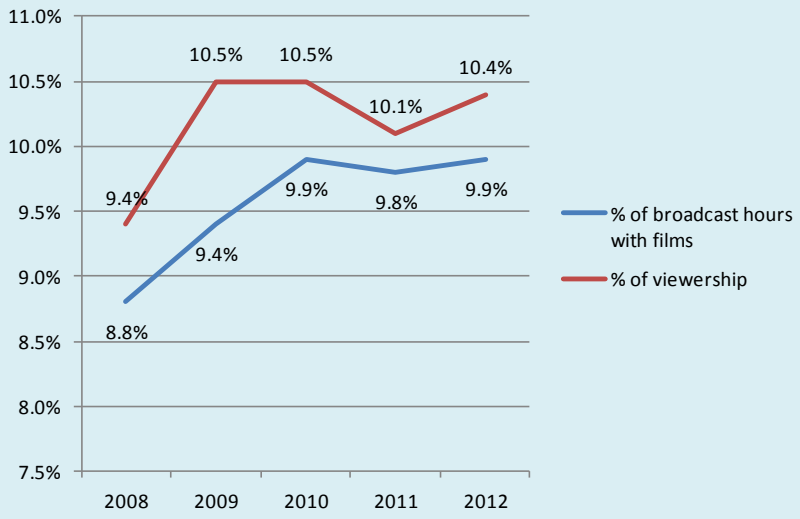
[35] For example the PwC Global Media Forecast and the McKinsey Global Media report.

Impact on pay models

In 2013, the global pay-TV market was valued at about 200 billion USD, mainly from subscription fees from broadcast platforms like DTH, cable and IPTV. As discussed in section 2.1 a significant increase is expected in OTT services reflected in the CDN traffic growth (Figure 10). VoD services like Hulu or Netflix could have an effect on the pay-TV industry and lead to consumers cancelling all or part of their pay-TV subscription. Research by Deloitte in the UK found that 4 per cent of respondents claimed to have cancelled their subscription in 2012, with affordability being the main reason. Ten per cent claimed to be thinking about cancelling, and of this small sub-set, only 7 per cent claimed that paid-for VoD services were a factor. A contributing factor for having a limited impact (yet) seems to be that almost all of the pay-TV providers deliver 'multi-play' or bundled services. Next to the television services they also provide Internet and/or telephony services. Service bundling makes taking out one or a selected number of services from a total service package a complex consumer decision, as they have to reconsider the whole package. Even more so as the pay-TV STB also provides additional functionality such as personal video recording.

Interestingly, TiVo Research found that Netflix services do not impact traditional television viewing. They found no significant difference in the amount of traditional TV viewing between the self-reported Netflix and non-Netflix households, nor did either group differ from the overall TV viewing population[36]. This could also point to media stacking, as discussed in section 2.10. An alternative view on the predicted OTT service growth could be that it will form an opportunity for traditional broadcasters. They have strong content libraries and can fall back on brand trust and loyalty. This is the very reason why catch-up television services are the most popular VoD service for homes. With more OTT services available on connected TVs, people will get more familiar with accessing content via TV-apps (which will become more and more standardized in their functionality and user interface). Broadcasters can build on that by extending their service offering. As PwC's 2014-18 Global Media Forecast states "pay-TV providers will not be daunted by the rise of OTT, as it grows across global markets". They predict that global subscription TV revenues will grow at a CAGR of 3.5 per cent over the next five years to 236 billion USD in 2018. The European Audiovisual Observatory also says that VoD services that are OTT delivered are on the rise. Traditional players are responding by launching their own TV-apps and also by airing more feature films in their linear broadcast services. Figure 21 shows this trend of the percentage of broadcast hours that include feature films of the top-5 best performing linear television service in Europe. The figure also shows the rising viewership of these broadcasters (as a percentage of all people).

Figure 21: Growth of viewership and number of feature films of top-5 TV services



Source: European Audiovisual Observatory, 2013

[36] See TiVo Research press room on http://pr.tivo.com/

It seems doubtful if the competitive measure of having more feature films in linear broadcast services will last in the long run. With the rapid growth of connected televisions, companies like YouTube are now no longer confined to computers and mobile devices. These (OTT) companies are investing in providing content for the more lucrative long-form VoD market or will move even further with providing TV and film services. For example YouTube has already launched its first online pay channels, where content can be downloaded and kept, or 'rented'. Also, Netflix has distributed a number of Netflix-exclusive programs; including original series such as House of Cards and Orange Is the New Black.

2.2.2 Business strategy changes

There are many business strategies for responding to changes in the converged market place. In this section only some typical strategies are indicated. These strategies merely serve as examples and are not presented as a best way to respond. The following strategies are covered:

1. multi-play;
2. multi-screen;
3. eco-systems;
4. Internet traffic management.

Multi-play

Multi-play includes the bundling of fixed and mobile telephony, television and Internet access. With multi-play offerings, extra functionality and service levels can be offered to consumers. The following user example illustrates this.

In the train on your way home from work, you watch a live music award show on your television enabled mobile phone. You like the nominated songs, and so you order four MP4 music clips from your mobile, asking for them to be delivered both to your mobile and to your media centre at home (i.e. in your personal 'cloud'). You also vote for one of the songs you like best. When you arrive at the railway station, you have to stop watching, even though they are about to announce the winner. But when you get home, you switch on your connected television, and you continue to watch the time-shifted music award show from the point where you stopped watching it in the train.

All this when managed in a single integrated eco-system and with the same familiar user interface, will provide many up-sales opportunities and above all increase customer loyalty. This has clear added value not only for the provider but also the customer. Discounts, value for money and the convenience of dealing with a single service provider are obvious reasons for consumers to adopt bundled communications services.

Not only the incumbent cable and telecom operators are bundling services but also relatively new players like ISP and OTT providers are following this multi-play strategy. The Australian Communications and Media Authority (ACMA) reports that although still in its infancy VoD services are bundled by several ISPs including iiNet and Optus. They are providing IPTV services bundled with home broadband and fixed-line telephone services for no extra cost.

Multi-play services provide customer incentives to retain their fixed line or fixed broadband telecom operators. However, some industry analysts claim that the customer lock-in may be too big in the longer term. It will be harder for customers to switch provider as they will have to reconsider the whole package of services. Regulatory concerns may arise in relation to bundling of services in the end-user market. This risk becomes more eminent if the multi-play becomes a 'must have' in the end-user market. Some regulators consider IPTV networks as instrumental in offering multi-play services and introduce measures to arrange for wholesales access to these platforms[37].

[37] See for more details Telecommunications Policy 38 (2014) 264-277, 'Wholesale broadband access to IPTV in an NGA environment: how to deal with it from a regulatory perspective'. See also Korea Country Case in section 5.5.

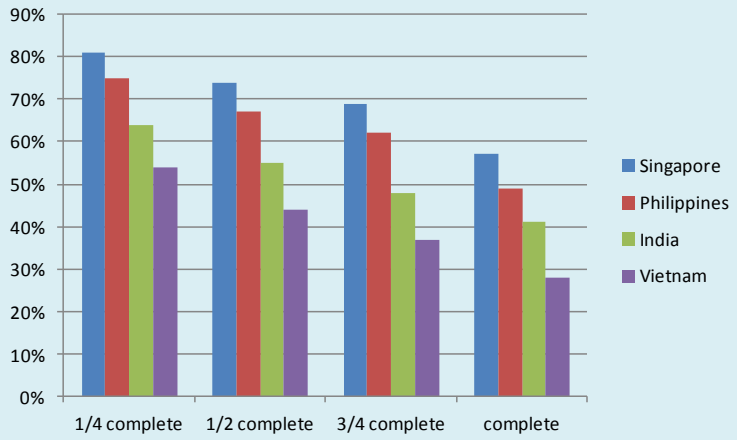
Multi-screen

In line with the global trend, also in emerging Asia the IP video traffic share of tablets and smartphones are forecasted to grow from respectively 1.9 per cent to 4.1 per cent for tablets and 11.5 per cent to 21.9 per cent for tablets[38]. This trend, in combination with the increasing number of devices per household (see Figure 3) and the share of video time played on mobiles and tablets (see Figure 12), makes it evident for providers of interactive multimedia services to include a strategy for multi-screen. Commercial and public broadcasters across the world have embraced such a multi-screen strategy, providing at least catch-up television services adopted for display on mobiles and smartphones.

The more advanced strategies include media meshing activities (section 2.2.1) whereby audience participation is possible through the second/third screen (like voting and quizzing). The delivery of interactive content is not limited to mobiles/tablets. Also the delivery of live video and VoD services can be to all four screens (i.e. smartphones, tablets, PC/laptops and connected TVs) with a smart combination of audience engagement and advertising analytics to maximize the revenue opportunity.

Advertising analytics require insight into the consumer behaviour when viewing video content on connected devices. For traditional broadcasters these advertising analytics for connected devices is a relatively new capability which will need different skill sets and measuring methods. Viewing engagement on connected devices can vary significantly between countries, also in the Asia-Pacific region. For example, Figure 22 shows the engagement percentages (expressed as the percentage of viewers that complete the video for ¼, ½, ¾ or full length) for a number of selected countries.

Figure 22: Online video viewer engagement for selected AP countries



Source: OOYALA Video Index Q1 2013, adapted

Figure 22 clearly shows that viewers in Singapore are more engaged, with 57 per cent of the viewers completing the online video. Such insights can guide when publicity should be inserted and also indicate a necessity to offer (more) live content as with live content viewer engagement is significantly larger (see Figure 15). Also interactive content on second screens (i.e. media meshing) can help viewers complete video content and expose them to publicity (either on the first or second screen).

Eco-systems

In the market of interactive multimedia services, display devices are critical for enjoying the services and they range from smartphones to connected televisions. These devices are 'smart' as they are more than just a piece of hardware. Device producers are basically platform or eco-system providers. A platform for

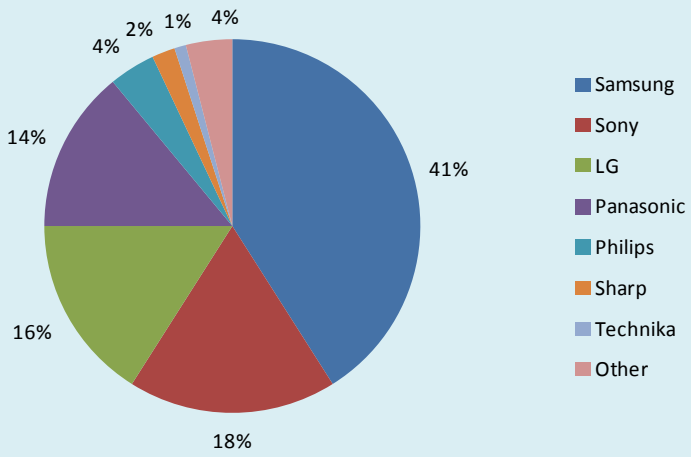
[38] See Cisco VNI Global IP Data Traffic Forecast, 2013-2018.

consumers to access their services through an integrated single user interface. The eco-system also enables content providers to make their content available in a unified manner. Both consumer and supplier are serviced and billed in this single eco-system.

The classic example of this device platform or eco-system is the i-Phone and its i-Tunes and App-store services. With the significant increase of connected televisions, new elements in the eco-systems are added by the television manufacturers. Clearly with these eco-systems the device manufacturers would like to move up the value chain and add recurring revenues (for example by having revenue sharing with content providers or providing subscription based services) to their more cyclic revenues stream of 'selling boxes'. The first step in their strategy is to gain market share quickly and hopefully set or dominate the industry standard. Dominance in a market obviously gives rise to competition concerns that may require regulatory attention.

However there are some other considerations to take into account as well when assessing these risks. With multi-channel television offerings becoming the standard practically everywhere, content diversity will increase significantly[39]. Standardization and an open platform for TV-apps also reduce the risk of market power abuse, as compared to a situation of having proprietary TV-apps. Competition at the device market itself or intermodal competition will help reducing the risks of market power abuse. Figure 23 shows the number of competitors in the connected television set market in the UK.

Figure 23: Market shares of connected TV producers



Source: Ofcom, 2013

Finally, like in the mobile device market, market shares can change quickly. In such volatile markets regulatory measures can be quickly misdirected (at the wrong party). However, the above example of access to eco-systems of connected televisions has its reverse side. There is a possibility that content providers are possibly blocked from an eco-system for device manufacturers to gain (unfair) market advantage. This raises the issue of net neutrality[40].

[39] In particular content diversity will increase after the worldwide migration process from analogue to digital broadcasting has been completed. See for example the Country Case India in section 5.3.

[40] See OECD paper 'Connected televisions, convergence and emerging business models', 22 January 2014. See also section 4.4 and Country Case Korea in section 5.5. In the often cited case of Samsung, the device producer was asked by KT (the largest ISP in Korea) to block OTT-apps (i.e. services that require high network capacity) from smart televisions.

Internet traffic management

For many years, Internet service providers have carried each other's traffic under either a peering or transit agreement[41]:

- Internet peering is a business agreement by which two companies (ISPs) reciprocally provide access to each other's customers, i.e. each other's networks (hence not the entire Internet). There is (in principle) no metering of each other's traffic volumes or traffic based payments. It assumed that traffic volumes of both parties are more or less the same.
- Internet transit is an agreement whereby an ISP provides (usually sells) access to the global Internet. Other ISPs or end- customers connect their networks to their transit provider, and on payment of a fees get access.

Peering or transit contracts are negotiated, and these market negotiations are mostly unregulated. ISPs avoid transit agreements as much as possible. Hence there is a strong tendency to aggregate networks by ISPs. This model has proven to be effective in terms of the speed at which the Internet was able to increase capacity and follow demand.

However this world is undergoing change as video Internet traffic has witnessed unprecedented growth. OTT providers are competing in the same converged market place as traditional broadcasters and IPTV providers. With the trend of UDHTV and connected televisions (section 2.1) OTT providers are facing challenges to deliver this type of service with enough quality of service (or experience) to their customers. At the same time, OTT providers do not have (complete) control over the distribution or network chain. Their customers are connected through third party ISPs (especially in the local loop/last mile) and/or telecom service providers.

Next to content management, a very important part of the OTT provider strategy is to manage Internet traffic efficiently. This traffic management strategy is aimed at getting more control over the way traffic is delivered over the Internet. As discussed in section 2.1 and illustrated in Figure 10, one way of doing so is to make use of Content Delivery Networks. Commercial and public broadcasters all over the world, including the Asia-Pacific, make use of CDNs to deliver their catch-up or linear broadcast services over the Internet. A more recent development is that of OTT providers, previously on peering contracts, willing to consider to pay for (more or less) guaranteed Internet speeds to end-users.

An example of this is the landmark agreement between Netflix (the leading OTT provider in the US) and Comcast (the largest ISP/broadband provider in the US). Under this agreement, Netflix agrees to pay Comcast to ensure Netflix films and television shows will stream smoothly to Comcast customers.

As mentioned in section 1.2 and depicted in Figure 1 (under type 7), this type of contract signifies a change from unmanaged to managed video services. In such cases, the Internet becomes more and more like a traditional broadcast/telecommunication network where users (irrespectively whether they offer content or consume content) pay for capacity and service levels. In other words, one could say that profits/revenues are shared.

3 Technologies and standards

Based on the definitions as provided in the Introduction, the Internet, Integrated Broadband-Broadcast services and IPTV are all key technologies that can be used to provide effective and efficient interactive multimedia services. Technically, any service that can facilitate a return path from the viewer to the service provider will enable interactivity. For example, the DVB family of standards and technologies has defined a number of return paths based on various telecommunication transport technologies.

In more elaborated forms of interactivity, the return path access additional data servers to provide enhanced experience. The up and down streams can be operated in heterogeneous transmission technologies.

[41] For more details see Bill Norton's Peering Playbook.

In the Introduction seven categories of interactive multimedia services, in combination with various technologies, were identified (see Figure 1). Only the technologies supporting the first five categories of interactive multimedia services are included in this section. Categories 6 and 7 are variants of categories 4 and 5.

3.1 Type 1: Linear digital television

Traditional linear broadcast services are offered by both public service and commercial broadcasters as services to receive at dwellings over terrestrial, satellite and cable networks. As interactive services require a return channel, interactivity with live broadcasts are established using telephone networks, by dialling into the studio. Sending mobile text messages (mobile SMS-Short message service) or responding via web servers also enables either live or off line interactivity.

In many instances, the caller or one who sends text needs to bear the costs of the return path communications. Another factor that determines which return path they select for television services is the platform of delivery. As satellites can deliver over large geographies, web-based feedback is more practical. When the television service is delivered over a terrestrial transmission platform, telephone calls and texting are viable options. In this category, the television service provider will assure the quality of service either by themselves or through a network provider having defined service levels (included in an agreement). For more information on digital broadcast services, please refer to the ITU Guidelines for the Migration from Analogue to Digital Broadcasting[42], 2014 and Recommendation J.205 (01/12) of ITU[43].

Teletext services can also provide limited interactivity. In Teletext additional data is transmitted with the normal video transmission in the same data stream. Buttons on the remote controller allows the user to access a number of data services such as flight, financial, weather etc.

There are other technologies that can be used to deliver linear television broadcast services, mainly for mobile or handheld devices. Section 3.3 describes systems that can be used to receive linear television services on mobile devices, including recent developments and status of mobile multimedia broadcasting for mobile/hand-held terminals. Similarly DVB-T2 Lite can also deliver linear broadcast services to mobile or portable devices[44].

3.2 Type 2: Wired integrated broadband broadcast

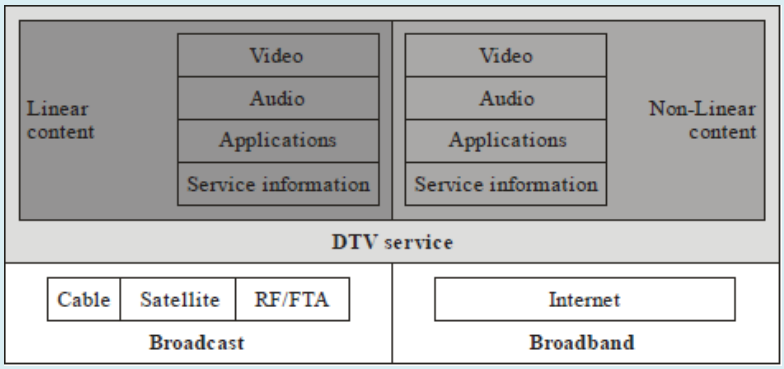
Recently, combination of broadcast and broadband is considered to expand the opportunity for new services. This approach is quite natural because this combination has potential advantage to provide both efficient mass content delivery and personalized services. At the same time, combined use of broadband may bring complexity to the system and its usage due to its very wide capability and flexibility. Hence integrated broadband broadcast (IBB) systems are more than an addition of another delivery channel. Figure 24 shows a system overview of IBB.

[42] See www.itu.int/en/ITU-D/Spectrum-Broadcasting/Documents/Guidelines%20final.pdf

[43] See www.itu.int/rec/T-REC-J.205-201201-I

[44] See www.itu.int/ITU-D/arb/COE/2012/DTV/documents/doc2.pdf page 45

Figure 24: IBB system overview



Source: ITU

There are number of systems that can operate in hybrid configuration. Most of these systems have explored information and communication technologies (ICTs) to deliver the services. There are a number of IBB systems experimented by broadcasters.

Recommendation ITU-T J.200[45] identifies the structure, the origins and the specification sources for a harmonized environment, including a set of application programming interfaces (APIs) for interactive television services. Various IBB systems have been considered in standardization by various global and national standardization bodies. The report ITU-R BT.2267 describes several IBB systems[46].

Standards have historically been set on a country-by-country basis (proprietary standards), requiring delivery of specialized hardware or content to each nation. The establishment of a unified standard means content owners and application developers can write once and deploy across many countries. Unfortunately there is no unified global standard yet.

However, working parties of ITU are studying IBB systems to formulate an ITU-R recommendation. The ITU-R SG6 is currently studying the Integrated Broadcast-Broadband (IBB) Systems, and based on the Recommendations established at ITU-T SG9, in July 2013 they established the Recommendation ITU-R BT.2037: General requirements for broadcast-oriented applications of integrated broadcast-broadband systems and their envisaged utilization, and in February 2014 they also established the Recommendation ITU-R BT. 2053: Technical requirements for integrated broadcast-broadband systems.

In addition, the ITU is currently working towards a new Recommendation ITU-R BT.[IBB-SYSTEM], which defines the IBB systems. Japan is also proposing the inclusion of their Hybridcast in the new Recommendation and this proposal is reflected in the working document.

This section presents an overview of three of the IBB systems, as well as a technical comparison between the three systems. The section is structured accordingly:

1. HbbTV;
2. Hybridcast;
3. iCon;
4. System comparison.

[45] See www.itu.int/rec/T-REC-J.200-200103-S/en

[46] See www.itu.int/dms_pub/itu-r/opb/rep/R-REP-BT.2267-2013-PDF-E.pdf

3.2.1 HbbTV

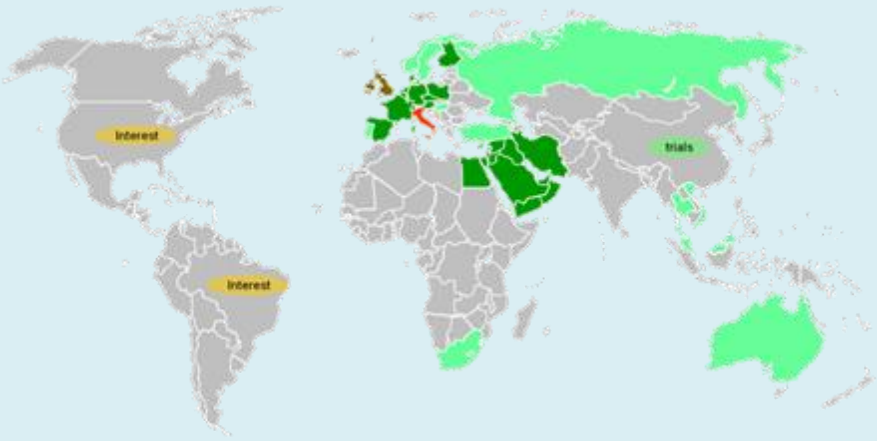
The Hybrid Broadcast Broadband TV (HbbTV) is a new international standard that is supported by range of new televisions and can be used by broadcasters and distributors to offer innovative services. These can be offered *directly* on a connected TV or an STB or dongle without consumers having to buy extra equipment.

HbbTV is one of the standards that can provide a direct link between the linear programme and online content. Through this link, HbbTV provides a new service dimension in the provisioning of television programs and channels. As HbbTV is well standardized, broadcasters and distributors can roll out such innovations without interoperability issues.

HbbTV standards are developed by the "HbbTV Association" [47] and published by European Telecommunications Standardization Institute (ETSI)[48]. The HbbTV Association was established in 2009. Hence the standard has been available for five years and with the migration from analogue to digital broadcasting its application is on the rise.

The HbbTV association aims at providing an alternative to proprietary technologies and delivering an open platform for broadcasters to deliver on-demand services to the end consumer. The association has defined an HTML-based specification to enable broadcasters to associate applications with their television content, allowing consumers to access other video content and additional information. It has been widely adopted by broadcasters and manufacturers. Figure 25 shows the global adoption of the HbbTV standard.

Figure 25: Global adoption of the HbbTV standard[49]



Source: HbbTV Association

As its origin is in Europe, the HbbTV standard has been foremost adopted by broadcasters in Europe. HbbTV was launched in Australia in 2014 and is planned to be launched in Malaysia in 2015. The HbbTV standard is also in the process of being tested in Indonesia, Myanmar, Singapore, Thailand, and Viet Nam. North and south American countries, and Russia are considering the HbbTV standard. More details on the current status of the global HbbTV deployment are provided in Annex A: HbbTV deployment.

