Deliverable 8.2 First market analysis

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10.10.2012

Work Package 8: Markets, Business Models and Exploitation Strategies

LinkedTV

Television Linked To The Web

Integrated Project (IP)

FP7-ICT-2011-7. Information and Communication Technologies

Grant Agreement Number 287911

Dissemination level[1]	PU
Contractual date of delivery	30th September 2012
Actual date of delivery	10.10.2012
Deliverable number	D8.2
Deliverable name	First market analysis
File	LinkedTV_D8.2.docx
Nature	Report
Status & version	Final version
Number of pages	68
WP contributing to the deliverable	WP 8
Task responsible	Universitat St Gallen
Other contributors	All project partners
Author(s)	Katarina Stanoevska-Slabeva, Jana Ebermann, Thomas Plotkowiak / University St. Gallen
Reviewer	*Sven Glaser, RBB*
EC Project Officer	Thomas Kuepper
Keywords	Market analysis
Abstract (for dissemination)	This deliverable provides an overview of a first market analysis of the IPTV market. It points out possible customers, competitors and the differences between LinkedTV and their competitive firms.

[1] • PU = Public
• PP = Restricted to other programme participants (including the Commission Services)
• RE = Restricted to a group specified by the consortium (including the Commission Services)
• CO = Confidential, only for members of the consortium (including the Commission Services))

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1 Introduction

This Deliverable summarizes the chances, strengths, weaknesses and risks of LinkedTV regarding its competitors. The first market analysis mainly consists of a market classification or segmentation to identify and classify the relevant market.

1.1 History of the document

Table 1: History of the document

Date	Version	Name	Comment
05.04.2012	V0	Stanoevska-Slabeba, Plotkowiak, Ebermann, Universitaet St. Gallen	Bulletpoints for first market analysis
20.04.2012	V0.1	Stanoevska-Slabeva, Plotkowiak, Ebermann, Universitaet St. Gallen	Market overview
15.05.2012	V0.2	Stanoevska-Slabeva, Plotkowiak, Ebermann, Universitaet St. Gallen	Definitions, Players, Trends
30.06.2012	V0.3	Stanoevska-Slabeva, Plotkowiak, Ebermann, Universitaet St. Gallen	Competitor Analysis
05.08.2012	V0.4	Stanoevska-Slabeva, Plotkowiak, Ebermann, Universitaet St. Gallen	Summary of results
03.09.2012	V0.5	Stanoevska-Slabeva, Plotkowiak, Ebermann, Universitaet St. Gallen	Finalized Deliverable 8.2: Formatting, text finalization in all chapters
18.09.2012		Lyndon Nixon, STI	Review of the deliverable
21.09.2012	V0.6	Stanoevska-Slabeva, Plotkowiak, Ebermann, Universitaet St. Gallen	Corrections based on 1st review
28.09.2012		Sven Glaser, RBB	Review of the deliverable
08.10.2012	V0.7	Stanoevska-Slabeva, Plotkowiak, Ebermann, Universitaet St. Gallen	Final version adjusted for review and ready for submission
09.10.2012		Martha Merzbach, Frauhofer	Final review
10.10.2012	V1	Stanoevska-Slabeva, Plotkowiak, Ebermann, Universitaet St. Gallen	Final version with corrections based on Martha's comments. Final version ready for submission

1.2 Purpose of the Document

The goal of this first market analysis is to explore how IPTV market has changed. What are the main competitors and their offered functions? Since LinkedTV is part of the IPTV ecosystem due to its infrastructure, delivery and consumption through IP networks, we analyzed the characteristics that set LinkedTV apart from the remaining market sectors and competitors and compared each function to the competitors.

1.3 Abbreviations

Table 2: Abbreviations

Abbreviation	Explanation
IPTV	Internet Protocol television (IPTV) is a system through which television services are delivered using the Internet protocol suite over a packet-switched network such as the Internet, instead of being delivered through traditional terrestrial, satellite signal, and cable television formats.
iTV	Interactive television describes a number of techniques that allow viewers to interact with television content as they view it.
Hybrid TV	Can show digital TV content from a number of different sources including traditional broadcast TV, internet, and connected devices in the home
HBB TV	Is both an industry standard and promotional initiative for hybrid digital TV to harmonize the broadcast, IPTV, and broadband delivery of entertainment to the end consumer through connected TVs (Smart TVs) and set-top boxes.
OTT TV	In the fields of broadcasting and content delivery, over-the-top content (OTT) means on-line delivery of video and audio without the Internet service provider (Comcast, Verizon, etc.) being involved in the control or distribution of the content itself
STB	Set Top Boxes is an information appliance device that generally contains a tuner and connects to a television set and an external source of signal, turning the source signal into content in a form that can then be displayed on the television screen or other display device.
DVR	Digital Video Recording
SmartTV	Smart TV, which is also sometimes referred to as "Connected TV" or "Hybrid TV", (not to be confused with IPTV, Internet TV, or with Web TV), is the phrase used to describe the current trend of integration of the internet and Web 2.0 features into modern television sets and set-top boxes, as well as the technological convergence between computers and these television sets / set-top boxes.
Advanced TV	Advanced television is an umbrella term used to describe an array of features enabled by digital technology that significantly change analog television as it has come to be known during the 20th century.
ETSI MCD	The European Telecommunications Standards Institute (ETSI) is an independent, non-profit, standardization organization in the telecommunications industry (equipment makers and network operators) in Europe, with worldwide projection.
EBU	The European Broadcasting Union (EBU; French: Union européenne de radio-télévision (UER)) is a confederation of 85 broadcasting organisations from 56 countries, and 37 associate broadcasters from a further 22.

Abbreviation	Explanation
EBIF	Enhanced TV Binary Interchange Format (EBIF) is a multimedia content format defined by a specification developed under the OpenCable project of CableLabs (Cable Television Laboratories, Inc.).
TRU2WAY	Tru2way is a brand name for interactive digital cable services delivered over the cable video network, for example interactive program guides, interactive ads, games, chat, web browsing, and t-commerce.
WTVML	WTVML is an XML based content format designed to allow web site operators to easily develop and deploy Interactive TV services, typically it reduces the time taken for web site operators to create a TV Site, and results in the Site being deployable on a larger number of devices, and is capable of being automatically validated, tested and transformed.
WAP-TV	WapTV was the name given to the company which originated the WTVML (Worldwide TV Mark-up Language) as a content format for the delivery of Interactive TV applications using Internet Servers. The system is an Interactive television technology platform comprising a microbrowser, a markup language, and a significant collection of associated software tools and services.
CE-HTML	CE-HTML is a language for creating user interface pages for Consumer Electronics (CE) devices such as televisions. These CE-HTML pages are typically placed online and are based on a 10-foot user interface for easy control from a distance.
DVB MHP	Multimedia Home Platform (DVB-MHP) is an open middleware system standard designed by the DVB project for interactive digital television.
MHEG-5	MHEG-5, or ISO/IEC 13522-5, is part of a set of international standards relating to the presentation of multimedia information, standardized by the Multimedia and Hypermedia Experts Group (MHEG).
BML	Broadcast Markup Language, or BML, is an XML-based standard developed by Japanese ARIB association as a data broadcasting specification for digital television broadcasting.
ATSC standards	Are a set of standards developed by the Advanced Television Systems Committee for digital television transmission over terrestrial, cable, and satellite networks.