A wide variety of HbbTV services and applications have been deployed including service like Video On Demand, Catch up, Start Over, Information services, EPG and shopping services. Several commercial and public broadcasters have developed HbbTV services, including leading European broadcasters like ARTE, M6, NPO, NRJ, RTVE, TF1 and ZDF. Figure 26 shows a typical user interface of HbbTV services.

[47] A Swiss not-for-profit organization, for more details see http:hbbtv.org.

[48] ETSI is officially recognized by the European Union as a European Standards Organization.

[49] The designations employed and presentation of material in this publication, including maps, do not imply the expression of any opinion whatsoever on the part of ITU concerning the legal status of any country, territory, city or area, or concerning the delimitations of its frontiers or boundaries.

Figure 26: Typical HbbTV user interface

Source: HbbTV Association

3.2.2 Hybridcast

The Japan public broadcaster (NHK) launched the new integrated broadcast-broadband service "Hybridcast" on September 2, 2013. Hybridcast enhances a broadcasting service with broadband, like the other systems. NHK started with offering the HTML5 application on a TV receiver to provide detailed and useful content such as latest news, weather, sports, and financial information. NHK is planning to provide program-related services, video on demand services and device linkage services, which uses a mobile terminal as a second screen, by 2015. In the future, any service provider will be able to create applications and distribute them to viewers. Application authentication will be necessary to verify that an application originated from a trusted service provider and has not been modified in any way.

On December 16, 2013, NHK started a service linking the home screen with mobile terminals such as smartphone and tablet. This home screen is depicted in Figure 27.

Figure 27: NHK's Hybridcast home screen

Source: NHK

When a viewer uses a Hybridcast Launcher application pre-installed on a mobile terminal, the home screen on the television is 'iconized' and the viewer can get program-related information such as the website of the current programme on the mobile terminal. Then, by using the "Keyword Connect" service, a viewer can select one of the keywords, such as names of actors appearing in the program, so that the viewer can easily use an external search engine with the selected keyword to get more information on the mobile terminal. This interaction between the home screen and the mobile terminal is illustrated in Figure 28.

Figure 28: Interaction between home screen and mobile device

Source: NHK

Hybridcast services are currently provided by using "broadcast-oriented managed application". When a service is about to start, a broadcaster transmits a control signal to for example terrestrial television receivers to launch an application automatically. The broadcaster creates an application and distributes it to each viewer, so a viewer can feel safe to use it.

In the future, Hybridcast services will also be provided by using "non-broadcast-oriented managed application". In this case, a service provider that the broadcaster trusts will create an application and distributes it to each viewer who can launch it anytime. Therefore, security technologies such as identification, authentication, and digital signature are necessary to ensure reliability of applications. The security system for Hybridcast will be standardized at IPTV Forum Japan.

Hybridcast Specification Ver.1.0 for broadcast-oriented managed application has been standardized at IPTV Forum Japan in March 2013. Hybridcast Specification Ver.2.0 for non-broadcast-oriented managed application will be standardized by end 2014[50].

3.2.3 iCon

The Korean Public broadcaster (KBS) launched iCon, or Open Hybrid TV (OHTV) in the Republic of Korea on March 19, 2013. iCon is the first terrestrial hybrid TV service in R.O. Korea. The service includes EPG, programme search, video clip, vote, etc. The standard aims at integrating digital terrestrial television service with broadband interactivity, like the two previously discussed standards.

Advertising market share on the Internet has been rapidly increasing (see for example Figures 19 and 20) and a smartphone is the most necessary media for the age group under 30's. About half of viewers in R.O. Korea use a smartphone while watching TV (see also section 2.1).With iCon KBS intends to respond to these trends in the market. In the future OHTV 2.0 services will be provided. These services use HTML5 and second screen devices such as smartphones or tablets. KBS is planning launching these VoD services in the fourth quarter of 2014.

[50] For more information see www.itu.int/dms_pub/itu-r/opb/rep/R-REP-BT.2267-2013-PDF-E.pdf

3.2.4 System comparison

Here a concise comparison of the three previously presented IBB systems is provided, based on their system characteristics.

In the Recommendation ITU-R BT.2053-0 (02/2014) titled "*Technical requirements for integrated broadcast-broadband systems"* several application types are defined[51]. This Recommendation defines technical requirements for integrated broadcast-broadband systems and intends to harmonize the behaviour and the interaction of a variety of types of applications by broadcast delivery, broadband delivery, pre-installed, via application repository, and home area network delivery.

Recommendation ITU-T J.205 titled "*Requirements for an application control framework using integrated broadcast and broadband digital television*" defines requirements for IBB applications and their environments. From a technical point of view, some important requirements to characterize the system were chosen in this comparison and additional items were added from the view point of service provisioning. Table 1 provides an overview of the system comparison[52].

Table 1: IBB system comparison

	Hybridcast	HbbTV	OHTV
Relationship with iTV - Interactive TV	A mechanism to switch execution between Hybridcast apps and BML based iTV content is defined.	The interactive content can be just text on its own or with associated programme. It's being launched via RED button application. There shall be broadband connection enabling interactive content delivery.	No relationship
Application delivery transport	Broadcast and Broadband	Broadcast and broadband	Broadcast and Broadband
Content delivery transport	Broadcast and on-demand content over Broadband	Content being carried on carousel via broadcast and broadband connection.	Broadcast and Broadband
Metadata delivery transport	Broadcast and Broadband	Broadcast and broadband	Broadcast and Broadband
Application control signal transport	Broadcast and Broadband	Broadcast and broadband	Broadcast and Broadband
Support of service associated apps.	Supported in V1.0	Supported in V1.5 To be develop by broadcasters or with associated service provider	supported
Support of stand-alone apps.	Application type is defined in V1.0 as Non-Broadcast-Oriented application	To be develop by broadcasters or with associated service provider	Not supported
Support of third-party apps	Supported in V1.0 with limited applicability	Supported in V1.5 To be develop by broadcasters or with associated service provider	Can be linked within each broadcaster's application
Application life cycle control by provider	Supported in V1.0	Supported in V1.5	supported
Application life cycle control by end-user	Will be supported in future version for stand-alone apps.	Supported in V1.5	Not supported

[51] See ITU website with URL www.itu.int/rec/R-REC-BT.2053-0-201402-I/en

[52] See www.itu.int/rec/T-REC-J.205-201201-I

	Hybridcast	HbbTV	OHTV
Application authentication	Broadcast-Oriented applications are authenticated by the fact that signalling is given through broadcast channel.	Broadcast-Oriented applications are authenticated by the fact that signalling is given through broadcast channel.	supported
Service integrity and security	In Broadcast-Oriented applications, all the applications can be started under the control of signals given by broadcasters.	Broadcast-Oriented applications, all the applications can be started under the control of signals given by broadcasters.	supported
End-user privacy protection	Each broadcaster can access to their dedicated storage area in a receiver.	To be decided	supported
Content protection	A dedicated object to access to broadcast video image is defined.	Using DRM (Marlin)	Depending on system implementation
Companion device collaboration	Supported in V1.0	Supported in V1.5	Will be supported in future version
Application format	HTML5 with additional objects and functions	HTML	HTML

It can be observed from Table 1 that the majority of features are supported by three systems. Since the majority of the features are common in all three systems, broadcasters find it difficult to choose a system. Thus the choice of an IBB system would mostly be influenced by the deployment numbers of the three systems. The deployments of HbbTV are listed in Annex A: HbbTV deployment. The deployment of the other two systems is unique for the respective countries.

Specifications for the three systems as compared above in Table 1 can be accessed from the following standard documents that are listed below.

1. HbbTV: ETSI TS 102 796 V1.2.1, "Hybrid Broadcast Broadband TV" and ETSI TS 102 809 V1.2.1 "Signaling and carriage of interactive applications and services in Hybrid broadcast / broadband environments"[53].
2. Hybridcast: IPTVFJ STD-0010, "Integrated Broadcast-Broadband system specification V1.0", IPTV Forum Japan and IPTVFJ STD-0011, "HTML5 Browser specification V1.0", IPTV Forum Japan.
3. OHTV - Korean system TTAI OT-07.0002.

3.3 Type 3: Mobile integrated broadband broadcast

With the popularity of mobile and handheld devices connected to broadband, viewers have options to access content at anytime, anywhere (see also section 2.1). As there is variety of systems applied for this service category, two countries are presented as an example where the technology has been applied, including:

1. Malaysia: On-the-Go service of pay-TV provider Astro;
2. Japan: NOTTV service based on ISDB-T_{mm}.

[53] See www.etsi.org/deliver/etsi_ts/102700_102799/102796/01.02.01_60/ts_102796v010201p.pdf

3.3.1 Malaysia

On-the-Go services offered by Malaysia based pay-TV provider Astro is one example in the Asia-Pacific region. Those who have signed up for Astro's DTH services can access broadcast content, on demand content via fibre or coaxial network. While on mobile, they can also access the content on their mobile devices.

In 2012 Astro launched its On-The-Go service to cater users on the web and on mobile devices. On-The-Go offers both free and pay content. There is no installation and sign up is free. When a customer has signed up, customer will get to watch selected programs for free or customer could get a premium package including sports, live events, movies, TV shows. Customer can watch customer selected shows anywhere customer go. Customer can watch them on mobile phone or on a tablet. Interactive multimedia content is delivered via broadband based on LTE technology. Data usage will be charged by the mobile operator. Customers can watch both linear (live and catch-up) and VoD content.

3.3.2 Japan

After Japan completed its analogue switch-off (ASO) process it freed-up spectrum for interactive mobile services in the VHF band[54]. In this freed-up VHF band, Japan operates two systems: ISDB-T_{SB} and ISDB-$T_{mm.}$

The first system will provide regional multimedia broadcasts over the VHF-low band, using a system based on the Integrated Services Digital Broadcasting for Terrestrial Sound Broadcasting (ISDB-T_{SB}) system. The other system, which is a modified ISDB-T system (ISDB-T_{mm}), is for nationwide multimedia broadcasting using the VHF-high band.

The ISDB-T_{SB} system assigned to the VHF-low band will be enacted by Ministerial Ordinance by the end of 2014. This system will use 99-108MHz. There are 7 divided areas across Japan. Each service will use 9 ISDB-T_{SB} segments. The actual VHF-Low band multimedia broadcasting service is expected to be launched in 2014. Both ISDB-T_{SB} and ISDB-T_{mm} are capable of offering interactive multimedia services based on the core technology of ISDB. However their carrier frequencies are different for the ISDB transmission technology and also the intended service coverage areas. Table 2 shows an overview of both systems.

Table 2: ISDB-T system overview

	ISDB-T_{SB}	ISDB-T_{mm}
Frequency Band	99 – 108 MHz	207.5 – 222 MHz
Bandwidth	429 kHz multiplied by "n" n: Number of segments	
Modulation	Segmented OFDM	
Carrier Modulation	QPSK, 16QAM	
FEC	Inner: Convolutional code Outer: Reed-Solomon code	
Video Coding	ITU-T H.264 | ISO/IEC 14496-10 (Level 3, Main Profile)	
Audio Coding	AAC + SBR+PS, MPEG Surround	
Service Area	Regional	Nationwide

The mobile services carried over the ISDB-T_{SB} are also commercially referred to as One-Seg services. For a more detailed description of the One-Seg technology please refer to the ITU Guidelines for the Transition from Analogue to Digital Broadcasting, January 2014. Only ISDB-T_{mm} and the operator utilizing this technology (NOTTV) is presented in rest of this section.

[54] The FM band in Japan is different from most other countries.

ISDB-T_{mm}

VHF-high band multimedia broadcasting in VHF band III 207.5 to 222MHz seamlessly provides both high-quality live streaming service and file-casting service in a single allocated bandwidth. Furthermore, this broadcasting system provides several useful functions by collaborating between “Mobile Broadcasting” and “Mobile Telecommunications” within a single mobile device. For example, missing data in file-casting content, which are not able to be received by the broadcasting channel, will be complemented by using mobile communication channels.

NOTTV

NOTTV is a digital broadcasting network that is designed exclusively for Japanese Android "Galapagos” smart phones and tablets. NOTTV began offering its service from April, 2012. Currently it is only available on devices offered by NTT Docomo. This may be explained by the fact that the company running the NOTTV service, mmbi, is a NTT Group company.

NOTTV is not just software; it requires special hardware and a special antenna. This hardware and antenna are build-in about 30 of Docomo's phones and almost 10 of their tablet models. You can add and cancel your NOTTV service to/from your phone bill directly from the application (which includes an addable home screen widget).

NOTTV is similar to Japanese One-Seg technology in that it broadcasts digitally using the VHF Band. This band was used by regular television services and has excellent building wall penetration characteristics. It shares the same telescoping antenna that most One-Seg phones have. Unlike One-Seg, which is a technology that uses "One Segment" (out of 13) NOTTV doesn't associate with traditional television channels. NOTTV uses a sub-spec (of ISDB-T): ISDB-T_{mm}. The audio/video digital stream is encrypted MPEG4 AVC/H.264 based.

ISDB-T_{mm} uses XML based BML metadata that displays data like weather, programming and channel info, sent together with the video and audio service. The NOTTV app for Android integrates with both Facebook and Twitter, so live-tweeting (automatic NOTTV hash tags are added) of baseball and soccer and other sports is possible.

An advantage of One-Seg and NOTTV for Japanese commuters is it does not suffer from packet competition during congested times of the day (for example, during morning and evening commutes), meaning it can be watched on the train (providing your train is above ground) during rush hour when every mobile device in Japan is trying to receive data at the same time.

The advantage that NOTTV has over the older One-Seg technology is its superior resolution and frame rate: its current three channels broadcast at 720x480 progressively at 30 frames per second. For its "shift-time" programming, it can go up to 1280x720 (but only at 15 frames per second), which is almost ten times the resolution (and considered HDTV quality) of One-Seg, which is 320x240 at 15 frames per second.

One-Seg is a relatively old technology, and on today's high resolution phones, phablets, and tablets with large screens, the superior resolution of NOTTV is immediately noticeable. In addition, the natural frame rate of 30 per second makes watching action, such as sports, much more enjoyable. NOTTV looks good also on a 10 inch screen tablet.

3.4 Type 4: IPTV

ITU defines Internet Protocol Television (IPTV) as multimedia services such as television, video, audio, text, graphics, and other data delivered over IP based networks managed to provide the required level of quality of service/ quality of experience (QoS/QoE), security, interactivity and reliability[55]. This definition excludes

[55] See http://academy.itu.int/topics/item/328-iptv . Also the H series from the ITU gives recommendations related to IPTV services, see www.itu.int/ITU-T/recommendations/index.aspx?ser=H.

the delivery of IP based interactive multimedia over the free Internet. These so-called OTT services are addressed in section 3.5.

IPTV has found its way to millions of homes in the world with its live television and VoD services. However, a lack of common standards for delivering digital content via IP to the television slows down the adoption of IPTV by industry. Also the lack of broadband access may hamper the take-up in the short run. As it stands now an STB for one IPTV network would not work for another unless they are manufactured under a common standard. Because of a wide range of areas to cover, and IPTV in itself being a broad subject, setting standards for IPTV is not an easy task. Standardization is underway, however it tends to favour one or a few members of the value chain. An overview of these various standardization bodies and their efforts is provided in Annex B: IPTV Standardization bodies.

This section presents a description of what IPTV is and its functionality (with reference to a system architecture overview). It also explains how the platform delivers VoD services. Finally this section provides a list of the key features of IPTV.

3.4.1 IPTV architecture

IPTV is a system where digital television services are delivered over a network by using Internet Protocol (IP). The video streams are encoded as a series of IP packets. Unlike linear television where all television programme are broadcasted simultaneously (section 3.1), IPTV provides only one programme at a time and content remains on the service provider's network and only authorized customers can view the content. It can also be bundled with high-speed data access and Voice over Internet Protocol (VoIP) commonly known as triple-play (sections 2.1 and 2.2).

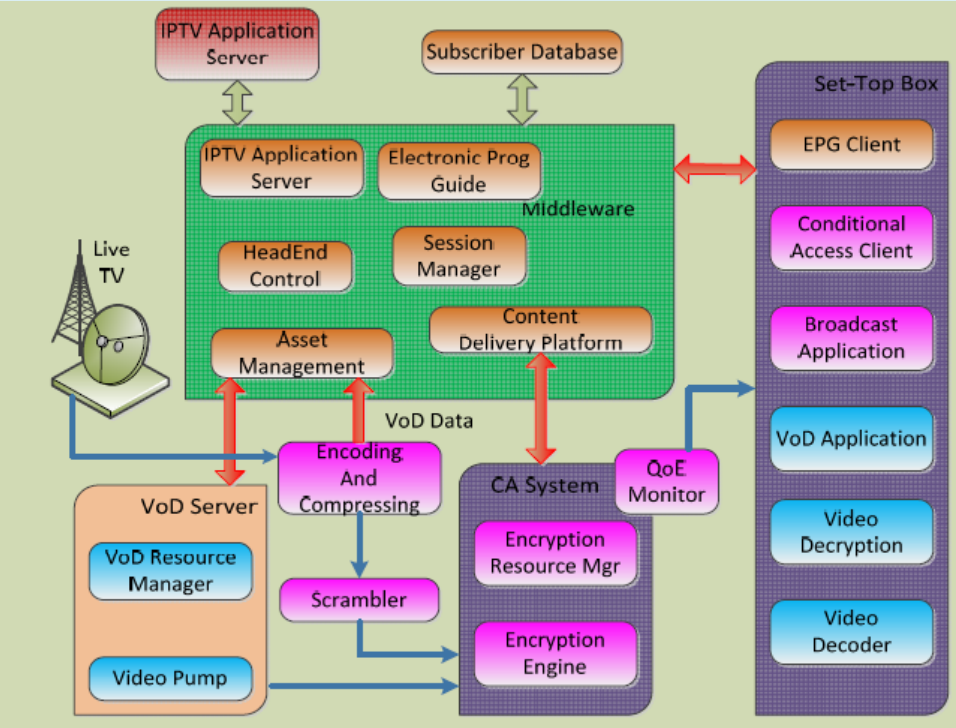
IPTV primarily uses multicasting with Internet Group Management Protocol (IGMP) for live television broadcasts and unicasting with Real Time Streaming Protocol (RTSP) for on-demand programs. HTTP (Hyper Text Transfer Protocol) is also used to communicate with the network servers and computers for data transfer. Compatible video compression standards include MPEG-2, MPEG-4 (Part 2 and 10) H.264, AVC and a few others. Figure 29 shows a simplified IPTV system architecture.

Figure 29 shows an overview of IPTV architecture. The main building blocks one finds in an IPTV system are:

- contribution of content (these form the ingress to the IPTV system; may be derived from satellite;
- other content production houses;
- live television signals and content libraries and archives;
- video on demand server;
- process engines to transcode and encode signals for delivery;
- conditional access system for digital right management (DRM); and
- middleware to handle the customer base and interactions from the customers via set-top-box at the receiving end.

IPTV services may include, for example, Live TV, video-on-demand (VoD) and Interactive TV (iTV). These services are delivered across an access agnostic, packet switched network that employs the IP protocol to transport the audio, video and control signals. In contrast to video over the public Internet, with IPTV deployments, network security and performance are tightly managed to ensure quality of service.

Figure 29: IPTV architecture overview



Source: IPTV-Internet Protocol Television, ISBN 13: 978-3-659-38740-1, 2013

IPTV supports both live TV (multicasting) and the stored videos (VoD) unicasting services. In order to receive the IPTV signals, a computer or a television with a set-top-box is required. The video content is typically compressed using either a MPEG-x codec and then sent in the transport stream via IP multicast in case of the live TV or via IP Unicast in case of VoD. IP multicast is the technology that delivers the video content to various users simultaneously whereas the Unicast technology delivers the video content specifically for each user.

While the basic concept of IPTV is simple, actually creating a comprehensive IPTV system is not. Some literature recognizes posting videos online using free online services to be viewed on set-top-boxes or smart TVs as an IPTV system, but it is a very crude version and wouldn't qualify for a true IPTV system. To create a functional and comprehensive solution there are a few building blocks that need to be in place. They are described briefly here:

TV head-end

The TV head-end is the station or broadcast centre where the delivery of IP multicast streams, encoding, recording, and encryption takes place. When viewers are watching television services delivered by an IPTV system, the content they are viewing originates or is being delivered from the TV head-end.

Resource management

Resource management is carried out through another piece of hardware referred to as the application server. It refers to an IPTV system's ability to keep track of customer privileges and utilize content information. One of the advantages of an IPTV system is that providers can customize channel availability down to the individual set-top-box. The application server keeps track of all the data necessary to manage all of the system's end-points and gives them the necessary privileges. With its resource management capabilities, the application server also controls the system-level interface to third party technology. With application programme interfaces (API) the system can interface with external programme that need system information to carry out the tasks.

Middleware

The middleware, also known as the interactive portal, is the graphical user interface (GUI) that the viewers see. The electronic programme guide (EPG), navigation, or any other visual guide with which the viewer interacts, makes up the middleware.

The IPTV middleware is divided into a service platform middleware and a terminal middleware linked through a Bridge. The IPTV middleware invokes the lower layer resources (e.g. network interfaces) to control them, and provides APIs for upper layers.

The IPTV middleware also provides some specific functions, like resource management function. This functional module manages system resources in IPTV terminal devices and servers. It also provides Application management functions. This functional module manages the life cycle of the applications and the interactions between them.

Video on demand platform

The bulk of the content in most broadcast set-ups (IPTV, cable, or otherwise) is live viewing, or content that is broadcast live from the head-end to the viewers. VoD content is essentially stored content that is delivered to viewers whenever they choose as a unicast from the server. A unicast is a one-to-one stream of the content and is displayed when a viewer selects a certain program, such as a movie. The server delivers a unique copy of the content to that particular viewer for a specified amount of time. Video on demand services are described below and also illustrated in Figure 30.

Transmission network

The transmission network delivers content from Point A to Point B or Point A to multiple points. In the case of IPTV, the transmission network is the IP based network, be it through an Ethernet, fibre cable or wireless connection. Think of it as the road through which the video content travels.

Gateway

The gateway is the equipment at the end of the transmission network that delivers the video content into the viewer's home. In the case of an IPTV system, this would be the viewer's home router.

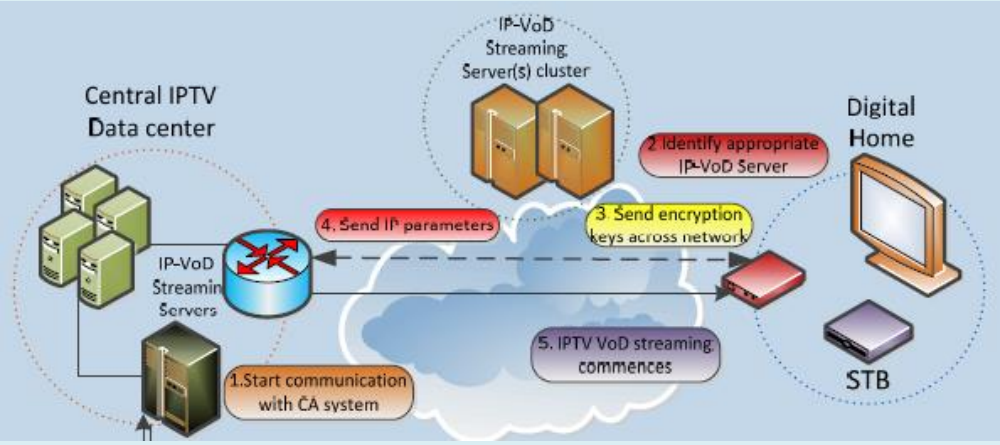
Customer premises equipment

The customer-premises equipment (CPE) is the set-top-box or smart TV that decodes, decrypts, and displays TV content (multicast and unicast) on the TV screen in a viewer's home. The CPE takes the data packets sent from the head-end over the IP transmission network and turns it into a picture for the viewer to see.

Linear (Live) television services are delivered as multicast service from headend to the receiver. The basic protocols used in the IPTV multicasting are the HTTP (Hyper Text Transfer Protocol), IGMP (IP Group Membership Protocol) and RTSP (Real Time Streaming Protocol). HTTP is the protocol that browsers use to communicate with the servers and computers for data transfer. Live TV uses IGMP for connecting set-top-boxes with the multicast stream and switching to another multicast stream while RTSP protocol is used for VoD services. With IPTV the content library for VoD services can be unlimited and is unicasted to the end-user. Figure 30 shows the VoD process flow.

In a VoD service, a single user requests and consume/view video-audio programme as a stream according to the user's requirements. Bandwidth optimization can be achieved by having identified common request closer to the receive end in the network. The multiplexers closer to the access network can serve multiple receivers and STBs mitigating the bandwidth requirements on the backbone network.

Figure 30: VoD delivery process



Source: IPTV-Internet Protocol Television, ISBN 13: 978-3-659-38740-1, 2013

VoD allows the user to control the time at which it needs to be accessed and to be watched. The user can find what the user wants from a wide collection of programs/content at the required time by browsing, querying and searching the content source database which is provided by the IPTV system. Then the user submits the request through the STB and enjoys the corresponding programme VoD can support fast-forward, rewind and pause operations (see also section 2.1).

In a VoD service where customers can select and watch video content over a network can be categorized into three types depending on the transmission method. Those three methods are described briefly in the following paragraphs.

Near VoD

A near VoD service is a consumer based video service which is broadcast by the service provider with multiple programme channels using high-bandwidth distribution mechanisms. Multiple copies of a programme are broadcasted at short time intervals (typically 10–20 minutes) providing convenience for viewers, who can watch the programme at a scheduled point in time. The customer has no control over the session except in choosing which programme to watch.

Real VoD

Real VoD services allow customers to select and watch video content over a network as part of an interactive and enhanced selective service. With a real VoD service the customer has control over choosing which video or content to watch and when.

Push VoD

Push VoD is a download based video content distribution service. The service is similar to the real VoD in that customers can select and watch video content over a network as part of an interactive and enhanced selective service. However, push VoD is downloading a programme episode or film entirely or partially to a set-top box before viewing starts.

IPTV services generally include real VoD services. It may have few variations based on the billing/charging policy such as pay per view or pay for multiple views.

3.4.2 IPTV functionality

The key functionality of IPTV is listed here and includes:

- Support for Interactive TV: With the help of two-way capabilities of IPTV systems, service providers can deliver a number of interactive TV applications. This can include standard TV, high definition TV (HDTV), interactive games, and high speed Internet browsing. Besides, this feature can also be used to get feedback from the customers.
- Time shifting: IPTV in combination with a digital video recorder (or a dedicated server in the network) permits the time shifting of programming content - a mechanism for recording and storing IPTV content for later viewing.
- Personalization: End user can personalize their TV viewing habits by allowing them to decide what they want to watch and when they want to watch it.
- Low bandwidth requirements: Unlike traditional television the service provider has to deliver only the channel that end user has requested, this allows network operators to conserve bandwidth on their other networks[56].
- Accessible on multiple devices: Viewing of IPTV is not limited to televisions. Consumers can also use their laptop computer, tablet and mobile devices to access IPTV services.

Based on IPTV system architecture and its functionality, some of the advantages (over OTT and other cabled networks, see section 3.5) are listed below. A number of these are slowly losing its ground as technological and market developments allow other evolving technologies to offer some of these features too. Most notably the developments in OTT also offering more and more QoS/QoE, as indicated in the Introduction and as reflected in Figure 1 (under service category 7):

1. IPTV ensures high quality and fidelity of video and sound irrespective other traffic on the (public) IP backbone; An IPTV system with above building blocks provides numerous advantages over a standard cable delivery system. The content is digital which vastly improves the picture quality that viewers experience. Also, viewers will almost immediately recognize that an IPTV solution gives providers the ability to offer much more content. This is due to the switched broadcast capability of IPTV.
2. You can personalize your account and customers will also have immediate access to a wide variety of on-demand premium digital content. With cable infrastructures, the cable company broadcasts every channel on its network. Because of this, with a standard cable delivery system, the provider is limited by the available bandwidth. The switched broadcast capability of an IPTV system allows the provider to offer only the content the viewer is requesting. This allows the provider to have virtually an unlimited amount of services.
3. Another advantage of an IPTV system is that it is economically more efficient. Many pieces of an IPTV system are significantly less expensive due to the ever decreasing cost of IP related technology, allowing providers to give their customers more content for less. The cost of transporting content with Internet Protocol is inherently less than the current cable delivery costs. IP set-top-boxes are less expensive than cable set-top-boxes, and IP networking costs are declining faster than traditional networking costs.

3.5 Type 5: OTT

Over-the-top (OTT) refers to a range of services (including video, television, streaming music, telephony, other services) provided over the open Internet rather than via a service provider's own dedicated, managed IPTV network (section 3.5). In this report, the reference to OTT is in the context of multimedia (audio and video delivery) applications and services.

[56] This bandwidth capacity gain depends on the number of individual services offered and the variety of the individual user requests. A high diversity of simultaneous user requests will impact the required bandwidth capacity.

OTT services are delivered over (in principle) networks not managed by the television service provider. As there is a return channel available through the Internet, full interaction is possible. OTT is delivered directly from the provider to viewer using an open Internet/broadband connection, independently of the viewer's ISP, without the need for carriage negotiations and without any infrastructure investment on the part of the provider. It is a 'best effort', unmanaged method of content delivery via the Internet that suits providers who are primarily broadcasters rather than ISPs. Viewing experience will be influenced by the bit rate of the video service, buffer size of customer premises equipment (CPE) and traffic on the Internet.

This section is structured as follows:

1. OTT architecture
2. OTT implementation barriers

3.5.1 OTT architecture

OTT for delivery of multimedia utilizes open Internet over unmanaged networks and transports the content with the help of regular Internet data protocols. It sets the service operator free from investing in its self-owned and managed distribution network. Instead, it invests in ensuring the best possible encoders required for Adaptive Bitrate (ABR) and Content Delivery Network (CDN), the two main technical building components when it comes for effective OTT delivery. While ABR technique is used to stream videos securely and smoothly across multiple networks, CDNs are used to deliver content to various browsers, set-top-boxes, mobile devices, etc., quickly and in a cost-effective manner.

The technology required for OTT based audio - video delivery is almost like the technology applied in IPTV except for the network component.

OTT TV differs from IPTV as it transmits streams using HTTP, the protocol which has been used for decades to transport web pages over the Internet. HTTP is based on TCP, a connected transport protocol with more practical features than UDP. It is easier to track a TCP connection. As a result, a TCP connection can be easily managed through firewalls, NAT (network address translation) systems, home and office networks. It also enables anyone with sufficient web hosting capacity to broadcast audio and video content to a worldwide audience over the open Internet. The OTT architecture takes existing content from the asset library and after compression transmits it individually to IP enabled devices that have adaptive clients on board to view the content.

HTTP has already been used as a transport solution for video on demand (VoD) media embedded into web pages, especially on Adobe Flash-based sites, such as YouTube, Hulu and Dailymotion. However this solution does not stream in real-time, but instead relies on progressive downloading media files. The browser downloads the file from the HTTP web server and when it has a sufficient amount of data, starts to play the content while it continues to download the rest of the file.

The main drawback to this approach is the length of time it takes to fill the initial buffer. Another issue associated with HTTP is streaming quality, which depends on the IP connection. Content streaming may be subject to stalling if there are fluctuations in bandwidth, leading to frame freezing. As a consequence, it was nearly impossible to use this solution to broadcast live channels. Until recently, live broadcasting was therefore restricted to operator-managed IPTV networks using the UDP multicast protocol. The arrival of OTT streaming, however, has brought a new approach and it is now possible to achieve levels of streaming quality over HTTP that allow live content to be broadcast over the Internet.

As said, one technical building block that is required for OTT delivery is ABR. The main challenge therefore is bandwidth-limited video quality. ABR Streaming is the OTT mechanism for delivering video to consumer devices over non-dedicated network s like the Internet. ABR streaming ensures that the show will go on so long as minimal resources are available, and at the same time delivers video at the best quality possible at a given time.

3.5.2 OTT implementation barriers

Currently in the Asia-Pacific region the level of broadband penetration is not sufficient in general for making broadcasting content available for a majority of the population, except in a few countries. Although countries are working hard to increase the broadband penetration, it is not at a stage where it can replace other traditional interactive broadcast modes.

Operators deploying video OTT and IPTV services are facing the increasing challenge of ensuring interoperability on a wide range of platforms while regulatory risks also prevail. In the TV space, there is a significant variation of devices with different operating systems, browser implementations and software versions. The technical impact of a broadcast television station going completely off-air could also be significant. Becoming an Internet-only broadcaster OTT service provider will require a different operational workflow, and creation of a new relationship with station viewers. While there are proven solutions that exist today to handle all of these technical challenges, implementing them to work on a 24/7 basis for a large viewing audience may stretch the technical and financial capabilities of many broadcasters.

If a television station was to go off-the-air completely, workflow changes would be required. Along with the transmitter being turned off, the need for MPEG-x encoding would go away (unless that format was still necessary for delivery to CATV and DTH satellite providers). Instead of a single video feed (often with multiple sub-channels), the broadcaster would have to produce feeds at multiple bit-rates in two or more streaming formats (to handle Android, Apple, etc. devices). Streams would also have to be created for each sub-channel. These signals would then need to be fed into a Content Distribution Network that would create a copy of a stream to feed to each viewing device (Internet-connected TV, PC, tablet, etc.).

For the viewer, switching from over-the-air to OTT can be a significant effort. Most televisions in the Asia-Pacific region have a built-in digital tuner that works only with OTA signals. To receive OTT content, two things need to be provided; an Internet connection and a method to receive a stream and decode it. Recent televisions have built-in Internet TV receivers, but many others will need some kind of external device such as a Roku, Xbox, Web-enabled Blu-ray player or some other device that can receive and decode the OTT signals. As described in the Annex A: HbbTV deployment, Europe is promoting Integrated Broadband Broadcast (IBB) system known as HbbTV (see also section 3.2) [57].

As additional bandwidth becomes available and more efficient processes are developed to manage content delivery, the distinction between a service delivered over a managed network (IPTV) and one delivered with various levels of management (Internet video) may become less important as both services will provide an acceptable level of quality to the user. Several techniques such as file downloading and video image compression were developed to ensure timeliness and quality of content delivery. Downloading offers files with video content for viewing at a later time, and requires no special video related processes. In the current environment, downloading of content continues to be a technique utilized by some content providers, despite recent increases in data speeds, as not all consumers have access to, or are willing or able to pay for faster Internet speeds that may allow reliable streaming of content. With higher speeds due to improved broadband access technologies, downloaded video files can provide longer and higher resolution content and so act as an online replacement for video stores.

A further technique, developed in an era when bandwidth scarcity was a concern, was video image compression; High Efficiency Video Coding (HEVC) is one of the greatest achievements in the media industry in delivering data intense media over limited bandwidth. Video compression techniques reduce the bandwidth requirements for video services, which, combined with the increasing availability of higher bitrate access services, enhance the viability of providing video services over IP access services.

Certain service providers such as Comcast have attempted to manage OTT on their networks by incorporating the caching of OTT video content from third-party providers (e.g., Netflix) in their data centres in order to improve QoS and reduce congestion on the network provider's backbone network. This serves as a mean for improving the quality of OTT video for video hosted in the data centre. However, as a

[57] According to the European Broadcasting Union, 93% of the newly sold television receivers are equipped with built-in HbbTV receiver.

customer, the number of devices on which you may simultaneously watch is limited. The availability of movies and TV shows to watch will change from time to time, and from country to country. The quality of the display of the streaming movies and TV shows may vary from computer to computer, and device to device, and may be affected by a variety of factors, such as your location, the bandwidth available through and/or speed of your Internet connection.

HD availability is subjected to subscriber's Internet service and device capabilities. A download speed of at least 5.0 Mbps per stream is recommended to receive HD content, which is defined as 720p or better. The time it takes to begin watching a movie or TV show will vary based on a number of factors, including customer location, available bandwidth at the time, the movie or TV show that the customer has selected and the configuration of Netflix ready device.

In contrast IPTV is carrier led and therefore only available to certain content providers. Its closed wall architecture is expensive and geographically limits its coverage. OTT on the other hand, needs no special provisioning and exists on the same principles as the Internet, anyone who holds the rights to a piece of content can create an endpoint and distribute it to a global audience.

4 Policies and regulations

As discussed in chapter3, interactive multimedia services can be technologically delivered in many ways. However, the content may be very similar to, and may compete directly with, traditional media forms. It is this characteristic of interactive multimedia services which gives rise to the complex question of how regulators should approach such new services.

This chapter is divided into five sections:

1. Regulatory aspects and concerns: this section discusses the substantive features of an appropriate regulatory framework for interactive multimedia services. This section considers a set of uniform rules that can apply to content providers regardless of the technological medium (i.e. traditional broadcast media, IPTV and OTT providers), with a view to ensuring that a level playing field is created without imposing excessive regulatory burdens on emerging media players.
2. Enforcement of new regulation: the second section looks at enforcement issues. In particular, consideration is given to how a regulator can enforce a converged regulatory framework against interactive multimedia services providers based overseas. This section considers voluntary commitments and regulatory outreach, the potential role of ISPs and domestic advertisers in enforcing regulatory obligations applying to content providers and options for international cooperation.
3. Institutional convergence: institutional convergence is addressed, considering a number of models of a converged media regulator responsible for enforcing content regulation, regardless of technological medium (as opposed to the regulator only focusing on traditional broadcast media). This section also considers the arguments for and against a more complete integration between media and telecommunication regulators, as well as hurdles that prevent full convergence of regulators.
4. Other regulatory issues: This section discusses other relevant regulatory issues concerning interactive multimedia services. Issues such as net neutrality, access to platforms, network devices, issues arising from bundling and vertical integration with telecommunication providers, universal service obligations, privacy and intellectual property issues are considered.
5. Regulatory conclusions: this section wraps up the four preceding sections.

In each of the sections, current regulatory environments in key jurisdictions around the world are reviewed, and their advantages and disadvantages are identified.

4.1 Regulatory aspects and concerns

This section explores how content regulatory frameworks should adapt to the increasing consumption of interactive multimedia services around the world (section 2.1). In particular, it considers whether traditional broadcast media (terrestrial television, radio, etc.) and interactive multimedia services (IPTV, OTT services, etc.) should be subject to the same regime of content regulation, in the form of a universal, technology-neutral regulatory framework that applies to all content services regardless of medium.

This section uses the term "convergence" to refer to the process of harmonizing content regulatory frameworks so as to apply both to traditional media and to interactive multimedia services. This harmonization of regulatory frameworks is a reflection of the convergence trend that takes place in the market and as depicted in Figure 2. The factors and principles that regulators need to consider when creating a converged media regulatory framework will be examined and applied to specific areas of regulation.

4.1.1 Convergence of media frameworks

Developing a converged media regulatory framework is a two-step process, with regulators needing to carefully examine the following two questions:

1. Should all content services (including interactive multimedia services) be regulated under the same regime, or is there a rationale for maintaining distinct regulatory regimes? In principle, the reasons that exist for regulating traditional broadcasting content are likely to be equally relevant for content delivered over new delivery platforms, although some traditional grounds for regulation may need to be adjusted or may no longer apply in the new converged media environment. While a converged regulatory framework may lead to regulators facing enforcement difficulties and different market dynamics, there are also arguments for regulating all content services under the same regime. In particular, a converged media regulatory framework minimizes "regulatory arbitrage", where certain content service providers obtain a competitive advantage purely because they are subject to less regulatory cost than traditional players.
2. If all content services are regulated under the same regime, how much regulation is sufficient? What are the specific regulatory settings that are appropriate for regulating converged media services? This question is significant, since convergence of regulatory regimes presents three key options:
    a. maintaining the same level of regulation as currently applied to traditional broadcasting and applying it to interactive multimedia services – the effect of this is to "scale up" the level of regulation applicable to interactive multimedia services.
    b. reducing regulation for traditional broadcasting so that it is equal to the regulatory regime that currently applies to interactive multimedia services – the effect of this is to "scale down" the level of regulation applicable to traditional broadcasting; and
    c. creating a new, proportionate converged regime that finds an appropriate balance for converged regulation which can apply in a technology-neutral way (across traditional media and interactive multimedia services), but is possibly differentiated according to different types of content services and the risks they present.

Enforcement issues regarding any converged regime, and the problems associated with it, are discussed in section 4.2 of this Chapter.

4.1.2 Factors to be considered in designing regulatory convergence

When developing a converged media regulatory framework, regulators need to carefully consider the following factors and principles of regulatory design in order to ensure that the framework is appropriate, reasonable and effective in achieving its objectives:

1. Regulatory obligations should be adapted to take into account the different levels of risk posed by different types of content services – a converged media regulatory framework should not be mistaken for a simplistic, "one-size-fits-all" approach to regulation, and does not necessarily require that identical obligations be imposed on interactive multimedia services and traditional broadcast media in all circumstances. Instead, regulators could consider a "converged but differentiated" approach to regulation, i.e. differentiated regulation may apply where there are clear substantive distinctions between different types of content services. For example, it may make sense to have separate licensing regimes for content providers that are designed to reach broad national audiences and for providers of "niche" content designed for limited audiences. Singapore currently has such a two-tier regime in relation to IPTV services[58]. A further regulatory distinction may be between linear content delivery mechanisms (such as TV broadcasts or linear IPTV), which could be subject to a greater degree of regulation due to less consumer choice over content, and non-linear mechanisms (such as video on demand), subject to lighter regulation.

   However, the level of regulation should not vary merely because the medium of delivery is different. Instead, differences in regulatory obligations should be based on substantive differences between types of content services and be technology-neutral to the greatest extent possible. There are concerns of varying licence conditions for traditional broadcasters, domestic and international interactive multimedia services providers for the same services. However, as an interim step in the convergence process, regulators may consider regulatory approaches such as interactive multimedia services providers through voluntary codes of commitment or a notification process rather than a full technology-neutral licensing regime.

2. The need to avoid excessive regulation – it is important to avoid convergence becoming merely a pretext for extending traditional regulation to interactive multimedia services, with the overall effect that there is a wholesale increase in regulatory obligations rather than a careful consideration of the necessary role of regulation in a converged media environment. Converged regulatory settings should be based on core regulatory principles: regulation should be used where there is a measurable, identifiable risk of harm, and the level of regulation should be proportionate to the level of risk. Moreover, regulation should only be considered where the potential benefits to consumers of regulation exceed the potential harm.

   Also, there is a need to avoid ineffective regulation. Where regulation is required in principle, but is likely to be impractical or impossible to enforce, introducing that regulation is ineffective in addressing the problem and can be considered excessive.

3. Competing regulatory imperatives – when determining the appropriate level of regulation, several competing regulatory imperatives must be balanced against each other. On the one hand, there is a desire to "level the playing field" between traditional broadcasters and emerging interactive multimedia services providers. The emerging providers should not be able to create business models on the basis of "regulatory arbitrage". Conversely, there is a need to ensure that emerging interactive multimedia services providers are not stifled in their development and that innovation does not suffer. The consumer benefits of interactive multimedia services, and the role they have in introducing greater innovation and competition into multimedia markets, need to be considered in this context. Moreover, regulators need to keep in mind that the greater the degree of regulation on legitimate interactive multimedia services providers, the more attractive illegal interactive multimedia services providers become, both to consumers and to future entrants as potential business models in absence of appropriate enforcement capabilities.

4. The problem of illegal interactive multimedia services providers – illegal content providers pose real challenges to both traditional media and legitimate interactive multimedia services providers. The illegal distribution of content typically takes place through individual users making available unauthorized copies of content through platforms such as BitTorrent or video and streaming websites (which are also used for legitimate content). This content can then be

[58] See www.mci.gov.sg/content/mci_corp/web/mci/media/developing_media/key_projects/iptv.html

accessed by users, typically at no cost. Illegal providers are not subject to any regulation (including more general obligations such as tax) and therefore do not incur any compliance costs. The outcome is generally two-fold. First, to potential entrants into the market, the low compliance cost of running an illegal content platform can be an attractive business model ("regulatory arbitrage" in the fullest sense). Second, the low costs of operating illegal content services can often be covered through advertising revenue, making the platforms attractive to consumers who generally do not have to pay to access the content services.

Whereas new entrants and/or consumers may see great benefit in accessing illegal content services in the short term, the long-term effect is that piracy has a significant impact on creative industries, affecting the revenue stream of legitimate businesses and not rewarding creative efforts. What exacerbates the issue is the fact that, in most jurisdictions, there is not yet an effective anti-piracy regime which provides countermeasures against illegal content providers.

When designing a converged media regulatory framework, regulators need to carefully consider whether particular regulatory settings will increase the use of illegal content providers. Regulations designed to level the playing field between traditional broadcasters and legitimate interactive multimedia services providers should not have the effect of encouraging increased use of illegal content providers. Instead, new media regulatory frameworks must allow all legitimate players to compete more vigorously against illegal content providers.

5. Regulatory clarity – many regulatory frameworks are not designed with interactive multimedia services and convergence in mind. Interactive multimedia services are often captured in unclear or inconsistent ways, using terminology and concepts designed for traditional broadcasting. Accordingly, one of the key benefits of a converged media regulatory framework is the rewriting of the law for regulatory clarity, so that all stakeholders are aware of their obligations.

4.1.3 Requirements for a converged regulatory regime

In this section the local content requirements, must-carry obligations and other content related requirements are discussed.

Local content requirements and must-carry obligations

Local content requirements typically require television or radio stations to broadcast a minimum percentage of local (or otherwise prescribed) content over their networks. Similarly, must-carry obligations require cable TV providers to carry locally-licensed television stations on their platforms. These obligations are based on the rationale that, if no such requirements were applied, the level of local content delivered over media networks would be below what is regarded as being in the public interest (e.g. to preserve national identity or languages, or to support local production industries).

In determining appropriate local content requirements, a distinction should be drawn between linear and non-linear content delivery. Traditional broadcasting and radio services are linear in their delivery: while viewers are able to choose what channel to watch or listen to, each channel offers a single, linear stream of content which provides the viewer with no choice over what programs to watch or at what time to watch them. Interactive multimedia services are, however, typically delivered in a non-linear, or on-demand, fashion, where the viewer chooses particular content from a library or "interacts" with the content. Nevertheless, interactive multimedia services can also be linear (e.g. using Internet television or IPTV)[59].

In a converged regulatory environment, it makes sense to apply local content requirements to linear content providers in a technology-neutral manner, so that linear IPTV or Internet television is subject to the same obligations as traditional broadcasters.

However, in relation to non-linear platforms, the relevance of local content requirements is less than clear. In particular, non-linear platforms raise two key challenges for the effectiveness of local content

[59] See also the Introduction and section 2.1.

requirements. First, due to a lack of natural capacity constraints (i.e. 24 hours of content per day per channel), there is a potentially indefinite and constantly expandable amount of overall content that can be made available on non-linear platforms. Accordingly, while it would be theoretically possible to require a *proportion* of all content made available on non-linear platforms to be local content, content providers would have to constantly adjust their local content offerings every time they expand their content libraries in order to ensure that they fall within the requirements. This would increase regulatory burden on non-linear platforms.