2 Market Overview

The market overview provides a summary of the changing TV market with a focus on IPTV. The results reflect dynamics and segmentation of the IPTV players. This analysis helps to define special segments that will be analyzed in the following chapters.

2.1 Evolution of TV

With the economic changes from the service based economy to an experience based economy (Pine & Gilmore, 1999) the expectations and challenges vary as well. The scope is no longer to provide a preferably efficient digitalized television but rather to create experiences by “personalization, social TV, interactive narratives and ambient technology”(Cesar & Chorianopoulos, 2009).

Therfore the TV segment had to change from the analog via the digital through to the interactive TV in the internet. Quayle (Quayle, 2010) points out the key trends of TV evolution. He presents a differentiated point of view regarding its consumption, access, service and funding trends, as well as the main power bases (compare Table 3: Evolution of TVTable 3).

Table 3: Evolution of TV

	Phase 1: Analog TV	**Phase 2: Digital TV**	**Phase 3: Internet TV**
Consumption	Live, on the TV set	Themed channels, time shifted TV	Anytime, anywhere, any device
Access	Broadcast Network TV channel gatekeeper	Pay TV networks Multichannel Providers	PayTV network bypassed, direct channel/content owner relationship
Service	Broadcast TV	Multichannel TV, time shifted TV, VoD	Personal TV, Social TV
Funding	Public, Advertising	Subscription, Advertising	Program purchase, Advertising
Power bases	Content Owners, Broadcast channels	Content owners, Broadcast/cable channels, Pay-Tv networks	Content Owners, Device manufacturers, Search engines, Social networks

The analyses (Kishore, 2009) of 17 IPTV technology suppliers and case studies of 5 network operators support the mentioned trends of Table 3 and will be discussed now in detail in the following chapters. The evolution of IPTV itself can be structured according to three different phases. From 2000 till 2005 companies were working on basic deployments like HD, limited VOD libraries or basic channel selection features. Following these pioneering developments then from 2006-2009 the resulting products were expanded successively. Libraries were extended with more channels, premium packages, HD channels and VOD titles. New applications were installed that allowed multi-room DVRs or PC-TV connectivity. Furthermore new interactive screens and content portals, limited online content on TV or more VOD functionalities were made available. The following and so far most current phase started in the year 2010. Partly already implemented, partly a work in progress - suppliers and network operators are realizing the high expectations regarding IPTV (compare expectations of Internet TV or Interactive TV in Figure 1). The most notable of such expectations are:

- 100s of HD channels,
- 10000s of VOD titles,
- The ability to seamlessly broadcast available material across multiple screens
- Robust multi-screen advertising business
- Personalized user interface supported by recommendation engine
- Internet video on TV and PC-TV connectivity for personal and other content

It is not by surprise that the myriads of upcoming technologies are finding their way into the sector of IPTV (in this case we do not refer to IPTV as of the „classic“ definition given by the ITU (IPTV, 2005) which covers e.g. QoS aspects or the “T-“ services) as it serves as a melting pot of a number of potential technologies, as can be seen in the Gartner cycle in Figure 1.

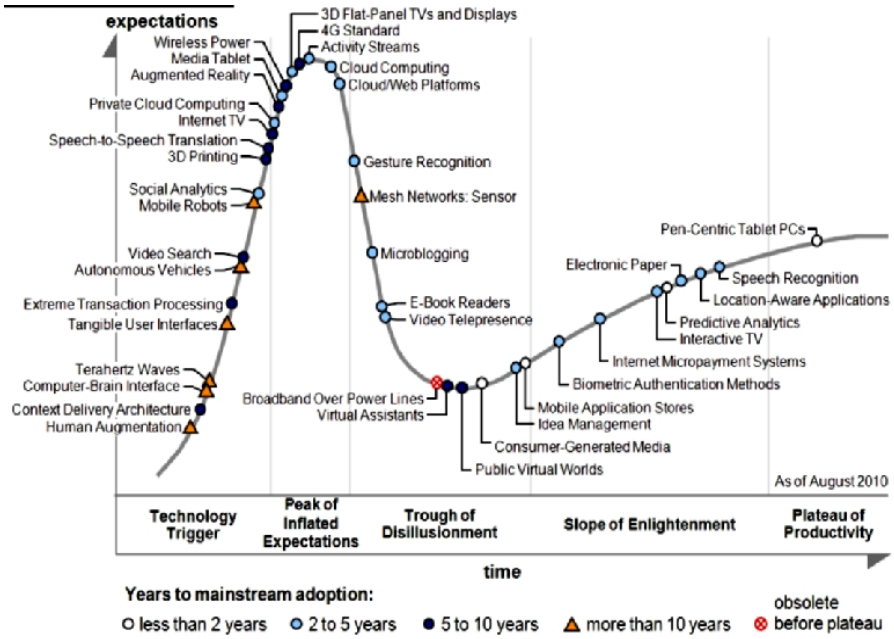

Figure 1: Gartner's Hype Cycle 2010 (Fenn & Lehong, 2011)

This overview gives a first summary about relevant market segments and trends, which will be analyzed more detailed in chapter 2.3. We see that IPTV across different phases of the cycle as certain technologies such as context delivery architectures (CDN), video search or Internet TV can be found to be before the peak of expectations, while other core IPTV technologies such as Interactive TV seem to be on their way to the plateau of productivity. Supporting technologies such as cloud computing, or could platforms are already past the valley of disillusionment. Therefore IPTV as the sum of these technologies is indeed creating a very vibrant melting pot.

2.2 Volume and Growth of the IPTV market

The TV market (shown in chapter 2.1) is undergoing a dramatic change with the introduction of IPTV driving a higher customer demand. At this point we would like only to present representable key facets, in order to reduce the volume of the deliverable.

Globally the number of IPTV subscribers was expected to grow from 28 million in 2009 to 83 million in 2013 and the overall revenue will grow from US$9.7 billion in 2009 to US$25.6 billion in 2013. Similarly the installed STBs with Hybrid OTT will increase globally (compare Figure 2).