Second, due to the greater degree of control that consumers have over the content they consume in a non-linear environment; local content requirements are less effective at actually ensuring that consumers are exposed to local content. To illustrate, it is much easier for consumers to bypass local content in an on-demand content library than it is when that content is the only option available to them on a given channel at primetime hours.

At the same time, the technical features of non-linear platforms create greater commercial incentives for carrying local content, thereby reducing the need for regulatory intervention. Because linear media has a finite capacity per channel (limited by the number of hours in a day), content service providers are incentivized to only carry the most profitable content and "crowd out" less-profitable content (including local content). Conversely, and provided rights are priced on a commercially viable basis, the much greater capacity and choice of non-linear media platforms means that the inclusion of local content options does not hinder consumer access to more profitable overseas content (indeed, it may provide a competitive advantage to the provider, since consumers are given access to a more complete range of content). As a result, there is a greater commercial incentive for non-linear content providers to offer local content as part of their offering.

Local content requirements may also be problematic in the case of overseas-based interactive multimedia services providers. The requirements may create a significant regulatory burden for overseas-based players, given that providers would need to adapt their platforms for every jurisdiction which imposes local content requirements. One way for regulators to respond to this issue in a proportionate way is to maintain a differentiated licensing regime, whereby "niche" or "specialized" content services licences are available to overseas-based interactive multimedia services providers if their intention is to provide specialized foreign content[60]. For example, it may be burdensome to impose local content requirements on an overseas-based provider that seeks to cater specifically to a particular ethnic or expatriate community within a country.

As an alternative to the imposition of local content requirements, regulators may also wish to consider other ways of promoting local content, such as direct funding or tax incentives for local content producers.

Addressing illegal content related requirements

In a similar manner to local content requirements, regulators could consider the most appropriate ways in which other content-related regulatory requirements traditionally applied to broadcast media can be extended to interactive multimedia services. These include content classification, child protection requirements and prohibitions on obscenity. Again, the need in principle to create a level playing field between content providers using different delivery technologies must be weighed against the practicality of enforcing a harmonised, converged media framework. Enforcement issues are discussed in greater depth in section 4.2.

4.1.4 Regulating user-generated content

There is an increasingly blurry divide between commercial interactive multimedia services such as Netflix or the Apple iTunes Store and content generated by individual users and delivered over Internet-based platforms such as social media networks. While it may be difficult to conceive of a user irregularly uploading

[60] See for example the Singaporean approach at www.mci.gov.sg/content/mci_corp/web/mci/media/developing_media/key_projects/iptv.html .

family videos on Facebook or YouTube as providing an "interactive multimedia service" (and therefore being subject to regulatory obligations), certain user-generated content may reach large audiences and may even generate revenue to the point where it becomes difficult to distinguish from a commercial content service provider. For example, many individually-run channels on YouTube achieve millions of views and are able to earn advertising revenue through the YouTube Partner Program[61].

Regulatory frameworks should therefore consider minimum thresholds before examining regulation of content delivered over the Internet (or any other medium). A useful threshold for determining what types of media content should be regulated under a converged framework was explored in Australia's Convergence Review of 2012, which proposed that regulation should only apply to "content service enterprises". Whether a provider was classified as a "content service enterprise" involved looking at several factors, including the subscriber base, revenue, the nature of the service intended to be accessible within the jurisdiction and the provider's level of control over the content[62].

The usefulness of the concept of "content service enterprises" is that it focuses on the substantive factors that underpin the need for regulatory intervention, such as a high subscriber base, while being technology-neutral. A minimum threshold, such as that encapsulated in the concept of "content service enterprises", ensures that small-scale, not-for-profit user-generated content is not subject to unreasonable regulation. However, it also allows certain user-generated content which reaches large audiences or generates significant revenue to be brought within the ambit of the regulatory framework, therefore ensuring that these forms of content cannot benefit from "regulatory arbitrage" merely because they are generated by individual users[63].

4.2 Enforcement of new regulation

The reality of interactive multimedia services is that these services are borderless, with consumers being able to access these services from providers that are either domestic or overseas-based. Accordingly, it is not enough to merely design a carefully-balanced and converged regulatory framework that applies to traditional broadcasters and interactive multimedia services providers alike, but is limited by the problem of extraterritorial enforcement. Regulators and policymakers must also think about how the regulatory framework can be *enforced*, particularly in relation to overseas-based interactive multimedia services providers. Therefore, the focus of the following section is on the effective enforcement of a converged media framework to overseas-based content providers.

In relation to domestic content providers, the issue around effective enforcement of a well-designed converged media framework is not a serious concern, as domestic providers will be subject to the territorial jurisdiction of the converged media framework (and are therefore in the same position vis-à-vis enforcement as with traditional broadcasters). This is not the case, however, with overseas-based content providers.

A major difficulty with regulating interactive multimedia services providers is the inability of regulators to enforce regulation on overseas-based interactive multimedia services providers. National regulatory agencies generally lack extraterritorial jurisdiction (unless international cooperation agreements, etc. are entered into). Given that the majority of developing countries, and a substantial number of developed countries, will have more overseas-based interactive multimedia services providers than domestic ones, the issue of enforcement has the risk of becoming a serious limitation for any new converged media framework. Table 3 shows whether regulatory obligations can be enforced on different classes of content providers under a pre-converged framework, post- converged framework and ideal design scenario.

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61 See Google, "What is the YouTube Partner Program?", https://support.google.com/youtube/answer/72851?hl=en

62 See Convergence Review Final Report: www.archive.dbcde.gov.au/__data/assets/pdf_file/0007/147733/Convergence_Review_Final_Report.pdf

63 For more information on the regulatory situation in Australia see section 05.1.

Table 3: Enforcement options

	Traditional Broadcasters	Domestic Interactive Multimedia Services providers	Overseas-based Interactive Multimedia Services providers	Illegal contents providers (pirates)
Pre- converged framework	Yes	No (or partially, under rules designed for traditional broadcasters)	No	No
Post-converged framework	Yes	Yes	Partially	No
Ideal design	Yes	Yes	Yes	Yes

Where regulatory discrepancies, including in relation to enforcement, exist between domestic and overseas-based interactive multimedia services providers, an uneven playing field is created. Domestic interactive multimedia services providers will incur additional compliance costs and, therefore, higher barriers to entry from being subject to converged media regulation, while overseas-based interactive multimedia services providers will likely escape the compliance obligations. Accordingly, the new converged framework becomes only a half-measure in redressing inequality – it attempts to level the playing field between traditional broadcasters and domestic interactive multimedia services providers, but does not resolve the issue of overseas interactive multimedia services providers, placing both traditional broadcasters and domestic interactive multimedia services providers at a disadvantage against their foreign competitors. In this context, consumers will also likely prefer overseas-based interactive multimedia services providers because their lower cost of business may result in lower prices for end-users. In the end, the domestic market for interactive multimedia services will be unfairly prejudiced.

A regulatory framework which takes into account the realities of international enforcement should be able to regulate all relevant parties, including traditional broadcasters and both domestic and overseas-based interactive multimedia service providers (while also responding to illegal interactive multimedia service providers, discussed further below). This framework would create a truer "level playing field", by ensuring that, as far as possible, all legitimate content providers are subject to the same obligations, while the use of illegal interactive multimedia services providers is restricted, to the extent practicable.

The enforcement issues can primarily be classified under the following categories:

1. Non-compliance with existing laws / regulations that primarily turns the operations illegal or practically illegal and the challenge pertains to that of pure enforcement.
2. Lack of clarity of regulations in the area of operation that requires clarification in terms of law as well as the enforcement mechanism.
3. Competition issues that are subject to existing or amended ex-ante and ex-post remedies.

Enforcement options that regulators may consider include:

1. Voluntary compliance and regulatory engagement efforts – a significant proportion of overseas-based interactive multimedia services providers, particularly large players, are usually willing to voluntarily comply with local regulatory and licensing frameworks for reputational and commercial reasons. Regulators should first seek to increase rates of voluntary compliance before looking at more punitive enforcement measures that involve the use of third parties such as ISPs or advertisers (discussed below).

   Voluntary compliance can be enhanced through engagement efforts between regulators and the interactive multimedia services industry, as well as through the creation of a streamlined and clear regulatory framework, including processes that make it administratively easy for an overseas player to obtain a licence/permit/registration. Another option is to agree on a take-down procedure between the law enforcement entities and the service providers. A voluntary,

cooperative approach between regulators and overseas-based interactive multimedia services providers is likely to achieve higher compliance rates and impose lower costs on both parties than more punitive measures.

2. ISP-level enforcement – a more drastic action is for regulators to require that ISPs degrade the transmission quality of non-compliant or unlicensed interactive multimedia services providers, or ban the transmission of content from non-compliant interactive multimedia services providers at quality levels higher than a "best efforts" basis. This places an incentive on non-compliant interactive multimedia services providers to meet their regulatory obligations in order to be competitive with domestic providers. Since ISPs are almost always companies with a domestic presence, ensuring that they implement such regulatory controls should not pose enforcement constraints. For example, in Thailand the Ministry of ICT has a mechanism to block web pages containing unlawful content. In Australia, there are procedures established for addressing prohibited online content with mechanisms for Australian hosted content and overseas hosted content.

   Another option is to require ISPs to block overseas-based interactive multimedia services providers unless they comply with the local regulatory framework. However, such a move may be politically difficult and be regarded as disproportionate by consumers and by ISPs. Indeed, regulators should ensure that ISPs are not unfairly burdened by requirements to restrict access to overseas interactive multimedia services providers and are able to carry out their regulatory obligations with as little disruption to their business as possible.

   A further difficulty with ISP-level enforcement is that it may not capture all non-compliant overseas-based interactive multimedia services providers – ISP-level degradation would have to be implemented through a "black list" that specifically identifies which interactive multimedia services providers are non-compliant. Creating such a black list, and maintaining it up-to-date, may impose significant cost on regulators and would be a much more burdensome process than the "white list" approach involved in implementing restrictions on advertisers (see below)[64].

3. Enforcement through advertising customers – another enforcement option is to create economic rather than legal incentives for overseas-based content providers to comply with the local regulatory framework. One specific method is by preventing local companies from placing advertising on content services provided by non-compliant or unlicensed content providers. This measure has two advantages. First, it creates a real economic incentive for compliance by cutting off a key revenue stream for content service providers. Second, it is relatively easy to enforce, since it can be implemented by publicly releasing a "white list" of licensed (compliant) interactive multimedia services providers, with advertisers banned from advertising with any content provider that is not on the list.

   One argument against such a measure is that it restricts the freedom of expression of advertisers. Like all rights, however, freedom of expression is not absolute and can be subject to reasonable limits, as demonstrated by analogous restrictions on doing business with embargoed organizations and individuals. The question for policy-makers will be whether the benefits of such a measure justify the accompanying limitation on the freedom of expression.

4. International cooperation – there are two ways in which international cooperation can be leveraged to assist the enforcement of regulatory obligations on overseas-based interactive multimedia services providers.

   First, regulators could engage in international cooperation in relation to the enforcement of judgments or regulatory decisions. This would allow a decision in a particular jurisdiction to be

[64] Nevertheless, regulators may take into account the law of diminishing returns. This is to appreciate that it is practical to focus on capturing 90 to 95 per cent of the non-compliant overseas-based providers, but being less active in relation to the remaining 5 to 10 per cent. The reason for this is the significantly increased cost of enforcing the ISP-level ban against the remaining 5 to 10 per cent, where the regulatory costs are not justified by the yielded regulatory benefit.

automatically recognized and enforced against overseas interactive multimedia services providers in their home jurisdiction. A key shortcoming of this approach is that home jurisdictions may be unwilling to enforce decisions against local companies, which are made on the basis of a foreign regulatory regime that may have significant differences with the local regime.

Second, regulators could cooperate in the creation of a harmonized international or regional regulatory regime, enabling mutual recognition. While a truly unified international regime would be very difficult to achieve, regional blocs could cooperate to create a harmonized regime, whereby an overseas interactive multimedia services provider meeting local regulatory standards in its home jurisdiction is deemed to also meet requirements in a foreign jurisdiction.

The difficulty with this approach is that some components of a converged regulatory framework are country-specific and cannot be the subject of mutual recognition (e.g. local content requirements or rules on obscenity). Other areas are more suited to mutual recognition, such as privacy or quality of service requirements. Accordingly, a harmonized regime can only partially address the dilemma posed by overseas interactive multimedia services providers, and regulators will still have to find other ways to ensure that overseas interactive multimedia services providers comply with country-specific regulation.

5. Dealing with piracy and illegal providers – Anti-piracy laws are often regarded purely as a means of dealing with copyright infringement, and therefore separate to converged media regulation. However, anti-piracy measures should be considered as essential to the broader goal of ensuring that there is a "level playing field" for all content providers and that regulatory convergence does not disadvantage legitimate interactive multimedia services providers by making illegal content providers more attractive to consumers.

   Similarly to regulatory enforcement against legitimate overseas-based content providers, action against illegal providers can be taken through ISPs. Certain countries, such as France and New Zealand, have already introduced "three-strikes rules", where ISPs are required to notify users who are downloading copyright-infringing content. After receiving three notifications, users are subject to penalties.

While some of the enforcement measures discussed above may appear to be unorthodox and untested, there is precedence for similar measures in other regulatory regimes that experience analogous cross-border enforcement challenges, such as online gambling or direct-broadcast satellites.

For example, in the United States, local banks and credit card companies are prohibited from processing payments made to or received from Internet gambling services, under the *Unlawful Internet Gambling Act 2006*[65]. This is analogous to (indeed, more stringent than) imposing restrictions on advertisers or ISPs in their dealings with overseas-based non-compliant interactive multimedia services providers. Of course, as noted in section 4.1 above, regulatory mechanisms need to be carefully balanced and specifically adapted to the level of risk posed by a particular class of services. Accordingly, regulators may decide that unregulated overseas-based interactive multimedia services do not pose the same level of risk to consumers as unregulated Internet gambling, and therefore that the measures which apply to Internet gambling are disproportionate when applied to interactive multimedia services.

The regulation of direct-broadcast satellites at the international level provides another, perhaps even closer, analogy with the regulation of overseas-based interactive multimedia services providers. Direct-broadcast satellites present similar international enforcement issues to interactive multimedia services, in that direct-broadcast satellite signals can be received in areas beyond their intended footprint (for technical reasons) and it is very difficult for countries in that footprint to prevent or block such signals. Accordingly, in 1982, the United Nations General Assembly adopted the *Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting*[66]. Although they do not represent

[65] See Galexia, *Issues of Jurisdiction and Enforcement in Internet Gambling* (October 2007), www.galexia.com/public/research/articles/research_articles-art47.html

[66] See www.un.org/documents/ga/res/37/a37r092.htm

binding international law, these principles require states which operate direct-broadcast satellites under their jurisdiction to notify and consult with states who may receive the signals of such satellites. The principles also encourage states to "co-operate on a bilateral and multilateral basis for protection of copyright" in relation to direct-broadcast satellites.

4.3 Institutional convergence

As mentioned above, the regulation of audio-visual content has traditionally only extended to content delivered over broadcasting media, with such regulation being administered by a distinct broadcasting regulator body. The rise of interactive multimedia services has challenged this institutional arrangement, as broadcasting regulators have generally been unable to fully regulate interactive multimedia services to the same extent as traditional broadcasters due to the technology-specific way that most media regulatory frameworks are drafted. This has resulted in regulators having an unclear mandate in the new media environment and has bolstered the case for a converged media regulator, as discussed below.

4.3.1 Converged media regulator

A "converged media regulator" is used here to refer to a single body which regulates all media content regardless of technology (i.e. both traditional broadcast media and interactive multimedia services would be covered). A converged media regulator is technology-neutral, although it may still have a role in regulating technology-specific areas such as radiocommunications licensing.

As with a converged regulatory framework discussed in section 4.1, the key benefit to a converged media regulator is regulatory consistency and the creation of a level playing field between traditional broadcasters and interactive multimedia services providers. A converged media regulator is particularly suitable where the regulatory framework itself has been made technology-neutral, even though it is possible to have a converged regulator (as an administrative or institutional arrangement), even where there are separate regulatory frameworks for different media types. Indeed, institutional convergence may be a first step towards broader convergence of regulatory frameworks.

The mandate of regulators to manage content is still limited[67]. In the Asia-Pacific region, the Australian Communications and Media Authority, Bhutan Infocomm and Media Authority, Malaysian Communications and Multimedia Commission, National Broadcasting and Telecommunications Commission (Thailand) are however examples of regulators responsible for both content and carriage areas of telecommunication and broadcasting.

A converged media regulator would not in itself solve the issue but would facilitate greater coordination and faster decision making. An effective collaborative mechanism can also reach similar outcomes. For example, OTT content providers could be under regulatory oversight of the converged media regulator only, since they provide only a content service, not a dedicated telecommunication network or a carriage service. Telecommunications regulators would continue to regulate the ISPs that deliver the OTT content service and potentially OTT providers that offer telecommunication services (such as voice and SMS).

4.3.2 Deeper institutional convergence

A degree of blurring between media and telecommunication regulation may apply in relation to certain categories of interactive multimedia services, such as IPTV, where telecommunication networks are used to provide a dedicated content-only service[68], and there are no separate "carriage service" and "content service" providers. Confusion may therefore arise over whether services such as IPTV should be regulated as "telecommunication carriage services" (by the telecommunication regulator) or as "content services" (by the media regulator).

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[67] For more details see ITU World Telecommunication Regulatory Database.

[68] See Introduction and section 3.4.

It is possible to make IPTV services subject to regulation by the media regulator for the content element of the product and the telecommunication regulator for the carriage service and network element of the product. This would not result in regulatory duplication, since the media and telecommunication regulators would be responsible for distinct areas of the provider's activity. Another approach would be the creation of a unified/converged licensing framework that facilitates provision of IPTV services delivery over existing or new converged networks. The specific issues emerging from delivery of services can be dealt with under appropriate converged regulatory frameworks.

However, in order to achieve greater efficiencies and coordination, it may be useful to look at deeper institutional integration to deal with situations such as IPTV or other services that lie at the interface of telecommunication and media regulation. Two options are particularly noteworthy in this regard:

1. Cooperation between telecommunication and media regulators – the two regulators may put in place a memorandum of understanding or other forms of cooperation to ensure that there is no unnecessary duplication in relation to regulating interactive multimedia services (particularly "carriage and content" services such as IPTV). Cooperation could also be enhanced in order to create smoother and more efficient regulatory processes from the stakeholder perspective – e.g. the regulators could integrate their front desk functions so that interactive multimedia services providers are able to meet licensing requirements through a "one-stop shop" process, even if distinct regulatory teams and institutional identities are maintained in the background.
2. Institutional integration of telecommunication and media regulators – this more complete form of integration involves the creation of a single telecommunication and media regulator, which would be responsible for the entire body of regulation in this area – i.e. regulation of telecommunication networks and radiocommunications, regulation of carriage services and regulation of content services. The Malaysian Communications and Multimedia Commission or the National Broadcasting and Telecommunications Commission of Thailand are examples of one such converged regulator.

4.3.3 Hurdles and limitations to deeper institutional convergence

Despite the benefits of converged media and telecommunication regulators being discussed widely in the literature, many regulators, including in large, sophisticated markets, the regulators are not converged (yet).

Although there are advantages of synergy at least as far as carriage is concerned, a criticism of converged content and carriage regulators is that, even after formally integrating, they continue to operate as a collection of separate units or divisions.

Another issue to consider is how a converged media and telecommunication regulator fits with the regulation of news and journalism. Both traditional broadcast media and interactive multimedia services are widely used for the transmission of news and journalism, which leads to the question of whether the converged regulator should have jurisdiction over this specific area as well. The Convergence Review in Australia took the view that the regulation of news and journalistic commentary should be performed in a technology-neutral way through an independent, industry-led news standards body, distinct from the otherwise converged communications regulator[69]. Given the specialised policy issues involved in the regulation of news and commentary, which are distinct from regulation applying to other audio-visual content, it may be reasonable to limit the scope of converged media regulation only to non-news content (e.g. entertainment content).

[69] See Convergence Review Final Report, pp. 50-53: www.archive.dbcde.gov.au/__data/assets/pdf_file/0007/147733/Convergence_Review_Final_Report.pdf

4.4 Other regulatory issues

Beyond calling for a rethink of the regulation of content services through a technology-neutral regulatory framework, the growth of interactive multimedia services (and the specific technologies they use) also gives rise to regulatory issues that are relevant to telecommunication service providers such as ISPs (and therefore impact on telecommunication regulation, not just media regulation). These areas are discussed below.

4.4.1 Net neutrality

Net neutrality and various competition issues arise from vertical integration or revenue sharing arrangements between telecommunication and content providers[70]. These are key regulatory concerns and areas of debate that have opened up with the rise of interactive multimedia services delivered over the Internet.

In some circumstances, telecommunication service providers may have an incentive to throttle or degrade certain OTT content, either because it competes with their own content services (i.e. discrimination arising from vertical integration) or because the telecommunication service provider has revenue sharing arrangement with other content services using its network. Both vertical integration and revenue sharing arrangements have become more popular in recent years, as telecommunication service providers seek new revenue streams and endeavour to avoid becoming a "dumb pipe"(i.e. merely a carriage service provider). The acquisition of DirecTV (a satellite and audio services provider) by AT&T (a telecommunication service provider) in the United States for a sum of USD 48.5 billion is one example of vertical integration in this space.

In turn, many independent OTT providers and end user groups have advocated strongly for net neutrality laws to prevent telecommunication service providers from discriminating against unaffiliated OTT traffic.

There is no one-size-fits-all approach to net neutrality – regulators should treat net neutrality as a competition and access issue, and should ensure that the level of regulation is grounded in an analysis of the market (relevantly, the retail level of the telecommunication services/ISP market).

Regulatory approaches to net neutrality need to be adjusted to take into account local conditions, particularly the level of competition at the retail level of the telecommunication services market. In competitive markets, barriers to end users switching between ISPs will be low, in turn providing a market incentive for ISPs to not discriminate against unaffiliated OTT content. However, in jurisdictions with less competitive intensity, regulatory intervention may be required in relation to net neutrality.

Regulatory intervention can range from lighter-touch options such as transparency requirements or minimum quality of service requirements to more interventionist regulation such as no-blocking or no-discrimination rules applied to the management of Internet traffic. Table 4 summarises attitudes towards net neutrality in a number of surveyed jurisdictions.

Table 4: Net neutrality attitudes

	Cautious observers	Tentative refiners	Active reformers
Measures taken	No specific measures	Light-handed net neutrality measures: e.g., transparency, lowering switching barriers, minimum QoS	Specific net neutrality measures: e.g., no blocking, no discrimination in treatment of traffic, but may be subject to reasonable traffic management
Example countries	Australia; New Zealand; Republic of Korea	France; Japan; United Kingdom	Brazil; Chile; European Commission; Netherlands; Singapore; Slovenia; USA (FCC rules)

[70] See GSR 2012 *Net neutrality: A regulatory perspective* (ITU, Discussion Paper, 2012) for a more comprehensive discussion on net neutrality, available online at www.ictregulationtoolkit.org/en/toolkit/docs/Document/4029

Latest developments on net neutrality appear to favour a more active reform in some key jurisdictions, with the United States and the European Union lately embracing net neutrality principles, but to varying degrees:

1. United States: in February 2015, the Federal Communications Commission (FCC) introduced new net neutrality rules (the Open Internet Order), which apply equally to fixed and mobile broadband services.[71] The rules prohibit broadband providers from blocking access to lawful content, applications, services or non-harmful devices, throttling traffic on the basis of content, applications, services or non-harmful devices and prioritising traffic in exchange for payment ("paid fast lanes"). The rules also impose certain transparency obligations on broadband providers in relation to promotional rates, fees, surcharges and data caps. However, the rules allow broadband providers to engage in "reasonable network management". Services that do not go over the public Internet, such as VoIP from a cable system or dedicated heart-monitoring services, are also exempt from the scope of the rules. The FCC has reserved the authority to address, on a case-by-case basis, practices that unreasonably interfere with the ability of consumers to access lawful content.

   Significantly, the new Open Internet Order reclassifies broadband Internet access services as "telecommunication services" under Title II of the Telecommunications Act, although the FCC has forebeared from imposing utility-style regulation in respect of broadband services. The 2015 Open Internet Order supplements the 2010 Open Internet Order, which was partially struck down by the United States Court of Appeals for the District of Columbia Circuit in January 2014.[72] The 2010 Open Internet Order continues to require broadband providers to disclose their network management practices and performance characteristics[73].

2. European Union: in April 2014, the European Parliament voted in favour of a new net neutrality regulation limiting the power of ISPs to charge third parties for premium network access. The regulation defines key concepts such as "net neutrality" and prohibits offering premium network access to third parties if that premium access hinders the availability or quality of normal Internet access services. Internet providers are only allowed to slow or block Internet access to enforce a court order, preserve network security or prevent temporary network congestion. Even so, measures must be "transparent, non-discriminatory and proportionate", and cannot last longer than necessary.

   Although the European Union's regulation on net neutrality appears to enforce quite a strict understanding of net neutrality, the regulation requires agreement from the Council of the European Union, which has been difficult to achieve. In January 2015, the current rotating presidency of the European Council (Latvia), issued a new proposal for net neutrality regulation that would exempt "services which require a specific level of quality" from net neutrality obligations. In 2015, the net neutrality debate has become important in India[74].

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[71] Federal Communications Commission, "FCC Adopts Strong, Sustainable Rules to Protect the Open Internet" (26 February 2015) <www.fcc.gov/document/fcc-adopts-strong-sustainable-rules-protect-open-internet>.

[72] *Verizon Communications Inc v Federal Communications Commission* 740 F.3d 623 (DC Cir 2014).

[73] Federal Communications Commission, *Open Internet* <www.fcc.gov/openinternet>.

[74] Latvian Presidency of the Council of the European Union, *Proposal for a Regulation of the European Parliament and of the Council laying down measures concerning the European single market for electronic communications and to achieve a Connected Continent, and amending Directives 2002/20/EC, 2002/21/EC and 2002/22/EC and Regulations (EC) No 1211/2009 and (EU) No 531/2012*, (20 January 2015) <http://data.consilium.europa.eu/doc/document/ST-5439-2015-INIT/en/pdf>.

4.4.2 Competition issues

Further competition issues that need to be considered in the context of interactive multimedia services are:

1. Competition issues arising from access to content delivery platforms, systems and devices – dominant providers of interactive multimedia services or of associated devices have an incentive to restrict the applications that they host on their services or devices, thereby disadvantaging competitors and creating a rationale for regulatory intervention through competition law.

   For example, the United States Government scrutinised Apple in 2009 when the FCC examined Apple's rejection of Google's Voice app for iPhone, and in 2010 when the Federal Trade Commission (FTC) questioned Apple's plans to ban all apps created with cross-platform development tools. In both cases, Apple quickly amended its App Store rules to satisfy the FCC's and FTC's concerns. These cases could have been litigated on competition grounds had the parties been more aggressive in their approaches, involving assessments of the relevant market, market share and abuse of market power. Further, similar issues could have arisen in relation to apps concerning access to interactive multimedia services[75].

2. Competition implications of bundling and/or vertical integration between the provision of content and carriage services (as well as, potentially, devices) – for example, telecommunication service providers are increasingly also entering the content space and offering "triple play" or "quad play" packages. This may raise competition issues, given that providers can potentially use their power in the content provision market to provide them with an advantage in the telecommunication services market. This can occur if, for example, users can only gain access to certain content/interactive multimedia services by buying a "bundle deal" through a particular ISP, and cannot access that content service through an alternative ISP, due to the first ISP owning the content service or having an exclusive revenue sharing deal with the content provider.

3. Issues of market definition, dominance thresholds and abuse of dominance in a converged environment.

4. Whether a media and telecommunication-specific competition regime is required, or whether the general principles of competition law can deal with emerging issues relating to interactive multimedia services (consider, e.g. Singapore's Telecoms Competition Code 2012)[76].

5. Restrictions on cross-media ownership and their applicability in an interactive multimedia services environment.

4.4.3 Universal service obligations

Television and telephony are often subject to Universal Service Obligations (USOs), with special measures taken to secure minimum service levels and availability in areas where there is no commercial incentive to provide services. Since interactive multimedia services rely on the availability of the public Internet in order to be delivered to end-users, there is an argument for extending USOs to include access to Internet (carriage) services and broadband.

Interactive multimedia services typically require access to high-speed fixed or mobile broadband, and are particularly suited to technologies such as fibre, which have a high rollout cost. Accordingly, USOs may have a significant economic impact. Regulators can also consider alternative ways of promoting universal access to high-speed broadband (and therefore to interactive multimedia services). One option that has been used in several jurisdictions is subsidies to operators (e.g. subsidies for fibre rollout in regional areas in the EU, or subsidies for improving mobile networks, including mobile data, in Australia). In other countries (e.g. Australia and New Zealand), the creation of government-funded next-generation broadband networks with clear coverage targets are a step towards ensuring near-universal or at least widespread access to high-speed Internet.

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[75] See also section 2.2

[76] See www.ida.gov.sg/Policies-and-Regulations/Code-of-Practice-and-Guidelines/Telecoms-Competition-Code .

4.4.4 Privacy and security issues

Privacy law affects content services (both traditional and interactive multimedia services) in relation to the collection of personal information for billing purposes. To this end, privacy law does not typically raise convergence issues, since it is usually administered as a separate, industry-neutral legal regime by a separate regulator (e.g. the Office of the Australian Information Commissioner).

However, an emerging concern in the privacy space may be the collection and use (including resale) of "big data" from customer usage patterns. This is particularly an issue for interactive multimedia services providers, since the collection of "big data" may not be technologically possible by traditional broadcasters. Converged regulators may therefore have to consider how to deal with this question, although this may be better dealt with by privacy regulators under the privacy regime rather than under the converged media regulation regime.

4.4.5 Quality of service and experience

The key question here is whether quality of service (QoS) requirements currently applied to traditional broadcasters (and to telecommunication service providers) ought to apply to interactive multimedia services such as IPTV.

Another consideration is the distinction between QoS and quality of experience (QoE). Generally, QoE is by definition subjective and qualitative in nature, and is more difficult to regulate than the QoS criteria that are often found in measurable contractual settings. However, QoE can be a more comprehensive measure than the technically-oriented QoS. It could be argued that QoS and QoE should be treated as commercial rather than regulatory issues for interactive multimedia services Providers in a competitive market where risk of abuse of dominance is not visible. In a similar manner to net neutrality (discussed above), QoS and QoE issues can largely be resolved through adequate levels of competition or wherever necessary broadband QoS measures, provided that the access regime facilitates competition at the retail telecommunication services level[77]. However, in less competitive markets, minimum QoS standards for carriage service providers may be considered, in order to protect consumers and to ensure that such providers do not degrade certain OTT services in order to favour their downstream arm or a competitor which is subject to preferential treatment due to a revenue sharing arrangement with the carriage service provider.

4.4.6 Intellectual property issues

An important regulatory element that can impact on interactive multimedia services is how the intellectual property regime, particularly provisions relating to redistribution and exceptions, applies to copyright infringement.

The United States start-up Aereo illustrates the potential issues involved in applying general (and often outdated) intellectual property laws to new technologies. Aereo is a technology company that allows subscribers to view live and time-shifted streams of broadcast free-to-air television on Internet-connect devices. Subscribers pay a small monthly fee to rent an individual miniature antenna in a physical warehouse operated by Aereo. Each antenna picks up free-to-air TV transmissions, which Aereo does not pay licensing fees for. Aereo enables users to choose what TV shows they would like to store, with chosen shows stored in a separate cloud-based account for each user and then made available to that particular user to view at a time of their choosing. These individualised features make Aereo operate essentially like a cloud-based personal video recording (PVR) system, rather than a true on-demand online streaming service.

Under the "Transmit Clause" in the United States *Copyright Act 1976*, it is an offence "to transmit or otherwise communicate a performance or display of the work… to the public, by means of any device or process, whether the members of the public capable of receiving the performance or display receive it in the same place or in separate places and at the same time or at different times." The major free-to-air

[77] See also Introduction and section 2.2.

broadcasters in the United States have brought several lawsuits against Aereo, alleging that its service transmits their works to the public and thereby constitutes copyright infringement. In June 2014, the Supreme Court of the United States upheld this argument, finding that Aereo functioned in a manner comparable to a cable TV provider, rather than being merely a personal video recording provider (which would have allowed it to fall under an exemption to copyright infringement according to previous US case law).

It is obvious that a service such as Aereo was beyond contemplation at the time the Copyright Act came into force. The challenge for regulators (and legislators) is to determine how they should respond to services such as Aereo that test the boundaries of copyright law. As with the principles underpinning the creation of a converged regulatory framework discussed in section 4.1, regulators should balance the need to foster technological innovation, on the one hand, with the need to ensure a level playing field and fair rewards for content creators, on the other.

4.5 Regulatory conclusions

The global rise of interactive multimedia services is increasingly testing the boundaries of existing media regulatory frameworks. interactive multimedia services are either falling outside the scope of regulatory regimes that were designed to apply to specific technologies, such as terrestrial television broadcasting or radio, or are being impacted by regulation in an ambiguous and uncertain manner.

Accordingly, there are strong grounds for regulators to consider implementing a technology-neutral, converged media regulatory framework that captures both interactive multimedia services and traditional broadcast media. However, in crafting such a framework, regulators need to act in a proportionate manner that avoids stifling technological innovation and is carefully adapted to risk. Moreover, the regulatory framework should not impose such heavy regulation on interactive multimedia services that it achieves the perverse outcome of discouraging the uptake of legitimate services at the expense of unregulated, illegal providers. A possible option is the creation of a "converged but differentiated" framework that is technology-neutral but imposes different levels of regulation depending on different service features, such as linear/non-linear delivery, audience reach or revenue.

In a world where interactive multimedia services are global in reach, regulators also need to grapple with the question of how to enforce regulatory mechanisms against overseas-based providers. This chapter has listed possible options to this end, such as regulating the key partners that interactive multimedia services rely on (i.e. ISPs that carry their content and advertisers that provide revenue), promoting international cooperation between regulators and, perhaps most effectively, encouraging voluntary compliance through global industry outreach and an easy-to-use, clear regulatory framework and institutional design.

On the topic of institutional design, this Chapter has also explored options for the convergence of regulators, from the creation of a technology-neutral converged media regulator to the deeper (and more contentious) step of integrating media and telecommunication regulators into one body.

Finally, this Chapter has looked at the issues that interactive multimedia services pose for non-content-related regulatory regimes, such as telecommunication regulation. Given the increasing integration between telecommunication providers and content providers, this is an area that regulators need to watch closely. In particular, the competition implications of vertical integration and revenue sharing deals may need to be examined.

Ultimately, given the rapid changes that are taking place, and will continue to take place, in relation to interactive multimedia services, it is difficult to provide a prescriptive approach to regulation in this area. Instead, regulators should constantly return to core principles of regulatory design – proportionality, reasonableness, equal treatment, pragmatism, among others – and implement solutions that promote the interests of end-users and other stakeholders and are targeted to the specific circumstances of the relevant issue.

5 Country cases

This chapter includes case-reports from Asia-Pacific countries. They serve the purpose of providing an update on the available interactive multimedia services and the regulatory framework. They also serve as examples and to illustrate observations made in the previous chapters and hence references are made to these country cases.

The following cases are included:

1. Australia
2. Hong Kong, China
3. India
4. Japan
5. Republic of Korea
6. Thailand

5.1 Australia

Population:	23.5m (2014)
Area:	7 692 024 km^2
Population density:	3/km^2
GDP/capita:	USD 42 640
Fixed broadband /100 inhabitants:	25.01 (2013)
% Households with Internet:	82.7% (2013)
3G/4G penetration:	63%/19.0% (2013)
National Regulatory Authority:	Australian Communications and Media Authority (ACMA)

Source: Bloomberg, GSMA, ITU, Wikipedia

5.1.1 Introduction

The ACMA is a 'converged' communications and media regulator, created to bring together the threads of the evolving communications universe, specifically in the Australian context the convergence of the four 'worlds' of telecommunications, broadcasting, radiocommunications and the Internet.[78] The ACMA was formed on 1 July 2005 by a merger of the responsibilities of the Australian Broadcasting Authority (ABA) and the Australian Communications Authority (ACA). It was created, at least in part, to respond to the observed and anticipated changes brought about by this convergence.

The communications and media industries in Australia continue to face unprecedented, largely Internet-driven change. Media content has increasingly become non-linear, interlinked and 'uncontained', while people expect to connect and communicate seamlessly – anywhere, anyhow, anytime..

The ACMA mandate is to deliver a communications and media environment that balances the needs of the industry and the Australian community through regulation, information and advice.

[78] The carriage of key economic aspects (competition policy, pricing and access regimes) of telecommunication regulation is in the hands of the Australian Competition and Consumer Commission (ACCC), which plays a complementary role to the ACMA on these aspects of the media and communications space.

The ACMA focus is on engaging industry and consumer stakeholders, using the construct of communication, facilitation, and then regulation if necessary, to deliver outcomes that are transparent, coherent and consistent. The approach helps the ACMA to remain agile and relevant at a time when many new, unexpected challenges are arising in the communications and media environment.

5.1.2 Australian interactive multimedia services and Pay TV market

Overview

Key developments during 2012-13 confirmed the ongoing role of the Internet in driving the development of the digital economy, including the following areas relevant to interactive multimedia services:

- Continued growth in use of smart devices such as smartphones and tablets and related applications and services.
- Internet services delivered over mobile networks providing ongoing growth opportunities in the Internet access market.
- Growth in the delivery and use of content services over multiple networks and consumer devices.
- Surge in the volume of data being downloaded in Australia, driven by fixed-line broadband subscribers.
- Increased use of professionally produced online content services such as catch-up TV.
- The expansion of key digital economy infrastructure such as 4G mobile broadband networks and the National Broadband Network (NBN)[79].

Online content services

While the use of traditional media channels has seen little change over the last five years, the increased frequency of Internet use in Australia is a driving factor in the emergence of online content services such as news and catch-up television. The provision of online content services in Australia is generally in three forms:

- catch-up television offered by free-to-air (FTA) television broadcasters on an over-the-top (OTT) basis enabling viewers to access recently aired shows via the Internet, usually free of access charges;
- high-end Internet protocol television (IPTV) services providing users with access to video content in return for a subscription, or fee-per-view provided by Internet service providers (ISPs);
- OTT content services offered direct from the content provider to the consumer.

At June 2012, there were nine IPTV providers in the Australian market, while take-up of these services is relatively low at five per cent of Internet-connected households.80 ABC iView is Australia's most popular catch-up service.

Global 'super aggregators' such as Apple TV and Google TV offer OTT services to Australian consumers. The Google-owned video website YouTube has 60 channels featuring broadcast-quality content.[81]

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[79] ACMA Communications report 2012-13 www.acma.gov.au/theACMA/Library/Corporate-library/Corporate-publications/communications-report-2012-13. Also available is the ACMA 'Our digital life' infographic www.acma.gov.au/theACMA/engage-blogs/engage-blogs/ACMA-buzz/Our-digital-life

[80] ACMA Communications report 2011-12 series: Report 1 – Online video content services in Australia www.acma.gov.au/webwr/_assets/main/lib310665/report%201_online_video_content_in_australia.pdf

[81] Refer to this and other data from the ACMA's first Google Hangout on the future of television in Australia www.acma.gov.au/Industry/Broadcast/Television/Licence-fees-and-charges/the-future-of-television-in-australia

More recently there have news media reports of Australia's free-to-air broadcasters intention to offer a service built on the Hybrid Broadcast Broadband TV (HbbTV) standard that combine terrestrial broadcasts with streaming video on the one device.[82]

The availability of higher-speed Internet services and the growth in online content services such as video on demand and catch-up television has seen Australians increasing their online media consumption in addition to their existing offline media use. For example, during June 2013 (in comparison to June 2012):

- 5 million people streamed videos online, an increase of 14 per cent;
- 2.6 million streamed music, an increase of 27 per cent;
- 1.7 million streamed television programs, an increase of 10 per cent.

In the six months to May 2013, 7.86 million Australians aged 18 years and over accessed a commercial or free-to-air online video content (OVC) service compared to 5.16 million in the six months to May 2012, a 52 per cent increase. The majority of OVC activity related to the use of online catch-up television services. ACMA research showed that in the six months to May 2013:

- 6.69 million used a catch-up television service;
- 1.94 million used video on demand services;
- 1.38 million used a commercial Internet television service such as IPTV.

In addition, an estimated 5.2 million Australians aged 18 years and over had access to a 'time-shifting' device (used to access professionally produced content services) at June 2013, an increase of seven per cent in comparison to June 2012.

Social media and messaging platforms provide new ways for users to generate their own content, and to share their own and others content, including professionally produced content. Social media and messaging platforms allows viewers to interact with TV broadcasters, or for readers to interact with online news and entertainment services. These interactions include commenting, rating and sharing multimedia. Social networking activities in Australia in the six months to May 2013 increased by three percentage points in comparison to the six months to May 2012, to reach 10.40 million people. As of June 2012 52 per cent of Australians used social network services.

Subscription TV

Subscriber numbers increased from 2.40 million at June 2012 to 2.48 million at June 2013, an increase of three per cent. Subscribers are able to scan, view and record content via their smartphones or tablets through mobile applications.

In June 2013, Foxtel launched an Internet delivered TV subscription service, Foxtel Play. Subscribers to the service are able to view content across multiple Internet connected devices, including smart TV's, smartphones, tablets, desk top computers and games consoles, through the 'Foxtel Go' app.[83] In October 2013, Foxtel announced an expansion of the functionality of its 'iQ' set-top-box to include catch-up TV.[84]

[82] www.smh.com.au/digital-life/computers/blog/gadgets-on-the-go/freeviewplus-works-with-nonfreeview-gear-20140310-346jb.html

[83] www.foxtel.com.au/about-foxtel/communications/introducing-foxtel-play-211377.htm

[84] www.cnet.com/au/news/foxtel-expands-epg-to-include-instant-catch-up-tv/

5.1.3 Changing regulation

Within the ACMA, media convergence is primarily framed to refer to the merging of the previously distinct platforms by which information is communicated. Relevant to interactive multimedia services the historical distinctions between telecommunications, broadcasting and the Internet are blurring.

Convergence is characterised by four key causes of change. These are:

- Technological developments. Digitalization and IP-enabled communications and media separates services from transport layers[85].
- Market developments and associated changes in industry structure. Broadcasting, media, information technology and telecommunication markets are merging into a broad communications market.
- Changing consumer and/or citizen engagement. Content production is shifting away from industry as users generate their own content and share it via the Internet. Private and public service delivery is also shifting online. These developments are changing the way citizens interact with each other, procure services and participate in the public sphere.
- Globalization of markets and regulation. Extended supply chains and the global reach of the Internet is challenging regulation designed for local and national markets.

Regulatory consequences of relevance to interactive multimedia services include gaps in the existing framework's coverage of new forms of content and applications, and the blurring of boundaries between historically distinct devices, services and industry sectors leading to inconsistent treatment of like content, devices or services.

Nonetheless, there remain expectations of communications and media public interest outcomes that are expected to remain relevant in the on-going evolution of the broadband-enabled networked society.[86] A broader mix of strategies will be called for, involving regulatory and non-regulatory interventions to address the changing profile of risks and harms in a dynamic networked economy and society.[87] Industry co- and self-regulatory arrangements are seen as the most developed expression of non-regulatory interventions. Communication strategies offer a flexible non-regulatory response to addressing emerging issues in digital communications and content.[88]

[85] The ACMA is consulting industry on the impact of higher demand for mobile broadband and emerging digital broadcasting platforms such as HbbTV.

[86] www.acma.gov.au/theACMA/enduring-concepts-building-blocks-for-a-converged-media-and-communications-future

[87] Speech by Chris Chapman, Chair, ACMA, Ericsson Broadband for All, Stockholm, 2013 www.acma.gov.au/theACMA/Newsroom/Newsroom/Speeches/acma-speeches-2013

[88] ACMA research report *Connected citizens-A regulatory strategy for a networked society* www.acma.gov.au/theACMA/About/The-ACMA-story/Connected-regulation/regulating-for-connected-citizens

5.2 Hong Kong, China

Population:	7.2m (2013)
Area:	1 104 km^2
Population density:	6521/km^2
GDP/capita:	USD 55 383
Fixed broadband /100 inhabitants:	30.75 (2013)
% Households with Internet:	79.9% (2013)
3G/4G penetration:	48%/NA (2013)
National Regulatory Authority:	(Office of the) Communications Authority (OFCA)

Source: Bloomberg, GSMA, ITU, Wikipedia

5.2.1 Introduction

Hong Kong, China has a vibrant broadcasting sector offering a wide range of services to the community. The government policy objectives are to widen the programme choice for the community, encourage investment and innovation in the broadcasting industry, promote fair and effective competition and enhance the position as a regional broadcasting hub. By providing a liberalized, light-handed and pro-competition regulatory environment to facilitate broadcasting services to flourish, these policy objectives have largely been achieved.

5.2.2 Regulatory framework

In Hong Kong, China, broadcasting content and network provision are regulated separately under the law. In this respect, the Broadcasting Ordinance (Cap. 562) ("BO") governs content regulations of TV broadcasting services while the Telecommunications Ordinance (Cap. 106) ("TO") covers the establishment, maintenance and operation of telecommunication networks, including broadcasting networks.

The Communications Authority ("CA") is an independent statutory body and is a unified regulator overseeing both the broadcasting and telecommunication sectors. The Office of the Communications Authority ("OFCA") is the executive arm of the CA.

Under the BO, there are four categories of television programme services, namely domestic free, domestic pay, non-domestic (mainly satellite television services targeting the Asia-Pacific region) and other licensable (mainly television services for hotel rooms) television programme services which are regulated according to their characteristics and pervasiveness rather than their transmission mode. Hong Kong, China adopts a light-handed approach in the regulation of domestic pay, non-domestic and other licensable television services. As stipulated in the BO, "Television program service" does not include the provision of a service that consists only of a service that, among others, "Any service provided on the service commonly known as the INTERNET".

All television programme service licensees have to comply with the relevant legislation - the BO, the Broadcasting (Miscellaneous Provisions) Ordinance (Cap. 391), and the related subsidiary legislation. They must also observe the terms and conditions of their licences. In addition, they should comply with codes of practice issued by the CA. A set of codes set out clear standards relating to programme and advertising, as well as technical standards applicable to the licensees. These codes are reviewed regularly in consultation with the licensees to take account of changing community attitudes and standards.

5.2.3 Market and business trend

Free TV

There are two licensees of domestic free TV programme services, viz. Television Broadcasts Limited ("TVB") and Asia Television Limited ("ATV"). In addition to the analogue TV broadcasting, they launched digital terrestrial television broadcasting in end 2007 and achieved a coverage rate on par with that of the analogue TV service at 99 per cent population by end 2013.