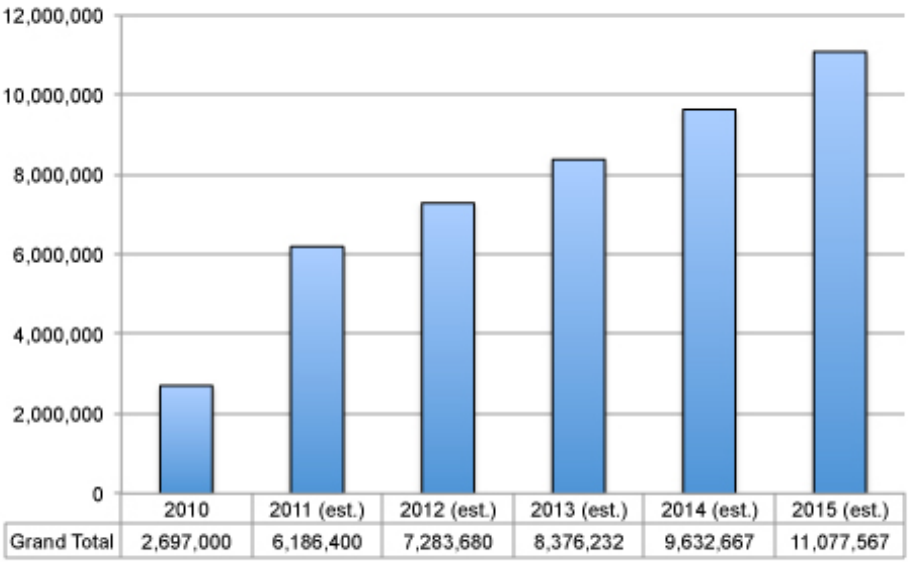

Figure 2: Global Hybrid OTT Installed STBs (compare Mrgco.com)

Europe and Asia are the leading territories in terms of the over-all number of subscribers. Europe will remain 35 million subscribers in 2013 and Asia 27 million subscribers (compare percentage of total worldwide IPTV subscriber in Figure 3).

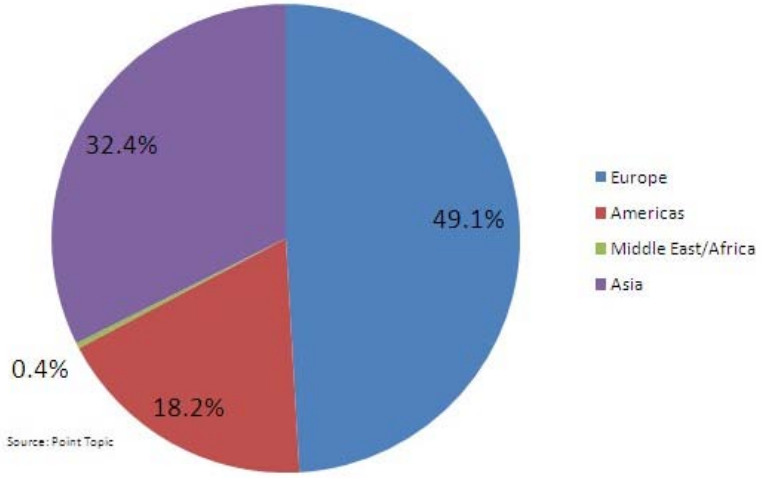

Figure 3: IPTV Subscribers by region (compare digitaltvnews.net)

685 companies worldwide were identified as deploying IPTV services[2]. The top ten IPTV countries in 2010 were France, China, USA, South Korea, Japan, Germany, Belgium, Spain and Italy.

The European leading markets operators for IPTV from 2010[3] are listed in Table 4 below.

[2] www.iptvmagazine.com

[3] www.comparebusinessproducts.com

Table 4: Top European IPTV Provider

Country	Provider
Germany	Deutsche Telekom
Belgium	Belgacom
France	Orange TV
Italia	Telecom Italia
UK	British Telecom
Spain	Telefonica
Switzerland	Swisscom

As we can see the main providers are not unknown, and show the significance of this market. The players originate mostly from a network operator environment, following their goal to use their infrastructure to diversify their product portfolio. The linkage between different market players can actually be quite intense as the next chapter will show.

2.3 Players in the IPTV Market

This section provides a short introduction on the players that form the IPTV Ecosystem. Following the IPTV value chain several players are included: First of all we see that Service-/ and Content-Providers are closely connected to the Platform-Providers. The producers of the End-Devices as well as the providers of Infrastructure (e.g. network Providers) play a key role in the value chain (Working Group: IPTV, 2009). The linkage between the players found in Figure 4 shows that there are no isolated players in this market. Providers are dependent of the basic networks while those in turn are dependent on the infrastructure providers. Everybody in this ecosystem is to some extent either dependent or collaborating with advertisers in from of agencies, media buyers and brands.

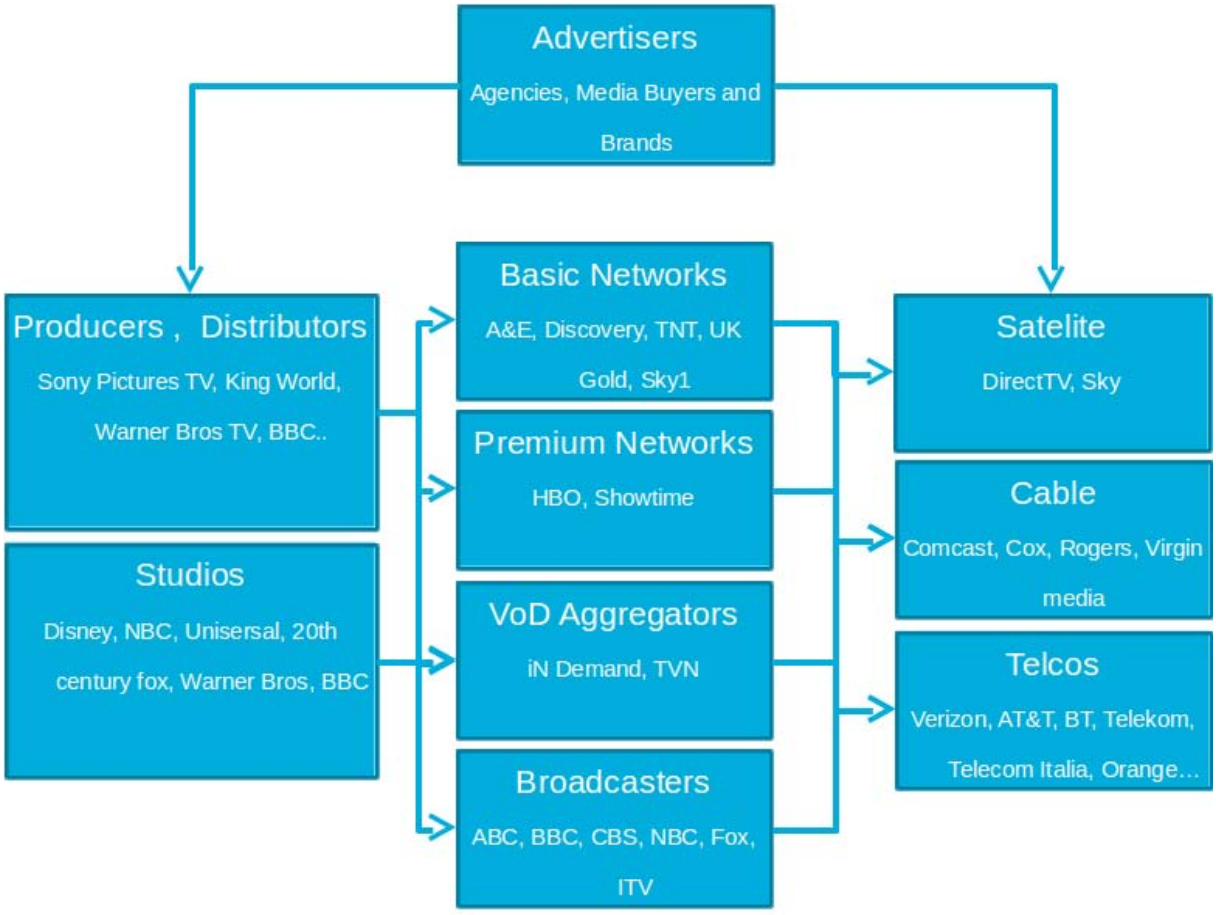

Figure 4: TV Ecosystem (Quayle, 2010)