In October 2013, the Chief Executive in Council granted approval-in-principle in respect of the applications by Fantastic Television Limited and Hong Kong Television Entertainment Company Limited for domestic free television programme service licences. Processing of the said licence applications is in progress.

Pay TV

The pay TV market has been fully liberalized since 2000. There are currently three licensees, namely, Hong Kong Cable Television Limited ("HKCTV"), PCCW Media Limited ("PCCW Media"), and TVB Network Vision Limited ("TVBNV") (formerly known as "TVB Pay Vision Limited"). The three licensees are licensed to provide domestic pay television programme services.

Under the technology-neutral regulatory regime, licensees are free to choose their transmission arrangements for delivery of television services. Broadcasters can build their own transmission networks to deliver their services and, in such cases, they need to apply for a carrier licence under the TO from the CA to cover their transmission networks. Alternatively, they can engage any of the existing carrier licensees to provide the transmission service. Licensees can also provide their television programme services via multiple transmission platforms so as to maximize the coverage. The transmission modes currently employed by the three pay TV licensees are described in Table 5.

Table 5: Transmission modes employed in Hong Kong, China

Licensee	Transmission Mode	Network Coverage (as of March 2013)
HKCTV	HFC[89], MMDS[90] and satellite (Digital)	97 per cent of total households (about 2.3 million households)
PCCW Media	PON and DSL[91] Broadband network (Digital)	Near 100 per cent of total households
TVBNV	Satellite and broadband network (Digital)	Near 100 per cent of total households

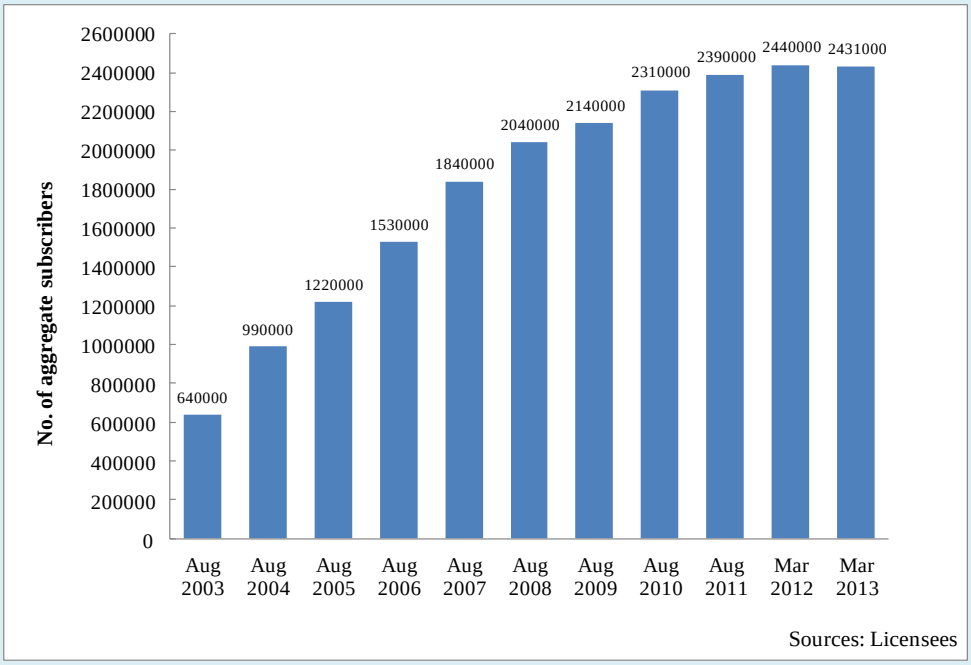
As of March 2013, the total number of subscribers to licensed pay TV services was 2 431 000, representing a penetration rate of over 100 per cent of the total households. The changes in total number of subscribers from 2004 to 2013 are shown in Figure 31.

89 Hybrid Fiber Coaxial Cable.

90 Microwave Multipoint Distribution System.

91 Passive Optical Network and Digital Subscriber Line.

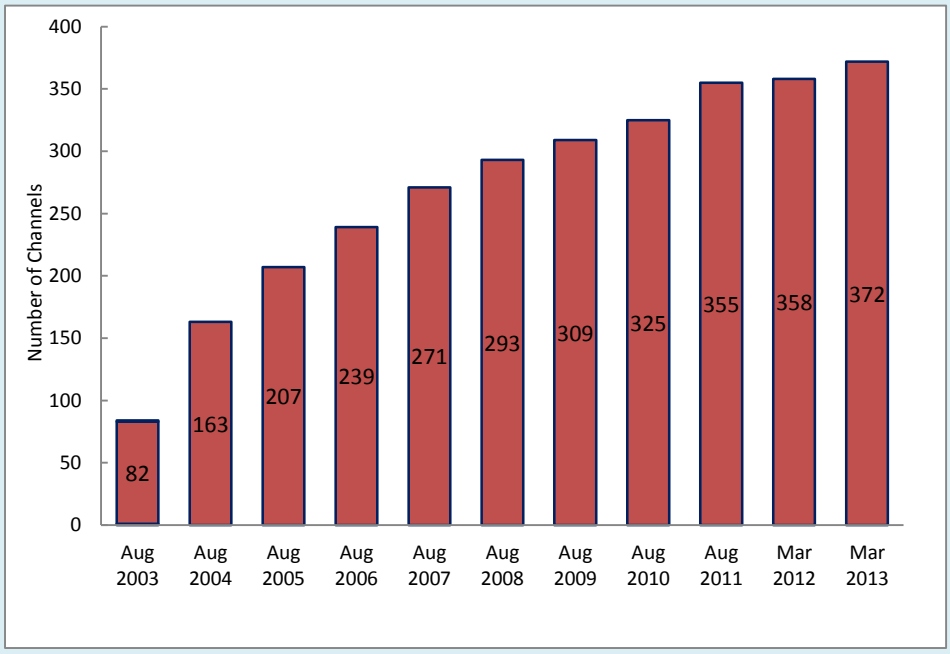
Figure 31: Pay TV subscribers in Hong Kong, China



Source: OFCA

As a result of growing competition in the pay TV market, Hong Kong, China viewers now enjoy a diversity of television programming. The pay TV market continued to grow in terms of programming variety and service development. The number of pay TV channels provided by licensees has increased to 372 from only eight when pay TV was first launched in 1993. It has become a general trend for pay TV programs to be produced in high-definition ("HD") format to enhance viewing pleasure. An overview of number of channels provided by pay TV licensees from 2003 to 2013 is shown in Figure 32.

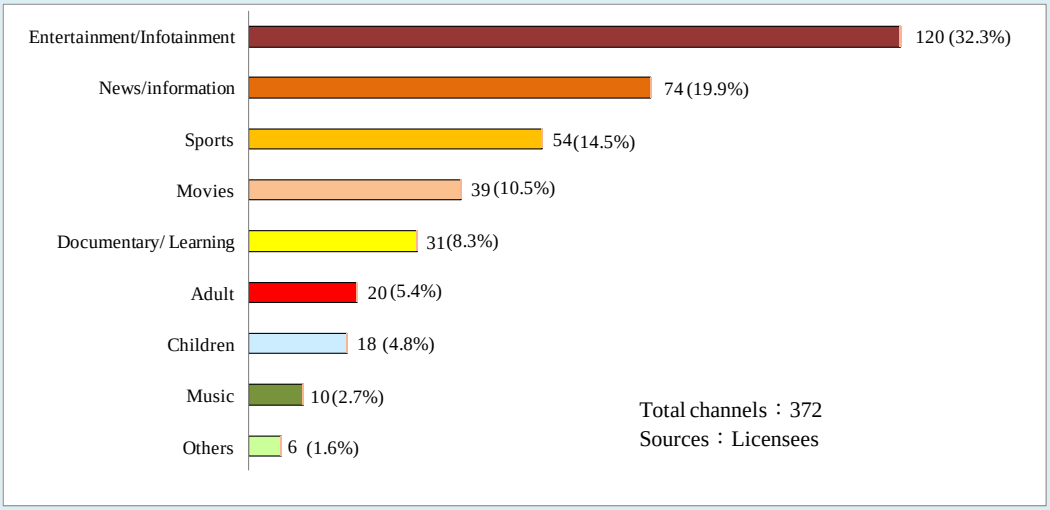
Figure 32: Number of Channels (TV services) in Hong Kong, China



Source: OFCA

A wide variety of channels were offered on pay TV services, including entertainment and infotainment channels, news and information channels, sports channels, movie channels, and documentaries/learning channels. As of March 2013, the nature of pay TV channels is given in Figure 33.

Figure 33: Pay TV Channels in Hong Kong, China



Source: OFCA

IPTV

PCCW Media offers the first pay TV service based on IPTV (known as now TV) in Hong Kong, China. TVBNV partners with PCCW Media and Hutchison Global Communications to offer its pay service over the IP platform. The ITU report reveals that by end 2012, Hong Kong, China was the world leader in terms of IPTV subscriptions as a percentage of households with a TV (48 per cent).

TV over the Internet

An incumbent broadband provider, Hong Kong Broadband Network ("HKBN"), provides IPTV services over the Internet in contrast with the managed IP network of now TV.

With the growing popularity of mobile broadband service and the use of smart phones, some TV broadcasters in Hong Kong, China have partnered with mobile network operators to provide TV streaming services on the Internet. Recently an incumbent free TV broadcaster also launched a service over the Internet for viewers to get access to its TV programme archives. Streaming video on the Internet is now provided by many fixed and/or mobile network operators. Video on demand services over the Internet are also widely available.

Triple-play

Along with the convergence of telecommunications, broadcasting and Internet services, triple-play packages are being offered by providers such as PCCW, i-Cable Communications Limited and HKBN under their marketing strategy.

5.2.4 Competition matters

At present, only sector-specific competition laws are in force in the broadcasting and telecommunications sectors. Providers of interactive multimedia services and pay TV services, insofar as they are licensees under BO or TO, and their conduct has a purpose or effect of preventing / restricting competition in a television programme service market or telecommunication market respectively, are subject to the competition provisions of the BO and the TO respectively. The CA is conferred the power to enforce the BO and TO, including the competition provisions under the two Ordinances.

In June 2012, the Legislative Council passed the Competition Ordinance (Cap. 619) ("CO") providing for a cross-sector competition law prohibiting anti-competitive conduct in all sectors. The Competition Commission (the "Commission"), which has been newly established, is the principal agency to enforce the CO in all sectors, whereas the CA is conferred jurisdiction concurrent with the Commission to enforce the CO in relation to the conduct of the BO and TO licensees. The CO is yet to commence full operation, pending preparation of enforcement guidelines and the consultation on them with the public and the Legislative Council. Upon full commencement of the CO, the competition provisions of the BO and TO will be repealed simultaneously subject to transitional arrangements.

With the full commencement of the CO in the near future, all traders in Hong Kong, China, including not only telecommunication and broadcasting service providers, but also content service providers and multimedia service providers that are not licensees under the BO and the TO, as well as any conduct that has an object or effect of preventing / restricting competition in Hong Kong, China, will be governed under the CO. This, in turn, will enhance the level of protection against unfair competition, and allow market players to provide competitive offers of innovative and quality products to consumers on a level playing field.

5.2.5 Consumer protection

In Hong Kong, China, a new cross-sector legislation prohibiting unfair trade practices was introduced as an amendment to the Trade Descriptions Ordinance (Cap. 362) ("TDO"), and has come into operation since July 2013. The new fair trading sections under the TDO have expanded the scope from previous coverage of goods to include services as well, prohibit specified unfair trade practices deployed by traders, including false trade descriptions of goods and services, misleading omissions, aggressive commercial practices, bait advertising, bait and switch, and wrongly accepting payment. The Customs and Excise Department is the principal agency responsible for enforcing the new provisions, and concurrent jurisdiction is conferred on the CA in respect of broadcasting and telecommunication services.

The new legislation enhances consumer protection in general as any traders, including providers of interactive multimedia and pay TV services, irrespective of whether they are licensed under the BO and the TO, will be liable for criminal prosecution or other enforcement action if they are found in breach of the fair trading sections of the TDO.

5.3 India

Population:	1 210 m (2011)
Area:	3 287 590 km^2
Population density:	367/km^2
GDP/capita:	USD 1 584
Fixed broadband /100 inhabitants:	1.16 (2013)
% Households with Internet:	3.1% (2011)
3G/4G penetration:	9%/NA (2013)
National Regulatory Authority:	Telecom Regulatory Authority of India (TRAI)

Source: Bloomberg, GSMA, ITU, Wikipedia

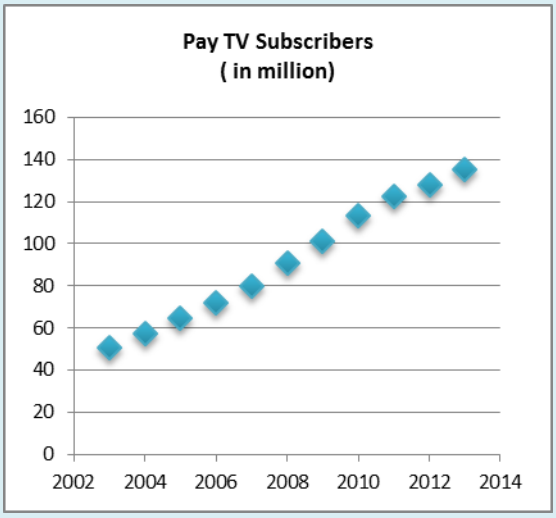
5.3.1 Introduction

India, the seventh largest country in the world, covers an area of 3.28 million km^2 and measures about 3 214 km from north to south between the extreme latitudes and about 2 933 km from east to west between the extreme longitudes. The total length of the coastline of the mainland and its islands is 7 516.6 km. Providing TV services to such a large and diverse country, offers opportunities and challenges

as well. The introduction of digital television in the cable and satellite industry is considered an important step in the development of interactive multimedia services in India.

The cable and satellite television market in India emerged in the early 1990s, spurred by major international events like the Gulf war. From that delayed start, the growth of this industry has been sustained largely by home grown media companies. From a small subscriber base of just about 410 000 in 1992 this industry has grown exponentially to more than 135 million subscribers by the end of 2013. This translates to a mind boggling growth rate of nearly 40 per cent every year for the last 22 years. Figure 34 shows the Pay TV subscribers over the years in India.

Figure 34: Pay TV subscribers in India



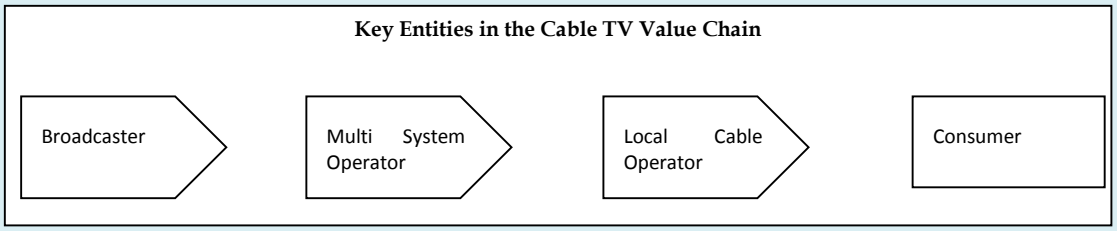
Source: TRAI

The expansion of subscriber base is mirrored by a commensurate growth on the supply side. India today has a large broadcasting and distribution sector, comprising of about 800 television channels, 6 000 Multi System Operators (MSOs), 60 000 Local Cable Operators (LCOs), 7 DTH TV operators, 2 Head-end in The Sky (HITS) operators and IPTV service providers.

India has the world's third largest TV market after China and USA. As per industry estimates, as on March 2014, of the 270 million households, around 169 million have televisions that are being served by cable TV systems, DTH services, IPTV services and the terrestrial TV networks. The terrestrial TV networks, offering free-to-air TV services, are operated only by the public broadcaster. However, the vast majority of the TV services distribution market offering pay TV services is served predominantly by cable TV networks, catering for around 100 million subscribers. The other major TV distribution platform is DTH, which is digital and addressable and has around 37 million active subscribers.

The largest TV distribution platform is cable TV and serves around 60 per cent of the total TV homes in India. The key entities in cable TV services are broadcasters, multi system operators (MSOs) and local cable operators (LCOs). The broadcasters own the content to be televised and transmit or "up-link" the content signals to the satellite. The MSOs downlink the broadcasters' signals, decrypt any encrypted channels and provide a bundled feed consisting of multiple channels to the LCO. LCO receives this feed (bundled signals) from the MSO and retransmits this to subscribers in its area through its cable network. Figure 35 shows this Cable TV value chain.

Figure 35: Cable TV value chain in India



Source: TRAI

5.3.2 Digitization of cable TV sector

The exponential growth in the number of TV channels combined with the inherent limitations of the analogue cable TV systems posed several challenges in the cable TV sector. The primary limitation is the capacity constraint of the analogue cable TV networks; the second reason is its non-addressable nature. The evolution of technology and the coming of the digital age paved way for the huge cable TV industry to be modernized and optimized, enabling it to provide all the new services to this large and upwardly mobile subscriber base.

The sector regulator, i.e., the Telecom Regulatory Authority of India (TRAI) after studying the subject at length and undertaking a comprehensive public consultation process recommended implementation of Digital Addressable Cable TV Systems (DAS) across the country to the Government of India on 5 August 2010. It also laid down a detailed roadmap to achieve the same. The government accepted the recommendations of TRAI and on 25 October, 2011, promulgated an Ordinance[92] amending the Cable Television Networks (Regulation) Act, 1995, enabling the implementation of Digital Addressable Cable TV Systems in India, in a phased manner, starting November 2012 and completing with full implementation of DAS by December, 2014. Given the size, complexity and regional specificities of the country the migration plan from analogue Cable TV distribution systems to the digital one was devised on the basis of the levels of urbanization. Table 6 shows the specific time-table.

Table 6: Migration to digital addressable cable TV systems in India

Phase	Areas	Sunset date for analogue cable TV
Phase –I	Four Metros of Delhi, Mumbai, Kolkata, Chennai	31.10.2012[93]
Phase –II	Cities with a population more than one million (38 cities)	31.03.2013
Phase –III	All Urban areas (Municipal Corporation/ Municipalities)	30.09.2014
Phase –IV	Rest of India	31.12.2014

5.3.3 Implementation of digital addressable cable TV systems (DAS)

Commencing the process of digitization, the TRAI first laid down a comprehensive regulatory framework for implementation of Digital Addressable Cable TV Systems, covering *inter alia* aspects of Interconnection, Quality of service and Tariff.

92 With the Parliament passing the bill, the Ordinance dated 25th October, 2011, became an Act on 30th December, 2011.

93 Date revised to 31st Oct 2012 from 30th June 2012, by the Central Govt. vide notification dated 21st June 2012.

For the physical implementation of DAS, TRAI devised a three step approach:

- The first step was ensuring content availability through signing of formal agreements between the broadcasters and MSOs. This, on the ground, ensured timely availability of adequate content to the MSOs.
- The second step was the seeding of the set-top-boxes (STBs); collection of consumer details and its integration into the Subscriber Management System (SMS). This was critical to bring in 'addressability' in the system.
- The third step was individual consumer billing to ensure that the consumer pays according to their choice/subscription. This marked the biggest change from the earlier analogue days when the subscribers basically paid a lump-sum amount for whatever was being delivered though the cable, whether they wanted that content or not.

For a smooth roll-out, the TRAI undertook the massive awareness drive using all forms of media, i.e., through radio, TV; and print. Through this drive various benefits of digitization were emphasized. A Task force was set up with members from the industry, the sector regulator and the Govt. which undertook field visits; review meetings; awareness workshops; and did whatever else that was needed to ensure a smooth and comprehensive implementation. Data was regularly collected from the service providers to monitor the progress in implementation and when required corrective measures were undertaken.

For the entire digitization process, as far as adoption of technology is concerned, TRAI has followed a technological neutral approach. It has been a conscious decision that technology choices are to be exercised at the level of the service provider – they should adopt the technology which proves to be the best for them.

5.3.4 Challenges faced

The sheer enormity of the task was the biggest challenge faced in implementing this programme. Seeding of around 24 million STBs in a short time span of 9 to 12 months was a daunting task indeed. This task was successfully carried out by close monitoring and holding regular review meetings with the service providers - to identify slippages and resolve problems in seeding.

Another challenge was to ensure Interconnection between the service providers in the changed regulatory environment. Here again collective and prompt resolution of budding issues/ problems ensured that things remained under control. The final and main task to ensure that a fully functional and addressable system was in place was the distribution; completion; collection and entry of the Consumer Application Forms/ data into the SMS. Without a proper consumer database none of the benefits of the DAS could actually accrue to the consumers. As the sector regulator it was a matter of great satisfaction that this task was completed with great vigour by all the service providers.

5.3.5 Present status

The first two phases of implementation have been completed and around 30 per cent of the cable TV homes have been covered. In Phase-I, around 9 million STBs were installed and in Phase-II, around 15 million STBs were installed. The work on the remaining two phases is currently underway. The country is expected to go fully digital by the end of this year. The experience of the first two phases of digitization is very encouraging. In fact a number of maladies of the analogue system, such as capacity constraint, non-transparent business transactions, restricted consumer choice of services, etc., are getting addressed.

In Phases-III and IV, around 76 million STBs are expected to be seeded. Given that these are the areas with a lower level of urbanization, the anticipated problems are different. Nonetheless, a similar structured approach is being followed.

5.3.6 Achievements

The consumers in the areas covered by DAS are today getting a far better choice of channels including HD channels; better picture and sound quality; the service provided has improved; itemized billing has

commenced. Increasingly, broadband services are being provided through the digital cable TV infrastructure. Now the stage is also set for other value added services and triple play services.

The digitization of cable TV networks has been taken up successfully by India and expected to set a benchmark for the other country to follow.

5.4 Japan

Population:	126.7 m (2012)
Area:	377 944 km^2
Population density:	335/km^2
GDP/capita:	USD 39 321
Fixed broadband /100 inhabitants:	28.84 (2013)
% Households with Internet:	86.2% (2012)
3G/4G penetration:	66%/21.3% (2013)
National Regulatory Authority:	Ministry of Internal Affairs and Communications (MIC)

Source: Bloomberg, GSMA, ITU, Wikipedia

5.4.1 IP multicast broadcasting in Japan

In Japan IP multicast transmission falls under broadcasting in the Broadcast Act, since the transmission by IP multicast involves simultaneous transmission of identical content to an unspecified number of people and not the transmission of content according to the request by a recipient. Therefore, those who want to perform the services must obtain the approval of the Minister for Internal Affairs and Communications based on the Broadcast Act, and will be expected to follow the rules pertaining to broadcasting programs, in the case of pay TV rules pertaining to pay TV, and rules pertaining to telecommunication equipment, etc.

5.4.2 Recent efforts concerning smart television

In response to the change in the environment surrounding the telecommunication and broadcasting services, the Ministry of Internal Affairs and Communications conducted the "Study Group on advanced Broadcasting Services" and summarized the results of the review in a report, with the intention of achieving highly convenient services based on the mutual cooperation between telecommunication and broadcasting sectors, and discussing a specific measure toward upgrading of broadcasting services (published in June 2013).

The report lists the results of the review concerning three areas, namely "4K/ 8K", "smart TV" and "cable platform". In particular in terms of "smart TV", it was indicated that a promotion system will be established to realize the "safety and peace of mind of the viewers" and "the improvement of an open development environment", with the purpose of accelerating the adoption of the "next generation smart TV"*[94]that enables a new type of broadcasting telecommunication cooperation service that is distinctive from the existing smart television (which is simply connected to the Internet, and has a processing ability similar to a PC), that would lead to the creation of new business models, etc. and the revitalization of the market.