As we can see in Figure 5 above, the mentioned areas are not selective but rather overlapping. By studying the overlapping areas we can identify further sections of the IPTV market. Focusing on the broadcast sector, we find delivery mechanisms like Satellite, Cable and Terrestrial. Telco IPTV companies are mainly providing network-centric solutions, whereas OTT or Internet TV sections are provided by network agnostic players. The overlap of broadcast and network centric players reveals the area of hybrid Telco, hybrid cable or hybrid satellite solutions. Examples for those combinations are BT Vision (Hybrid Telco), Verizon FiOS (Hybrid Cable) and Orange TV (Hybrid Satellite). The intersection between broadcasters and network agnostic providers is often referred to as the HBI TV category: Terrestrial/Satellite + OTT examples include Canal+ Le Cube, INUK, or TI's CuboVision. The final intersection between network-centric and network-agnostic shows, that although technically feasible, this business area is not (yet) a focus of any business model (Quayle, 2010).

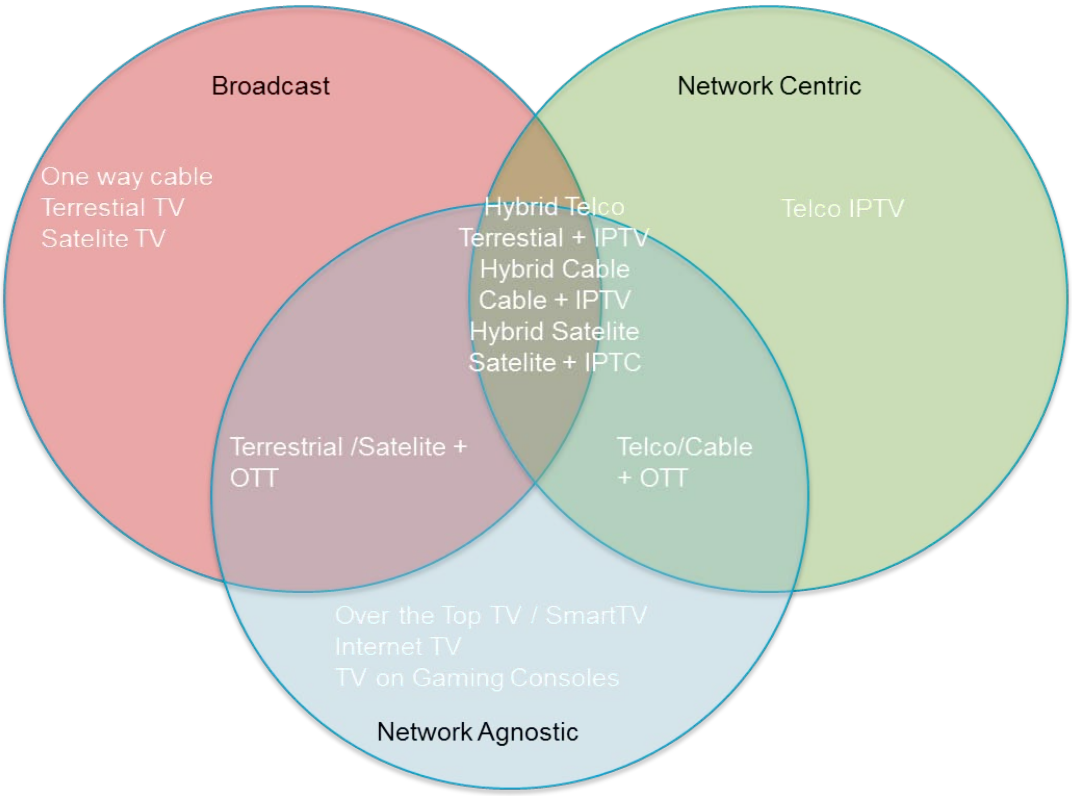

Figure 5: Mapping the Hybrid TV Landscape

3 Definitions Players and Trends

After reviewing the general three forces of broadcasters, network centric operators and network agnostic players, the resulting markets of IPTV can further be subdivided, as shown in Figure 6 below. This shows how the different technologies and umbrella terms can be organized logically, forming a framework which will help us to segment and analyze the market, and highlight which potential markets can be targeted by LinkedTV.

Areas in grey will not be focused on in this document because they are outside the scope of LinkedTV. This includes a detailed overview over the IPTV and advanced TV market. Instead the areas that this document will focus on will be the terms in blue: These are the areas which can be referred to as Interactive TV, VoD solutions and Internet TV. A special focus will be paid to providers from the SmartTV sector and specialized video overlay providers from the InternetTV sector. As part of the market overview the role of organizations and standards will be briefly discussed. Finally among the emerging trends we will highlight the role of social TV and the second screen paradigm. Both trend areas will be explored, since their developments are related to the focus of LinkedTV. The trends of 3D-TV and HD-TV will not be discussed.

As we can already see in the overview, the focus of the project goals pursued at the LinkedTV project is at the heart of the IPTV market. It is briefly coupled to the area of SmartTV but also covers aspects of InternetTV and common VoD markets. The next chapters will also briefly re-introduce LinkedTV's goals and features and then provide a comparison of LinkedTV with the established and prominent players in the blue market areas.

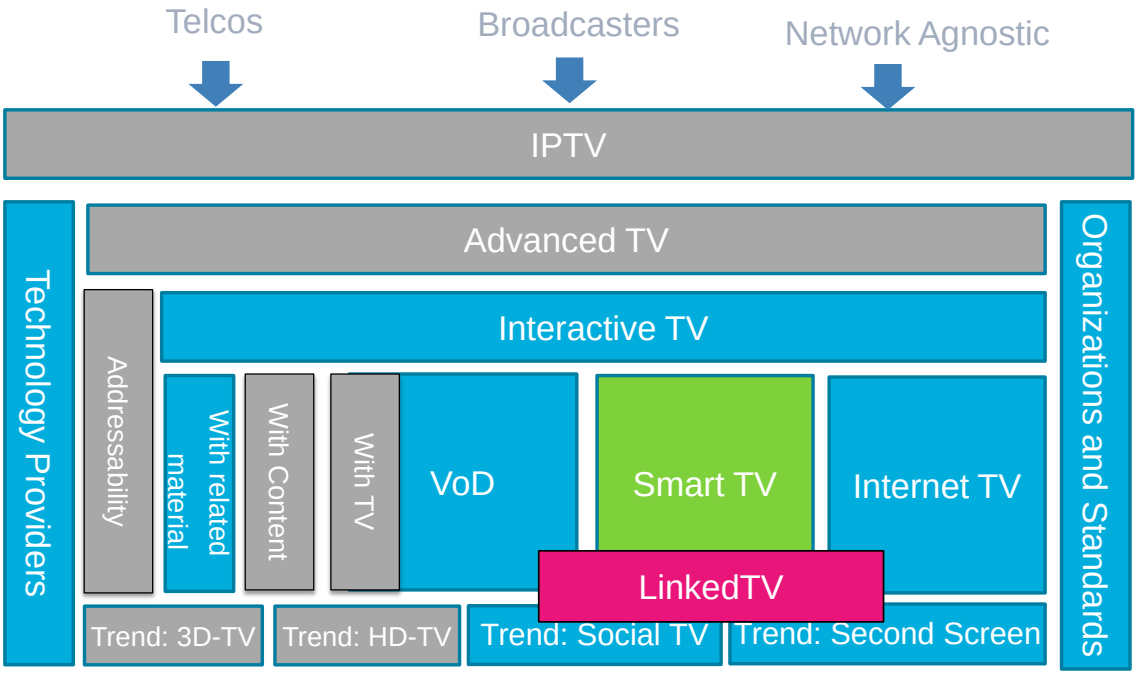

Figure 6: Overview of the different IPTV sub market segmentation

3.1 Organizations

First of all we find that there are a number of organizations which are very active in the IPTV sector, seeking to harmonize the efforts in this industry. As we can see in the listing below the organizations are rooted both on a European and world wide level.

- Open IPTV Forum http://www.oipf.tv/
- ETSI MCD http://www.etsi.org/WebSite/homepage.aspx
- EBU (European Broadcast union) http://www.ebu.ch/·
- ATIF IIF (IP-TV Interoperability Forum) http://www.atis.org/IIF/
- Broadband Forum http://www.broadband-forum.org/
- OEDN http://en.wikipedia.org/wiki/OEDN
- OpenCable http://en.wikipedia.org/wiki/OpenCable
- Beet TV http://www.beet.tv/
- International Television Experts Group http://www.international-television.org/
- DLNA (Digital Network Living Alliance) http://www.dlna.org/
- IETF (Internet Engineering Taskforce) http://www.ietf.org/
- ISMA (Internet Streaming Media Alliance) http://www.isma.org/
- ISO-IEC MPEG http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=31537
- MPAA Motion Picture Association of America http://www.mpaa.org/
- ITU-T (International Telecommunication Union) http://www.itu.int/ITU-T/

Most organizations put great emphasis on the use of open standards. The widespread use of open standards (such as MPEG-2, DAB, DVB, etc.) is prompted in order to ensure interoperability between products from different vendors, as well as facilitating the exchange of programme material between the organizations members. The resulting "horizontal markets" form a benefit both for the industry and the consumers.

3.2 Standards

Along with the organizations we find that a lot of standardization efforts are contributing to a homogenization of the IPTV market. The most notable are:

- HbbTV http://www.HbbTV.org/
- CE-HTML http://en.wikipedia.org/wiki/CE-HTML
- MHEG-5 http://en.wikipedia.org/wiki/MHEG-5
- EBIF Enhanced TV binary Interchange format http://www.ebif.tv/
- TRU2WAY http://www.tru2way.com/
- WTVML http://en.wikipedia.org/wiki/WTVML

- WAP-TV http://en.wikipedia.org/wiki/WapTV
- DVB-MHP http://www.mhp.org/ (http://en.wikipedia.org/wiki/Globally_Executable_MHP)
- ATSC http://en.wikipedia.org/wiki/Advanced_Television_Systems_Committee_standards
- Broadcast Markup Language http://en.wikipedia.org/wiki/Broadcast_Markup_Language
- OCAP http://en.wikipedia.org/wiki/OpenCable_Application_Platform

Due to the proximity of the offered features and delivery infrastructure of LinkedTV, this document will focus on the standardization efforts and the details of the HbbTV standard, as part of the SmartTV overview, where it plays an important role. While the other standards are to some extend part of each other, and while the role of some standards has been diminished or is now obsolete (e.g. WAP-TV) it is important to note that the competing standards in this sectors can make or break a product, as will be outlined in the SmartTV chapter.

3.3 IPTV

Referring to Figure 6 we see that all submarkets are unified by the term IPTV. IPTV in this document serves as a unifying term; it is defined as the secure and reliable delivery to subscribers of entertainment video and related services. These 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 a superior entertainment experience, resulting in a compelling business environment for content providers, advertisers and customers alike. Although this document does not focus on the developments and the general market of IPTV we have already outlined the organizations and standards that are leading to consolidation process, where a number highly competitive players are competing for a dominant role. These players will be discussed later as part of the overview of the interactive TV segment.

3.4 Advanced TV

Studying the term IPTV we often find the term of "advanced television" which was first used at the MIT Media Lab in the early 1990s. Development surrounding this term, already outlined how the development of high definition television was only an early step in the foreseeable enhancements to the medium. This umbrella term provides a clearer definition of how the IPTV sector can be segmented according to certain behavioral dimensions and features. These are

- **Time shifting:** allows the audience to control when content will be seen (Video on Demand (VoD), digital video receiver (DVR))- This area will be later discussed in detail under the VoD premise.
- **Addressability** allows e.g. advertisers to direct messages to subsets of the audience; the audience can also self-select (address to self) the content and commercial messages they receive. The details of the market resulting from this feature (e.g. targeted advertising on TV) will not be discussed in this document.
- **Interactivity** empowers the audience to respond to or bypass content. The term interactivity will be discussed in the chapter on interactive TV and will be then divided into interactivity with the TV set (e.g. adjust volume) related content (e.g. dial in), and interactivity with related material (e.g. recommended TV shows), of which only the later term will be discussed.
- **Interoperability** means that the same program and commercial content viewed using a television receiver can cross platforms and be viewed across a multiplicity of platforms/appliances. The implications of this paradigm will be discussed under the scope emerging trends in the market, in particular the paradigm of second screen.

3.5 Interactive Television

Interactive television (generally known as ITV or iTV) describes a number of techniques that allow viewers to interact with television content as they view it. Interactive television represents a continuum from low (TV on/off, volume, changing channels) to moderate interactivity (simple movies on demand without player controls) and high interactivity in which, for example, an audience member affects the program being watched (E.g. voting). As mentioned above the differentiation into three types of interaction helps to distinguish which kind of products are interesting to review, with a focus on LinkedTV:

- The first is the interactivity with **TV program content (**e.g. Big Brother, Hugo, clap-o-meter via phone). The most notable products here are the Yahoo7 Fango mobile app[4] which is the result of the cooperation of Yahoo with the Fango network (a demonstration can be seen on YouTube[5]). Since LinkedTV doesn't offer any features that foster the interaction of viewers with the TV program content, this market will not be further reviewed.
- The second type of interaction, is the **interaction with the TV set (**e.g. VoD, pause, rewind, time-shift). The products and players in this marked will be reviewed below and will also be part of the SmartTV sector overview.
- The third and most important type of interactivity, in regard to LinkedTV, is the **interaction with TV-related content**: This means getting more information about what is on the TV, weather, sports, movies, news, or the like (also called web-

[4] http://au.fango.yahoo.com/

[5] http://www.youtube.com/watch?v=od0S6vi7qDw

enhanced TV). The market overview will focus on players and vendors in this segment.