As a promotion structure, the Next Generation Smart Television Promotion Center was set up within the IPTV Forum Japan (Set up in July, 2013).

[94] The "next generation smart TV" is a new type of television that can display various Web content and applications as well as broadcasting content. For example it can simultaneously show or operate Web applications that are linked to the broadcast television content on the TV screen, or on smartphone or tablet devices that are connected to the TV.

Furthermore, a system to embody the necessary conditions for the development of broadcasting-telecommunication linkage applications that will operate on next generation smart TVs was set up within the Next Generation Television & Broadcasting Promotion Forum (NexTV-F) and the requirements for remote viewing was developed in February 2014.

Moreover, with a view to promote smart television that enables a TV programme linked to various web applications and TV working in connection with smartphone and tablet devices, while at the same time ensuring the convenience of the users and the provision of safe and secure services, the Smart TV Experimental Project "Hybridcast 2014" was implemented between December 2013 and March 2014.

The ITU-R SG6 are currently studying the Integrated Broadcast-Broadband (IBB) System, and based on the Recommendations established at ITU-T SG9, in July 2013 they established the Recommendation ITU-R BT.2037: General requirements for broadcast-oriented applications of integrated broadcast-broadband systems and their envisaged utilization, and in February 2014 they also established the Recommendation ITU-R BT.2053: Technical requirements for integrated broadcast-broadband systems. In addition, they are currently working towards a new Recommendation ITU-R BT.[IBB-SYSTEM], which defines the IBB systems. Japan is also proposing the inclusion of the Hybridcast in the new Recommendation, and this proposal is reflected in the working document.

5.5 Republic of Korea

Population:	50.2 m (2013)
Area:	100 210 km^2
Population density:	502/km^2
GDP/capita:	USD 34 777
Fixed broadband /100 inhabitants:	38.04 (2013)
% Households with Internet:	98.1% (2013)
3G/4G penetration:	45%/62% (2013)
National Regulatory Authority:	Ministry of Science, ICT and Future Planning (MSIP) and Korea Communications Commission (KCC)

Source: Bloomberg, GSMA, ITU, Wikipedia

5.5.1 Introduction

As of June 2013, Republic of Korea has more than 24 million pay TV subscribers, with cable TV being the largest platform in the market. Recently, however, IPTV is showing a remarkable pace to lure subscribers away from its major rival in the Republic of Korea. As a result, more than 7 million Koreans have subscribed to IPTV, representing 30.8 per cent of the total market share of the Korean pay TV industry. This number shows how fast the Korea IPTV market has been growing despite the relatively late start in 2008. It took only five years (2008-2013) for Korea to become one of the top IPTV countries in the world. Table 7 shows an overview of the pay-TV market.

Table 7: Summary of the Korea pay-TV market (as of June, 2013)

Platform	Major Players	N. of Subscribers (000)	Percentage of Digital Subscribers	Market Share (pay TV subs)
Cable TV	t-broad	3 126	35.8%	12.9%
	CJ Hellovision	3 549	48.2%	14.6%
	C&M	2 470	60.2%	10.2%
	HCN	1 284	44.7%	5.3%
	CMB	1 338	7.5%	5.5%
	others	3 076	23.1%	12.7%
IPTV	KT ollehTV*	4 458	100.0%	18.3%
	SK BTV	1 727	100.0%	7.1%
	LG U+	1 302	100.0%	5.4%
Satellite (DTH)	KT Skylife*	4 006	100.0%	16.5%
Total		24 303	62.4%	100%

(*) KT offers 'ollehTV Skylife (OTS)' service, a hybrid service providing its customers with Skylife channels over broadband IP network. As OTS subscribers are included both in KT's IPTV and Skylife, around 2 million subscribers are double-counted in each KT's platform.

Source: KISDI (2013)

5.5.2 The beginning of Republic of Korea IPTV

Table 8 shows a brief history of Korea IPTV, which began with an announcement in 2004 by KT, a leading broadband service provider in Korea, about its plan to launch the IPTV service. Several notable efforts to develop the Korea IPTV market culminated in the Korea Internet Multimedia Broadcasting Act of 2007.

Table 8: Milestones in the introduction of Korea IPTV

Date	Milestones
The 2nd Half of 2004	KT announced its IPTV introduction plan
July 2006	Establishment of the Korean Convergence Committee of Broadcasting and Telecommunications
July 2006	Hana TV service (launched by SK Broadband)
September 2006	Mega TV service (launched by KT)
January 2007	Establishment of a special committee for the convergence between broadcasting and telecommunication
December 2007	IPTV Act was passed

Source: 5 year whitepaper of Korean IPTV (KODIMA, 2012)

As shown in Table 8 video service over IP network was already possible in Korea around 2004, but providing real-time channel package service was allowed only to cable and satellite operators. Thus, early stage IPTV in Korea (R.O.) offered only video on demand services since there was no need for an additional licence to provide the VoD services. However, it seemed that providing linear video package service over IP network was problematic, if not licensed properly.

The scattered governance structure for IPTV caused the delayed introduction of linear IPTV service in the Republic of Korea. At that time, the Ministry of Information and Communication was responsible for telecommunication policy in Korea, while the Korea Broadcasting Commission was in charge of broadcasting policy including pay TV business. Neither the Broadcasting Act nor the Telecommunication Act

could act as a governing law for the new convergence service of linear IPTV. Eventually, the Korean National Assembly solved this dilemma by passing an independent Act specialized for IPTV (so-called IPTV Act).

5.5.3 Regulatory disparity issues

Republic of Korea's IPTV case is a good example showing an uneasy task of governing a new hybrid service under the incumbent regulatory system, as there are significant regulatory disparities between broadcasting services and telecommunication services in Korea. Generally speaking, broadcasting services are governed more strictly than telecommunication services in Korea, which is common in other countries as well. To make matters worse, there was a non-negligible tension between the telecommunication and broadcasting sectors in Korea (R.O.). Skylife, the only DTH service provider in Korea (R.O.), was the earlier case showing exactly the same problem as IPTV's case. In the late 1990's when KT launched its first commercial satellite (Koreasat 1) to provide DTH service in Korea, it took more than three years for the Korean National Assembly to amend the Korean Broadcasting Act in order to accommodate the new DTH service.

Recently, OTT (over-the-top) can be seen as a similar case showing a similar kind of conflicts over a hybrid media service. Over the last few years, OTT, the Internet based video delivery service, has been expanding its footprint all over the world, including the Republic of Korea. Currently, Tving (provided by CJ Hellovision), Pooq (jointly provided by major terrestrial broadcasters in Korea), and EveryonTV (jointly provided by HCN and Pandora TV) are the major OTT services in the Republic of Korea , along with three major mobile OTT providers of KT, SKT, and LGT. Table 9 shows the key OTT players in Korea (R.O.).

Table 9: Notable OTT players in Republic of Korea (as of February, 2014)

Origin	Players	Contents	Business Model	Subscribers (paying only)
Cable TV	Tving	over 200 (linear) + 50 000 (VoD)	Subscription + PPV + RVoD	550 000
	EveryonTV	over 250 (linear)	Free + Ads.	-
IPTV	Olleh TV mobile	75 (linear) + 63 000 (VoD)	KT subscribers only (price varies)	1 000 000
	Btv Mobile	60 (linear) + 40 000 (VoD)	SKT subscription only (price varies)	1 000 000
	U+ HDTV	70 (linear) + 40 000 (VoD)	LGT Subscription only (price varies)	1 500 000
Terrestrial TV	Pooq	43 chs (linear) + VoD	Subscription + RVoD	180 000
Others	Hoppin	(TV + movie) VoD only	SVoD + RVoD	N.A.

Source: KISDI (2014)

All of these OTT services are being regarded as just 'value added telecommunication services', which have no strict contents obligations, while most of the Korea incumbent pay-TV services are governed by relatively strict contents regulations. For this reason, the Korea broadcasting sector claims OTT service should be governed as a 'TV-like' service, while telecommunication sector intends to let them stay unregulated or regulated at a minimum level. The Korean Government established a research group with stake-holders to find an agreeable solution to govern this new service but it will take a great deal of time to get an agreement with stakeholders involved.

Although Korea IPTV service has shown a remarkable growth, Korea still has the issue of regulatory disparity in pay TV regulations between cable and IPTV, which are considered to be substitutable competitors to

each other in the pay TV market. Different regulations for market share[95], cable TV must-carry obligations for the public interest channels[96], prohibition of IPTV channel ownership,[97] different levels of information disclosure[98], and asymmetric 'guideline' for programme licence fee[99] exemplify a significantly unbalanced level of regulations between IPTV and cable TV in Korea.

5.5.4 Network neutrality issue

On 10 February, 2012, KT blocked its subscribers from connecting most Internet sites such as Youtube if the subscribers tried to connect those sites from Samsung Smart TV. The KT action ignited a severe controversy over the network neutrality issue in Korea, although KT quickly stopped blocking after serious complaints from its subscribers. The issue is still under negotiation between KT and Samsung Electronics, another giant company in Korea while the Korea Government approaches this issue very cautiously. Like other network providers, KT argues that contents providers or smart device companies should pay for the increased network traffics.

5.5.5 Plan to solve the regulatory asymmetry issues

The Korea Government now seeks to reform broadcasting regulations from a coherence perspective. For this purpose, the inconsistent rules governing cable TV and IPTV have been under review by the government. A special task force team composed of diverse stakeholders is working on the reformation. The Korea Government is planning to make an agreeable suggestion on the reform to the Korean National Assembly. The key to this process is "the same rule for the same market."

Governing OTT services can be a different story. The task force team also can tackle this issue, but it's not clear whether or not the team could solve the problem. The basic stance of the Korea Government on this topic is simple. If OTT is clearly assessed to be a direct competitor to pay-TV service, it should be governed the same as pay-TV, otherwise, OTT deserves the minimum level of regulation. The assessment process will begin soon for this decision.

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95 Market share regulations (effective since January 2014) say for (a) Cable TV no more than 1/3 of the total national pay TV subscribers (b) IPTV no more than 1/3 of the total pay TV subscribers in each cable district.

96 Only cable TV must carry at least three public interest channels, while IPTV has no such rule.

97 Unlike IPTV operators, Cable SOs can operate their own channels, unless the number of channels they own and operate does not exceed 10% of the total number of channels in their product package.

98 Cable SOs should disclose more information on their business status than IPTV operators in Korea.

99 Korea's SOs should pay at least 25% of their subscription revenue to programme providers as programme licence fee. There is no programme licence fee guideline for IPTV in Korea.

5.6 Thailand

Population:	65.5m (2010)
Area:	513 120 km^2
Population density:	127/km^2
GDP/capita:	USD 9 875
Fixed broadband /100 inhabitants:	7.35 (2013)
% Households with Internet:	33.7% (2012)
3G/4G penetration:	37%/NA (2013)
National Regulatory Authority:	National Broadcasting and Telecommunications Commission (NBTC)

Source: Bloomberg, GSMA, ITU, Wikipedia

5.6.1 Introduction

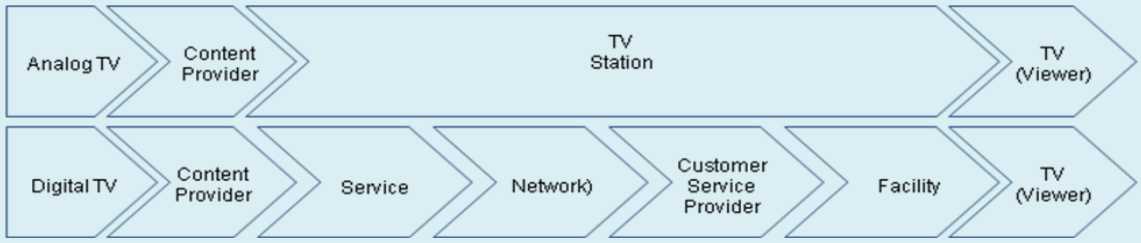
Television broadcasting is considered to be a very important factor to the overall economic development and social inclusion. Television is an influential medium for various aspects of people's lives such as their thinking, beliefs, behaviour and lifestyle. The transition to digital television broadcasting will therefore directly impact the quality of people's lives.

The introduction of digital terrestrial television is considered an important step towards the development of interactive multimedia services. This country case will cover the Thailand television market and the regulatory framework and policies for the introduction of digital television broadcasting.

5.6.2 Thailand television value chain

In the past, the Thailand television broadcasting industry was based on analogue terrestrial broadcasting whereby households received their services by means of frequency transmission and people used 'rabbit ears' or 'fishbone' antennas. The terrestrial television broadcasting industry can be divided into three time eras; 1st era of black and white television (B.E. 2490 – 2510), 2nd era of colour television (B.E. 2510 - 2555) and 3rd era of digital television. In the digital television era there is a structural change of the television broadcasting business by having separate businesses for content, service and network provisioning, as well as facility provisioning. This is different from the 1st and 2nd eras whereby functions were integrated. This industry change is illustrated in Figure 36.

Figure 36: Television industry change



Source: NBTC

The Thailand Broadcasting Master Plan (B.E. 2555/2012 – 2559/2016) aims at completing the digital migration within four years. The spectrum auction for digital television services (i.e. licences for commercial television services for national distribution) was conducted in December 2013. In total 24 licences, grouped together in four different content categories, were assigned with a start of service in April 2014. These new services will offer people access to a more diverse and higher quality bouquet of television services.

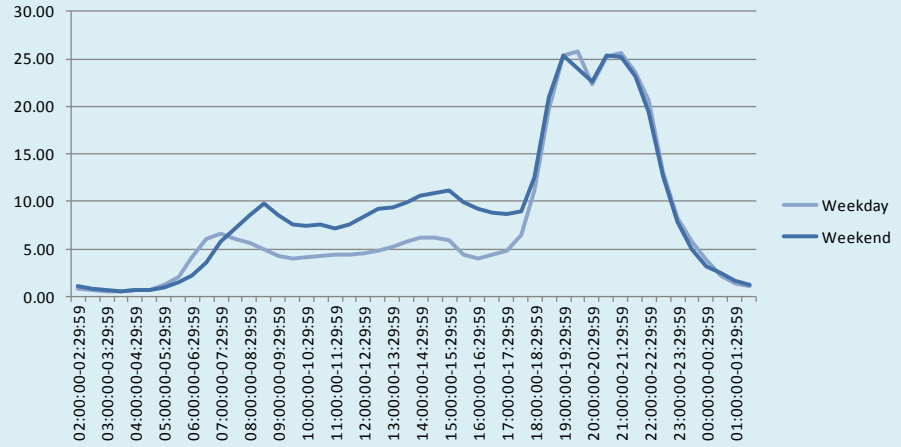
5.6.3 Thailand television viewing (2013)

In Thailand people watched television averaging 240 minutes per day across six channels of free TV, namely TV channel 3, Royal Thai Army Radio and Television Channel 5 (TV5), Channel 7 (Bangkok Broadcasting and Television Company Limited under licence from Royal Thai Army), Modernine TV, National Broadcasting Services of Thailand (NBT) and Thai Public Broadcasting Service (TPBS). This viewing included terrestrial, cable and satellite networks.

Analogue terrestrial television

People watched analogue terrestrial television (six free TV channels) for 191 minutes per day with prime time viewing periods during 7.00 – 8.00 p.m. and 8.00 – 9.30 p.m. for both working days and weekends. In general the number of viewing hours on Saturday and Sunday was higher than for working days. These viewing periods are illustrated in Figure 37.

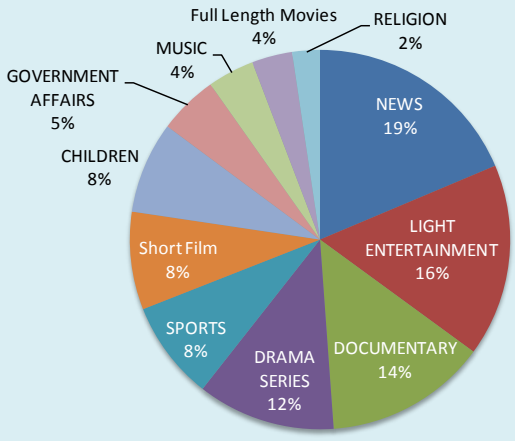
Figure 37: Analogue terrestrial television viewing periods



Source: NBTC

Television programming is classified in 11 categories, including full-length movies, drama series, short film or feature drama, news, government-related programmes, documentary, entertainment, music, children, sports and religious programmes. The numbers of viewers per category showed that the news had most viewers (18.64 per cent). Figure 38 shows an overview of the viewing percentages per programme category.

Figure 38: Viewing per programme category

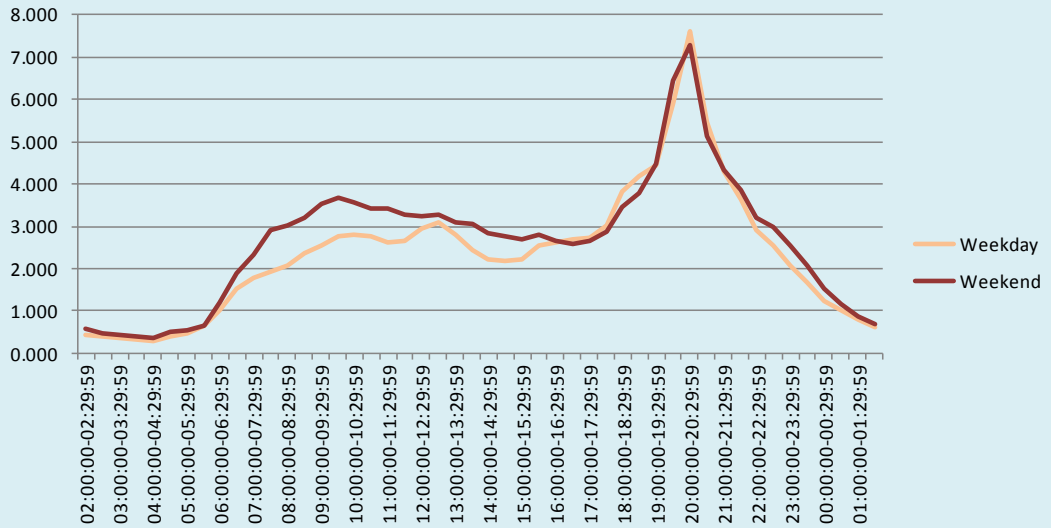


Source: NBTC

Cable and satellite television

People watched television via cable or satellite networks for an average of 119 minutes per day with prime during 8.00 – 8.30 p.m. for both working days and weekends. Figure 39 shows an overview of the cable and satellite viewing periods.

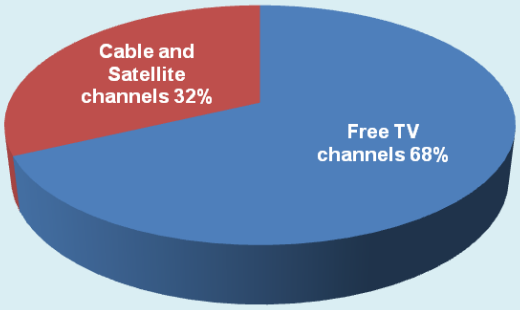
Figure 39: Cable and satellite viewing periods



Source:

However, when comparing the proportion of viewing minutes between the analogue terrestrial television and cable/satellite television viewing, it was found that the terrestrial viewing is still having a very high proportion. During an average month, terrestrial viewing compares to cable/satellite television viewing as 68 per cent to 32 per cent respectively. Figure 40 shows this proportion between terrestrial and cable/satellite viewing.

Figure 40: Viewing proportion per platform



Source: NBTC

5.6.4 Thai television market value

In 2013 the Thailand television advertising market grew as comparing with the advertising value in 2012. For free TV the growth was 1.68 per cent while the market value for cable and satellite television was growing at a higher rate of 22.79 percent. However, when considering the total advertising value proportion year by year, it was found that the proportion of free TV was a bit lower (1 percent) and the proportion of cable and satellite TV increased by 2 percent.

Table 10 provides an overview of the television market value changes over the period 2011 to 2013.

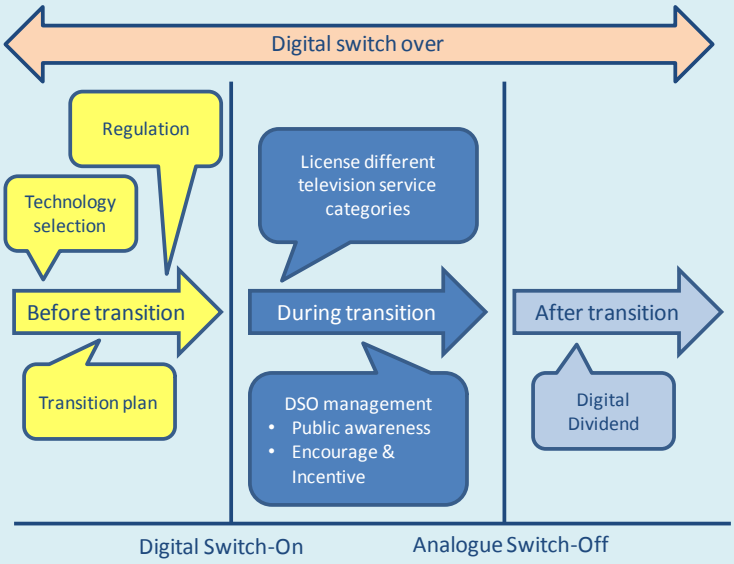
Table 10: Television market value changes

	2011		2012		2013		Change 12-13
	Million Baht	%	Million Baht	%	Million Baht	%	%
Analogue Free TV	62 238	52	68 105	52	69 249	51	+1.68
Cable/Satellite TV*	7 496	6	9 653	7	11 853	9	+22.79
Radio**	5 918	5	6 349	5	6 321	5	-0.44
Other Media	43 574	36	47 024	36	48 088	35	+2.26
* Not including TrueVisions							
** Not including self-promotion							

5.6.5 Transition to digital television

The Thailand digital transition process is divided in three main phases; (1) before transition; (2) during transition and (3) after transition. This process is illustrated in Figure 41.

Figure 41: Transition process in Thailand

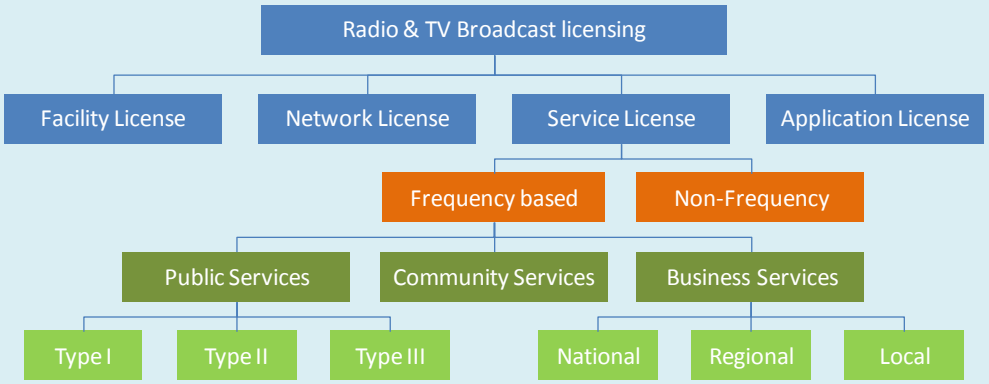


Source: NBTC

The selected standard for the Digital Terrestrial Television Broadcasting (DTTB) platform is DVB-T2. The DTTB platform includes five multiplexes (to be extended later to six) and these networks carry the six incumbent television services and hence the six incumbent television services are simulcasted in the DTTB coverage areas. In the fully deployed stage the DTTB network will cover 95 per cent of the households in Thailand.