Tightly related to the term interactive TV is also the term **“Hybrid TV”** or "**Enhanced TV**“. Although it has to be noted that the later term is rather outdated and had its main use in the nineties, as part of the pioneering work of first vendors. All three terms (interactive TV, hybrid TV and enhanced TV) will from here on be generalized under the umbrella term of interactive television or ITV. The second dimension in regard the distinction of ITV can be found in terms of **how** the interaction with the material takes place. Here two developments are noteworthy, since they will also play a role assessing LinkedTV’s market potential:

- There is an ongoing discussion on lean forward vs. lean back interaction (which is often referred to as a 10 foot rule), that describes the paradigm that TV content should be accessible from the TV sofa hence being readable from 10 feet.
- The almost controversial perspective on the 10 foot rule is the emerging discussion on one-screen vs. multi screens: Many think of interactive TV primarily in terms of "one-screen" forms that involve interaction on the TV screen, using the remote control, but the second screen paradigm covers emerging products that make use of a two-screen solution. These products will briefly be discussed under the trends section.

After introducing the term interactive TV the document will now provide an overview aligned according to the three main forces in the market (network operators, broadcasters and network agnostic providers) that have been introduced in the first chapter and show their efforts and products in the interactive TV market .

3.5.1 Network operators implementing interactive TV

A number of network operators are already implementing interactive TV solutions. Among those the main players in Europe have been listed below (Important non-European providers have also been listed selectively).

- **Germany**
  - Deutsche Telekom T-Entertain http://de.wikipedia.org/wiki/Telekom_Entertain
  - Hansenet AliceTV (deprecated) http://de.wikipedia.org/wiki/HanseNet
  - Kabel Deutschland Select Video
  - Telekom Austria http://de.wikipedia.org/wiki/AonTV
  - VoDafone VoDafone Videothek[6]

[6] http://de.wikipedia.org/wiki/Vodafone_Videothek

- **UK**
  - BT Vision http://en.wikipedia.org/wiki/Bt_vision
  - Virgin TV http://en.wikipedia.org/wiki/Virgin_TV
- **Switzerland**
  - Swisscom Switzerland http://de.wikipedia.org/wiki/Bluewin
  - UPC Cablecom http://de.wikipedia.org/wiki/Upc_cablecom
- **Portugal**
  - Telekom Portugal MEO http://en.wikipedia.org/wiki/Meo_(Portugal)
- **Italy**
  - Telecom ITALIA OTT TV Curbo Vision http://it.wikipedia.org/wiki/Cubovision
- **Sweden**
  - ComHEM http://en.wikipedia.org/wiki/Comhem
- **Non-Europe**
  - Telecom NewZeland TIVO http://www.telecom.co.nz/tv
  - Verizon Fios http://en.wikipedia.org/wiki/Verizon_FiOS
  - AT&T Multiview http://www.att.com/u-verse/explore/feature-landing.jsp

It becomes obvious that almost all major network operators in each country are seeking to use their infrastructure, to escape their role of being merely an infrastructure provider. The main leader in the German market T-Entertain was one of the first providers which offered triple[7] play solutions, which included internet, telephone and TV. From a network operator perspective this strategy has been followed by the majority of networks operators because it lessens the urge for customers to switch to different companies for different products (e.g. TV cable). We also see a similar strategy being performed by TV cable operators who are also now using their infrastructure to provide similar services (e.g. KabelBW). For the IPTV market this guarantees the network operators a very strong position, since they are the ones controlling the bandwidth available to a consumer and can now offer tailored IPTV products that make use of their technology. In regard to the interactive features of OTT boxes provided by network operators, this means offering higher quality and a bigger variety of services. Additionally, T-Entertain is among the first early adaptors integrating their own recommender systems into their own OTT boxes, as shown in Figure 7 below.

[7] http://en.wikipedia.org/wiki/Triple_play_(telecommunications)

Figure 7: T-Entertain internal rating system

Finally from a marketing perspective having a full access to the behavioral data from their own OTT boxes, they are able to track the user's behavior and see to which advertisements they react, and match those with the data available from the user's internet surf behavior. Therefore, the very near future [8] might look like this: If a user searched for a certain car brand during lunch, he will see the matching advertisement on TV in the evening. On the other hand although currently the network operators are already offering interactive TV solutions, they are still coping to find interactive TV products which offer a "killer feature" for their new high speed fiber networks. One of their hopes lays in new generation interactive TV solutions that make use of the new available bandwidth, which might drive the adaption of high speed fiber networks.

3.5.2 Network agnostic companies implementing interactive TV

Although being a network operator is beneficial in providing interactive TV solutions, with the wide access to internet and the premise of IPTV being agnostic to the underlying medium, the second main competitors are network agnostic companies, which are implementing their own interactive TV solution. These solutions can be distinguished according to the provided platform and the amount of integration with present hardware.

- **PVRs or HTPCs**
  - XBMC http://en.wikipedia.org/wiki/XBMC
  - Plex http://en.wikipedia.org/wiki/Plexapp
  - VoDdler http://en.wikipedia.org/wiki/VoDdler
  - Myth TV http://en.wikipedia.org/wiki/MythTV
  - Windows Media Center http://en.wikipedia.org/wiki/Windows_Media_Center

[8] http://www.smartclip.com/data/files/V05_smartclip_Multiscreen_Study.pdf

    - Also see comparison of PVRs http://en.wikipedia.org/wiki/Comparison_of_PVR_software_packages
- **OTT based**
    - AppleTV http://en.wikipedia.org/wiki/Appletv
    - Tivo http://en.wikipedia.org/wiki/TiVo
    - Boxee http://en.wikipedia.org/wiki/Boxee
    - Wallmart VUDU http://en.wikipedia.org/wiki/Vudu
    - Lodgenet Interactive http://en.wikipedia.org/wiki/Lodgenet_Interactive
    - Sezmi http://en.wikipedia.org/wiki/Sezmi
    - [Slingbox http://en.wikipedia.org/wiki/Slingbox- rebroadcasting]
- **Discontinued OTT**
    - ReplayTV http://en.wikipedia.org/wiki/ReplayTV
    - Ultimate TV http://en.wikipedia.org/wiki/Microsoft_TV
    - MSN TV http://en.wikipedia.org/wiki/MSN_TV
    - AOL TV http://en.wikipedia.org/wiki/AOL_TV
- **Middleware**
    - See SmartTV
- **Platforms**
    - Activision CloudTV e.g. Youtube link[9]

The main network agnostic providers are offering products that can be generalized as personal video recorder solutions or home theatre solutions. Although these products offer interactive TV features (such as time shifting, recommendations and others), these products work on the premise of an underlying linear TV programme. The second big area are vendors which are creating their own over the top boxes (OTT) which only need an internet access and are thus agnostic to the network operator of the customer. The most prominent among these solutions are AppleTV and the Tivo solution, which were both great success in the US.

[9] http://www.youtube.com/watch?v=NjvBi-uy7A4&list=UU5eMuOGd-L_RP-g0NrvtZnQ&index=4&feature=plcp

Figure 8: an interactive display of a baseball match on the apple TV device

As we can see in Figure 8, sophisticated OTT solutions already offer some very interesting interactive functions, which allow the user to obtain additional information for a running TV programme (i.e. a baseball game). The Tivo Solution excels at recommending TV shows for a user, based on this current profile, and combines this recommendation with the VoD features. Other vendors such as the Boxee OTT focus stronger on the integration of social features with the TV programme. In all cases the OTT boxes are streamlined to offer the best user experience and are mostly based on the 10 foot paradigm. In this area there are also a number of vendors which have discontinued their OTT efforts in the interactive TV sectors. These are players that mainly have attempted to pioneer this sector in the early nineties. Finally, we find that there is only one provider that actually provides a network agnostic and OTT agnostic platform solution. The CloudTV provider offers an open applications platform developed for the authoring, deployment and distribution of television apps from the network cloud to video products such as televisions, set-top boxes and portable devices. The OTT box, in turn, passes keyclicks from standard remote controls to the cloud, allowing for very slim OTT boxes, where the main logic is handled in the cloud and the box is only used to display the content. The last product quite well dramatizes the extent of developments in this area: While at the beginning network agnostic boxes were revolutionary since they offered a new way to consume TV content (as in the case of e.g. TIVO, PVRs or HTPCs), the second generation of OTT boxes completely bypassed the TV as a source of viewable material (e.g. AppleTV). The last product in the form of CloudTV degrades the OTT box to merely a TV-adapter which connects to a solution where recommendation, time shifting, or live-TV is fully taking place in the cloud.

3.5.3 Broadcasters implementing interactive TV

The third groups of competitors in the interactive TV are the group of the broadcasters that are driving the innovation and product development in the interactive TV sector. Their main goal is to find a direct way to connect to the consumer, bypassing third party OTT providers, and offering their own OTT solutions. Selected Broadcasters with own OTT solutions are

- Canal + http://en.wikipedia.org/wiki/Canal%2B
- Sky http://en.wikipedia.org/wiki/BSkyB former Premiere (discontinued)
- Project Youview http://en.wikipedia.org/wiki/Project_Canvas

Yet up to today in most cases broadcasters do not provide their own OTT, but provide an own VoD solution on their website, which will be described below. The Project Youview is notable among the listed providers since it is a partnership between four broadcasters (BBC, Channel 4, Channel 5 and ITV) and three communications companies (Arqiva, BT and TalkTalk) and will be roled out in 2012 in the UK.

3.6 VoD solutions

Generally Video on Demand (VOD) or Audio and Video on Demand (AVOD) can be described as systems which allow users to select and watch/listen to video or audio content on demand. From a systematic point of view there is a whole variety of non-linear / on-demand services. As opposed to linear services, which broadcast a program at a date and time chosen by the broadcaster, nonlinear services make programs available to the users, who will screen them at the time and place of their choice On-demand rental. A classification of the different variations of VoD products has been depicted in the table below (see Table 5):

Table 5: Classification of VoD products

Classification	Features
No-VoD	Similar to broadcast TV, in which the user is a passive participant and has no control over the session
PPV	In which the user signs up and pays for specific programming, similar to existing CATV PPV services
QVoD **(Q- Quasi)**	In which users are grouped based on a threshold of interest. Users can perform rudimentary temporal control activities by switching to a different group
NVoD **(N- near)**	Functions like forward and reverse are simulated by transitions in discrete time intervals. This capability can be provided by multiple channels with the same programming skewed in time.
TVoD **(T- Transactional)**	The user has complete control over the session presentation. The user has full - function VCR capabilities, including forward and reverse play, freeze, and random positioning

Classification	Features
SVoD **(S Subscription)**	Is a service offered by cable systems, which charges their subscribers a monthly fee for accessing unlimited programs.
IVoD **(I- Interactive)**	See interactive TV
EVoD **(E- Exclusive)**	When a particular TV-based VOD content provider offers a function, service and/or program that no other content provider has, it might be called Exclusive Video on Demand.
FVoD **(F- Free)**	Is Video on Demand programming that a network operator makes available as part of a content package.

In regard to LinkedTV the most interesting VoD solutions are those that are described as IVoD solutions, which describes solutions where the VoD becomes interactive and a user can influence what type of information, when and in which form he can consume. Regarding the competitor analysis, we see mainly that operators are using VoD as an umbrella term, to offer their TV programme on their website, which will be described below.

3.7 Broadcasters implementing VoD portal solutions

As mentioned in the previous chapter the main driver of VoD solutions are broadcasters that are thriving to find new ways to disseminate their already screened TV content on the web. The most influential players in this sector according to country are:

- **Australia**
  - ABC Iview http://en.wikipedia.org/wiki/ABC_iView
  - SBS http://www.sbs.com.au/ondemand/
  - Seven Network http://au.tv.yahoo.com/plus7/
  - Nine Network http://catchup.ninemsn.com.au/
  - Network Ten http://ten.com.au/watch-tv-episodes-online.htm
  - Telstra BigPond http://bigpondmovies.com/
- **UK**
  - BBC Iplayer http://en.wikipedia.org/wiki/BBC_iPlayer
  - BBC RedButton depr. (http://en.wikipedia.org/wiki/BBC_Red_Button)
  - ITV Player http://en.wikipedia.org/wiki/ITV_Player

    - Channel4 VoD http://en.wikipedia.org/wiki/4oD
    - Channel 5 http://en.wikipedia.org/wiki/Demand_5
    - Sky Go http://en.wikipedia.org/wiki/Sky_Go
    - Sky Anytime http://en.wikipedia.org/wiki/Sky_Anytime#Sky_Player
- **Ireland**
    - RTE http://www.rte.ie/player/#
    - TV3 3Player
    - TG4 via its TG4 Player
- **Germany**
    - Das Erste Mediathek http://de.wikipedia.org/wiki/Das_Erste:_Mediathek
    - ZDF Mediathek http://de.wikipedia.org/wiki/ZDFmediathek
    - PRO7/Sat1/Kabel 1 Maxdome http://de.wikipedia.org/wiki/Maxdome
    - RTL http://de.wikipedia.org/wiki/RTLnow.de
    - RTL Nitro http://de.wikipedia.org/wiki/RTL_Nitro_Now
    - RTL 2 http://de.wikipedia.org/wiki/RTL_II_Now
    - VOX Now http://de.wikipedia.org/wiki/VOXnow.de
    - Super RTL Now http://de.wikipedia.org/wiki/SuperRTLnow.de
    - History Channel http://de.wikipedia.org/wiki/The_History_Channel
- **Italy**
    - MTV via http://ondemand.mtv.it/
    - Mediaset Premium via http://play.mediasetpremium.it/
- **United States & Canada**
    - FOX
    - CBS
    - NBC
    - ABC
- **Brazil**
    - Rede Globo http://globotv.globo.com/
    - Globosat http://muu.globo.com/
    - Telecine http://telecine.globo.com/arquivos/especiais/ondemand.html
    - Net http://www.netcombo.com.br/netPortalWEB/appmanager/portal/desktop?_nfpb=true&_pageLabel=P460057197130434638113 0

- **France**
  - M6 http://en.wikipedia.org/wiki/M6_(TV_channel)
  - Canal + http://en.wikipedia.org/wiki/Canal%2B
  - Pluzz http://www.pluzz.fr/replay/
- **Spain**
  - Canal + http://en.wikipedia.org/wiki/Canal%2B_(Spain)
  - Digital + http://en.wikipedia.org/wiki/Digital_%2B
- **Sweden**
  - SVT http://www.svtplay.se/
  - TV4 Group http://www.tv4play.se/
  - Kanal 5 http://www.kanal5play.se/
  - Viasat http://www.viaplay.se/
- **India**
  - Tata Sky
  - Zee TV
- **Japan**
  - NHK

The leading VoD portals have been depicted in Figure 9. We see that despite cultural and language differences all portals offer a highly visual experience, leading the path for highly interactive websites that provide a similar experieance as in interactive- or SmartTV.