The licensing framework for broadcast services and distribution is based on the Broadcast Business Act (2008) and the Act on Organization to Assign Radio Frequency and to Regulate the Broadcasting and Telecommunications Services (2010). The licensing framework is depicted in Figure 42.

Figure 42: Licensing framework for broadcasting



Source: NBTC

In addition to above mentioned legislation, the NBTC has published several Notifications governing the regulation of broadcast licences. In particular the following Notifications are relevant for DTTB policies and licensing:

- Criteria and Means of Licensing for Provision of Facilities for Radio or Television Broadcasting, B.E. 2555 (2012).
- Criteria and Means for Granting License for Provision of Radio or Television Broadcasting Network, B.E. 2555 (2012).
- Additional Criteria and Means for Granting License for Provision for Digital Terrestrial Television Broadcasting Network-, B.E. 2556 (2013).
- Criteria and Means for Granting Spectrum for Radio and Television Broadcasting Business Services, B.E 2556 (2013).
- License Fees for Operating Radio or Television Broadcasting Services, B.E. 2555 (2012).
- Criteria and Means for Spectrum Auction of Digital Television Business Services – National Level, B.E. 2256 (2013).

In the above mentioned Notifications, under item 3, the roll-out obligation for the DTTB network operators is stated. This obligation is defined as a minimum coverage requirement (for fixed rooftop reception as a percentage of households. The percentages per period after the network licence assignment are as follows:

- 50 per cent within one year;
- 80 per cent within two years;
- 90 per cent within three years;
- 95 per cent within four years.

The network licence as included in Figure 42 includes an operating right. The service licence includes the spectrum rights as well as the right to broadcast television content (i.e. the broadcasting right). The Act on Organization to Assign Radio Frequency of 2010 stipulates that spectrum rights for business/commercial purposes should be auction. Consequently the DTTB Service licences have to be auctioned for assigning spectrum rights to commercial broadcasters.

In December 2013 the 24 licences were auctioned. 29 companies qualified and they submitted a total of 42 applications for a licence in one of the categories. For each category the demand exceeded supply. All licences were assigned in the four auctions. Table 11 shows the winners in each auction as well as their rank in terms of final bid price.

Table 11: Winners per licence type and rank

Rank	Company	Rank	Company
HD General		**SD General**	
1	BEC Multimedia	**1**	Thai Broadcasting (Workpoint)
2	Bangkok Media and Broadcasting	**2**	True DTT
3	BBTV (CH 7)	**3**	GMM SD
4	Triple V (Thairath)	**4**	BEC Multimedia
5	MCOT	**5**	RS
6	Amarin	**6**	MONO Broadcast
7	GMM HD	**7**	Bangkok Business (Nation)
News and documentary		**Kids and family**	
1	NBC Next Vision (Nation)	**1**	BEC Multimedia
2	Voice TV	**2**	MCOT
3	Thai TV	**3**	Thai TV
4	Spring News		
5	TNN (True)		
6	DN Broadcast		
7	Bright TV		

Source: NBTC

Table 12 shows the total auction proceeds of the four auctions as well as the value paid above the set reserve price level.

Table 12: Total auction proceeds as compared to minimum price level

Total auction proceeds in THB	
Final Bid Price	**50 862 000 000**
Reserve Price	15 190 000 000
The value above the reserve price level	35 672 000 000

Source: NBTC

For supporting the viewers to migrate to digital television the NBTC will issue a voucher for each household in Thailand. These vouchers can be used to contribute towards the purchasing price of any DVB-T2 enabled receiver.

Abbreviations

3G/4G	Third and fourth generation mobile networks
AAC	Advanced Audio Coding
ABR	Adaptive Bitrate
ACMA	Australian Communications and Media Authority
ADEX	Advertising Expenditure
API	Application Programming Interface
ATM	Asynchronous Transfer Mode
ATSC	Advanced Television Systems Committee
AVC	Advanced Video Coding
BML	Broadcast Markup Language
CAS	Conditional Access System
CDN	Content Delivery Network
CPE	Customer Premises Equipment
DAS	Digital Addressable Cable TV System
DMB	Digital Multimedia Broadcasting
DRM	Digital Rights Management
DTH	Direct To Home (satellite broadcast service)
DTTB	Digital Terrestrial Television Broadcasting
DVB	Digital Video Broadcasting
DVB-S2	Digital Video Broadcasting – Satellite, second generation
DVB-T	Digital Video Broadcasting – Terrestrial (first generation)
DVB-T2	Digital Video Broadcasting – Terrestrial, second generation
ETSI	European Telecommunications Standardization Institute
FFC	Federal Communications Commission
FTA	Free To Air
GDP	Gross Domestic Product
GPS	Global Positioning System
GUI	Graphical User Interface
HbbTV	Hybrid Broadcast Broadband television
HD	High Definition
HDTV	High Definition Television
HFC	Hybrid Fiber-Coaxial
HTML	Hypertext Markup Language
HTTP	Hyper Text Transfer Protocol
IBB	Integrated Broadband Broadcast
IDTV	Integrated Digital Television
IGMP	Internet Group Management Protocol
IMT	International Mobile Telecommunications
IP	Internet Protocol
IPTV	Internet Protocol Television
ISDB	Integrated Services Digital Broadcasting

ISDB-T mm	Integrated Services Digital Broadcasting – Terrestrial multimedia
ISDB-T sb	Integrated Services Digital Broadcasting – Terrestrial sound broadcasting
ISP	Internet Service Provider
ITU	International Telecommunication Union
iTV	Interactive Television
LCO	Local Cable Operator
LTE	Long Term Evolution
MPEG	Motion Picture Experts Group
MSO	Multi System Operator
MTV	Mobile Television (services delivered specifically over a broadcast network)
OFDM	Orthogonal Frequency Division Multiplexing
OHTV	Open Hybrid TV
OTT	Over The Top (delivery of services)
OVC	Online Video Content
PBS	Public Broadcasting Service
PDH	Plesiochronous Digital Hierarchy
PPV	Pay Per View
PSB	Public Service Broadcasting/Broadcaster
PVR	Personal Video Recorder
QAM	Quadrature Amplitude Modulation
QoE	Quality of Experience
QoS	Quality of Service
QPSK	Quadrature Phase Shift Keying
RTSP	Real Time Streaming Protocol
SBR	Standard Bit Rate
SD	Standard Definition
SDH	Synchronous Digital Hierarchy
SMS	Short Message Service
STB	Set Top Box
UHDTV	Ultra High Definition television
UHF	Ultra High Frequency
USO	Universal Service Obligation
VCR	Video Cassette Recorder
VHF	Very High Frequency
VoD	Video On Demand
xDSL	all types of Digital Subscriber Line, including: ADSL, SDSL, HDSL and VDSL
XML	Extensible Markup Language

Annex A: HbbTV deployment

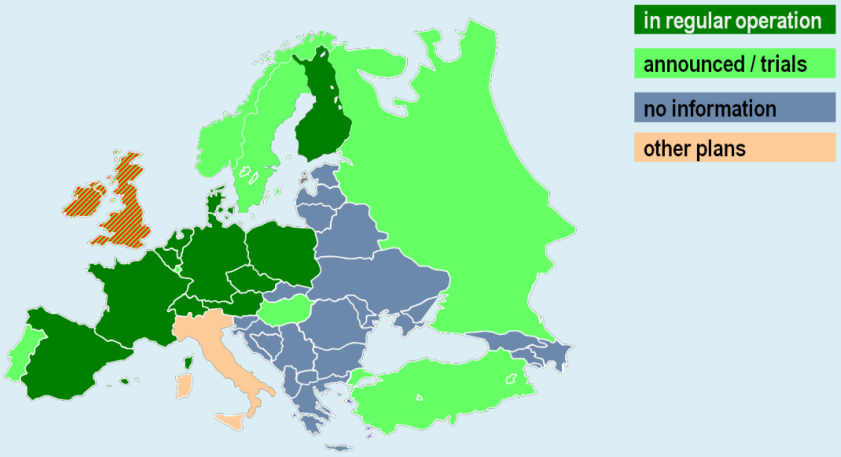
An overview of the HbbTV standard adoption has been already provided in Figure 25. This annex provides further details on:

1. HbbTV adoption details in Europe
2. HbbTV receiver types

HbbTV adoption details

An overview of the HbbTV standard adoption in Europe is provided in Figure A1.

Figure A1: HbbTV Standard adoption in Europe[100]



Source: HbbTV Association

HbbTV has been adopted by a number of countries in Europe as shown in Figure A1. Table A1 shows an overview of the HbbTV deployment status per country. The countries are sorted by deployment status and then in alphabetical order.

Table A1: HbbTV development status per country

Country	HbbTV matured	HbbTV developing	HbbTV growing
Germany	X		
France	X		
Spain	X		
Austria		X	
Poland		X	
Belgium			X
Denmark			X
Finland			X
Hungary			X

[100] The designations employed and presentation of material in this publication, including maps, do not imply the expression of any opinion whatsoever on the part of ITU concerning the legal status of any country, territory, city or area, or concerning the delimitations of its frontiers or boundaries.

Country	HbbTV matured	HbbTV developing	HbbTV growing
Netherlands			X
Czech Republic			X
Switzerland			X

Source: Global ITV

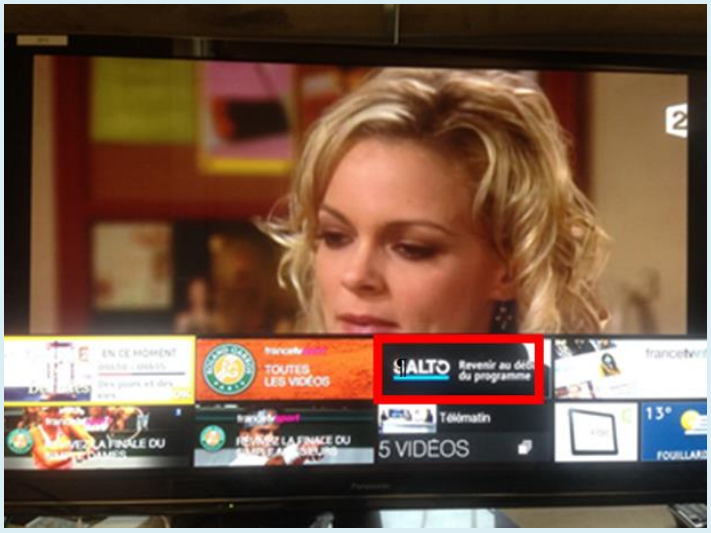
France

All HbbTV services of all the TV channels are distributed over the air (known as the TNT platform), satellite television and through all cable networks. In addition there is a test using the DVB-T network, which also provides additional services. In early 2013 there were 500 000 HbbTV capable TVs in France. The distribution per platform is DVBT/T2 69 per cent, free satellite 11 per cent, paid satellite 13 per cent satellite, cable 9 per cent and IPTV 35 per cent.

All French public channels (France Télévision – on France 2, 3, 4, 5 and France O), the pan-European culture channel Arte, and commercial broadcasters TF1, M6 and NRJ have an extensive range of HbbTV services. Most stations have an offering consisting of news, weather, sports and the electronic programme guide. The TV channel NRJ brings a variety of live radio stations in addition to catch-up TV.

The SALTO service of the public broadcaster is a "restart" function, which allows the viewer to go back to the beginning of a programme that is already running. As far the programme is not finished, this service is available even on live programs. This service has been developed and is operated by TDF. At this moment, this option is only offered at prime time. A screen shot of the SALTO service, showing the restart functionality, is included in Figure A2.

Figure A2: SALTO HbbTV service



Source: Global ITV, TDF

Germany

All HbbTV services of all TV channels are distributed via satellite television and through all cable networks. In addition, the DVB-T network (the equivalent of the Dutch Digitenne) is made suitable for HbbTV - distribution, which will also provide additional services. At this time HbbTV is available over the air in all urban areas. Deutsche Telekom is working to support HbbTV over IPTV.

According to data from market research firm GfK Retail and Technology, seven million TVs were HbbTV capable at the end of 2013. According to the industry association BITKOM nearly 60 per cent of all TVs sold in 2013 in Germany were HbbTV capable.

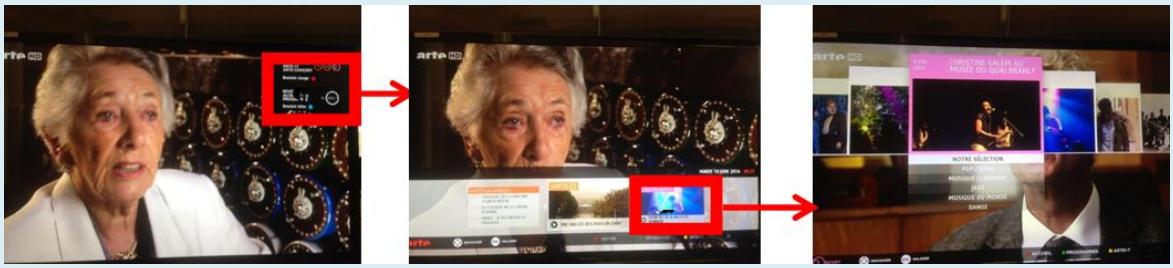
In September 2013, the German public and commercial broadcasters launched a joint campaign to bring HbbTV to the attention of the public. With the slogan "Auf ROT geht's los!". The campaign explains how HbbTV works and what the services are. The campaign includes TV spots and leaflets.

All public and most commercial broadcasters offer a range of services:

1. more than 70 active HbbTV applications;
2. delivering via satellite (Astra), Free-To-Air terrestrial and cable;
3. moving to IPTV with Cable-Kiosk package

Channel Arte is emphasizes its catch-up TV offering that allows the viewer to go back for seven days. Figure A3 shows Arte's HbbTV functionality, including Catch-Up TV, VoD and EPG.

Figure A3: ARTE HbbTV service



Source: Global TV, TDF

Channel France 5 has a daily programme called "C dans l'air" that allows viewers to communicate with the broadcaster through its HbbTV application.

TF1 shows a Twitter feed in popular programs such as The Voice. The MyTF1 VoD works according to the HbbTV 1.5 standard and uses standardized streaming and content protection systems (the same standard was agreed in The Netherlands).

AFDESI (Association for the Development of Enhanced TV Services and Interactivity) runs a pilot with the "Mes Services" TV platform, which is distributed over the digital ether network (DVB-T). Through a special barker channel, a large number of new services are tested by, *including C*adremploi.TV (job offerings), Equidia, L'Equipe, MySkreen, T-Seniority, Geste (representing the French printed press), Eco TV, France 24, Gong (animation and video games network), Groupe Altran, Groupe Casino (supermarkets), La Chaîne Météo, LifeStyle, Météonews.TV, RFI, TV5 Monde, Guide TV, PMU (gambling), Info Traffic and more.

Spain

All HbbTV services of all TV channels, public and commercial and regional are distributed through the ether (the so-called TDT platform), through satellite and through all cable networks. The terrestrial HbbTV services are jointly promoted as TDT Hibrida.

Free TV through the ether (TDT) with 98 per cent is the most popular way of viewing, with satellite (10%), cable (8%) and IPTV (5%) following.

Many broadcasters provide HbbTV services. These include the public channels of TVE and regional channels like Televisio de Catalunya, Tele Madrid, EITB, Canal Sur, Television de Galicia, Radio Television Canaria, IB3 (Balears), Lux Mallorca, Tele B and the commercial broadcasters like GolT (soccer) and Veo Television.

The public broadcaster TVE has a major offering of HbbTV services, among which an extended on-demand service, "A-la-carta". Especially for children TVE has the on-demand service "Clan a la Carta". Local and regional channels like Tele Madrid have an extended on-demand catalogue, and the soccer channel GolT offers highlights and catch-up TV of soccer games. Veo Television, a broadcaster that is owned by a publisher, offers access to content of newspapers and magazines from the publishers' other companies.

Table A2 provides the status of HbbTV deployment in other countries in the Europe region.

Table A2: HbbTV across Europe (2014)

Country	Status of deployment
Austria	ORF is running an HbbTV portal on its satellite service and a roll-out is planned in 2014 on the DVB-T2 pay TV platform.
Czech Republic	Czech public broadcaster Czech Television has developed a range of HbbTV 1.1 services including 7 years of on line TV programme archives.
Hungary	Antenna Hungaria is currently testing their first HbbTV services on Terrestrial.
Poland	TVP and Eska TV are operating a full range of HbbTV 1.1 services over DVB-T since over a year with good consumer usage.
Netherlands	Dutch broadcasters NPO and SPS have deployed HbbTV services. Main issue is access to the consumer due to limited cable access.
Scandinavia	a. The NorDig standard organization has dropped MHP and selected HbbTV 1.5. b. Public service broadcaster, DR, is running a pilot of its catch-up service on HbbTV with great success.
Switzerland	a. Radio Télévision Suisse, has launched RTS+ an HbbTV service with SuperText, catch up and dedicated offerings for people with disabilities; b. accessible over cable and satellite.

HbbTV deployment in Turkey:

a. The latest DVB-T2 receiver specification for the imminent launch of DTT services specifies HbbTV;

b. Digiturk is using HbbTV on its Satellite platform with around 1M HbbTV STBs.

HbbTV is also being adopted by several pay-TV operators in Europe, including:

1. Satellite:
    a. With embedded conditional access system (CAS);
    b. HD+ SmartTV;
    c. Fransat (France);
    d. Digiturk (Turkey).
2. Cable: KabelKiosk – replaces legacy Pay-TV middleware with HbbTV solution.
3. Telco IPTV: France IPTV operators are looking forward to supporting the popular broadcaster HbbTV services.

Other countries

HbbTV is planned to be launched in Australia on May 2014 and in Malaysia in 2015. It is also in the process of being tested in Indonesia, Myanmar, Viet Nam, Thailand and Singapore. North and South America, and Russia are considering HbbTV:

1. Australia: Freeview has announced its move from MHEG5 to HbbTV in 2014 on terrestrial and satellite.
2. USA: ATSC is actively liaising with HbbTV to use the technology as part of ATSC3.0.
3. ASEAN:
    a. Malaysia and Viet Nam have adopted HbbTV as of their DVB-T2 launches

   b. Indonesia, Singapore, and Thailand, are actively considering HbbTV for their terrestrial analogue switch off.

4. Russia:
   a. Russia Television and Broadcasting Network has announced HbbTV trials on the DVB-T2 in 2013;
   b. HbbTV is being considered by pay TV operators.
5. Africa:
   a. South Africa is launching HbbTV;
   b. The Namibia Broadcasting Corporation has announced a roll-out of DVB-T2 HbbTV service.

HbbTV receiver types

HbbTV is already embedded in both smart or connected televisions, as well as STBs.

Smart TVs

All major global TV manufacturers are shipping with HbbTV support. Many smaller manufacturers are also shipping with HbbTV support. Support may also be enabled on a per-country basis:

Germany

   a. 3.4 million HbbTV televisions sold in 2012;
   b. 90 per cent of the connected televisions are HbbTV.

France

   a. HbbTV televisions represent 55 per cent of all televisions:
   b. Starting at 350€ retail price.

Set-top-box

1. A wide range of STB manufacturers are shipping models with HbbTV support:
   a. available for satellite market in Europe with embedded conditional access system CAS;
   b. available for DVB-T2 analogue switch-off in emerging markets;
   c. limited extra cost between HD receivers and HD with HbbTV.

Annex B: IPTV standardization bodies

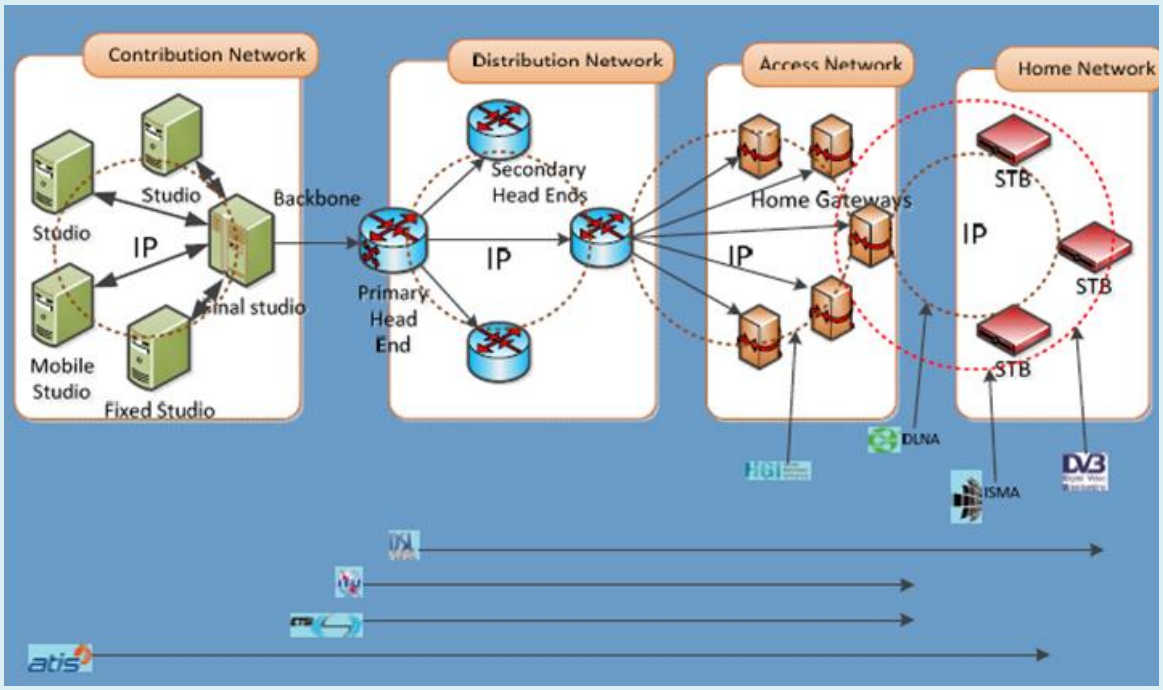
Table B1 summarizes various organizations working on the formulation of an IPTV related standard.

Table B1: Standardization bodies working on IPTV

Name	Focus	Type of organization	Primary industry
Open IPTV Forum	End to end IPTV services, including interaction and quality of service	Industry consortium	Telecom
ITU-T	IPTV focus group	Formal standardization organization	Telecom
ARSI	IPTV based on IMS and referencing relevant standards for the transport layer	Formal standardization organization	Telecom
ATIS	IPTV for cable television providers	Membership organization	Cable-TV
SCTE	Technologies related to digital cable television	Industry association	Cable-TV
DVB Forum	IPTV and interactive television, primarily for broadcasters	Industry consortium	Broadcasting

Figure B1 shows different areas of the IPTV value chain that are under study and focus of IPTV standardization. The bodies that are involved include DLNA (Digital Living Network Alliance), HGI (The Home Gateway Initiative), ISMA (The Internet Streaming Media Alliance), ETSI and ATIS (Alliance for Telecommunications Industry Solutions).

Figure B1: Overview of IPTV related activities



Source: ITU

In Figure B1 the following abbreviations are used:

- DLNA (Digital Living Network Alliance) for the home network;
- HGI (The Home Gateway Initiative) for the standards surrounding the residential gateway between the broadband connection and the in-home network;
- ISMA (The Internet Streaming Media Alliance) for the transmission of AVC video over IP;
- DSL Forum for the standards surrounding DSL and remote management of in-home devices including STBs and residential gateways;
- ITU (International Telecommunication Union) in which, the IPTV focus group is standardizing the distribution and access network architecture;
- ETSI (European Telecommunications Standardization Institute) in which, the NGN initiative is standardizing the IP network carrying the IPTV;
- ATIS (Alliance for Telecommunications Industry Solutions) in which, the ATIS IPTV interoperability Forum (ATIS-IIF) is standardizing the end-to-end IPTV architecture including contribution and distribution.

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