Figure 9: Representative overview of a number of VoD portals

In the German market we find that every major broadcaster provides their own VoD portal offering a combination of current (or live) material combined with a limited archive of

screened material. In some cases where a broadcaster maintains a whole family of channels (e.g. RTL group, or PRO7-Sat1), they all use the same VoD portal technology, yet run under their own domains with separate content. In some cases such as for BBC or Channel4 the broadcasters offer(ed) additional software that emulates a TV experience on the computer (e.g. BBC Iplayer, ITV Player, 4oD). With the emergence of the highly media affine HTML 5 standard we can expect though that in future the website based versions of VoD portals will offer the same functionality without a need for a software installation, and might even be consumable directly on the TV screen. This brings us to nework and broadcaster agnostic companies that are implementing VoD solutions. These companies have been summarized under the term InternetTV in the next chapter.

3.8 Internet TV

Internet television (otherwise known as Internet TV, or Online TV) is the digital distribution of television content via the Internet. Internet Television is a general term that covers the delivery of television shows and other video content over the internet by video streaming technology, typically by major traditional television broadcasters. Due to the nonexistent limitations regarding geography and content, a high number of network agnostic companies are trying to compete in this market, may it be either by being content curators, content delivery providers, or supplying VoD or TVoD solutions for existing providers. The main players in this are listed below according to their corresponding category.

- **VoD**
  - Hulu http://en.wikipedia.org/wiki/Hulu
  - Amazon on Demand http://en.wikipedia.org/wiki/Amazon_Instant_Video
  - Netflix http://en.wikipedia.org/wiki/Netflix
  - BlinkBox http://en.wikipedia.org/wiki/BlinkBox
  - iTunes http://de.wikipedia.org/wiki/ITunes
- **TVoD**
  - Zatoo http://en.wikipedia.org/wiki/Zattoo
  - Wilmaa www.wilmaa.com
  - Microsoft LiveStation http://www.livestation.com/en/untv
  - Joost http://en.wikipedia.org/wiki/Joost (status unknown)
  - Octoshape http://www.octoshape.com/
- **CDN & Engines**
  - TV Genius http://en.wikipedia.org/wiki/TV_Genius
  - Red Media http://www.redbeemedia.com/services/search-recommendations
- **Curators & others**

  - LinkedTV http://www.linktv.org/
  - iTVMediaPlayer http://en.wikipedia.org/wiki/ITVmediaPlayer
  - Clicker http://www.clicker.com/
  - Tanktop TV (recommendations) http://www.tanktop.tv/
  - Scale Engine CDN http://www.scaleengine.com/
  - Miro Media Player http://de.wikipedia.org/wiki/Miro_Media_Player
- **OVPs (Online Video Plattforms)**
  - Limelight http://www.limelightvideoplatform.com/
  - Brightcove http://en.wikipedia.org/wiki/Brightcove
- **Video Services**
  - Youtube http://en.wikipedia.org/wiki/Youtube
  - Veoh http://en.wikipedia.org/wiki/Veoh
  - Also see comparison of video hosting Services http://en.wikipedia.org/wiki/Comparison_of_video_services
- **Startups with Deeptagging (discontinued)**
  - ClickTV (Deep video tagging) acquired by CISCO 2007
  - Motionbox (discontinued)
  - Jumpcut 2005
  - Pluggd 2006
  - SeeSaw (defunct) / Former Kangaroo Project / Now Youview
  - (Viddler http://techcrunch.com/2006/08/09/viddler-to-make-moments-in-video-searchable/)
  - Also see Deeptagging http://techcrunch.com/2006/10/01/all-the-cool-kids-are-deep-tagging/

Regarding the internet based VoD providers most notable are Hulu and Netflix. Hulu provides website and over-the-top (OTT) subscription services offering ad-supported on-demand streaming video of TV shows, movies, webisodes and other new media. Netflix is a also a provider of on-demand Internet streaming media who statrted out as a flat rate DVD-by-mail in the United States but now offers the whole VoD range as Hulu. ITunes also offers a variety of movies and TV shows via the internet, although in terms of the IPTV market it is geared towards integration with the above described Apple TV OTT box (or other Apple products e.g. Ipad, Iphone). In the live TV on demand (TVoD) area the most notable in the European region are Wilmaa and Zatoo, which both belong to the Swiss broadcaster SF. They both offer the whole range of live TV channels where the user can use his computer or mobile device in the same manner like a normal TV. Although currently the content cannot

be consumed on a regular TV device it most resembles a classic TV experience, enhanced by interactive features such as social voting or cheering for soccer games. In the curators and others area, products have been subsumed that provide some sort of curation of existing TV material, often with the possibility to consume the content on their website. This sectors seems to be assimilated by other sectors, since providers like Netflix are providing an own recommender systems, that offers very impressive results[10]. Finally an interesting sector are online video platforms, which are cloud based providers covering the whole process of media management up to the point of dissemination and personalization through a certain website. These backend B2B products show the whole complexity of ITPV based media management (see Figure 10 below).

Figure 10: An overview over the variety and complexity of the features of an online video platform

On the frontend side we find popular video service providers, such as Youtube, Vimeo or Veoh, that provide an easy consumption, linkage and annotation of video material. In this sector we also find a myriad of different products, which are yet dominated by the strong[11] market position of Youtube. Finally we would like to highlight a number of startups that traditionally focused on hosting, linking and semi/automatically tagging video material, which are discontinued these, days, but their efforts led to the creation of many interactive video overlay projects that are discussed below.

3.8.1 Interactive video overlay projects and OVPs/VS

The technologically closest market covering similar features and aspects as LinkedTV comes from highly specialized internet based companies that are providing interactive overlay solutions as third party providers. Although these companies are still rather small or startups their products are highly competitive and innovative. The main players in this sector are:

- **Interactive Video (overlay) projects**

[10] http://www.netflixprize.com/

[11] http://www.sysomos.com/reports/video/

- WireWax http://www.wirewax.com/
- Clickthrough http://www.clikthrough.com/
- AttractTV http://www.attractv.com/
- Cavi http://www.cavi.tv/
- Evenhere http://www.evenhere.com/
- OverlayTV http://www.overlay.tv/
- LinkToTV http://www.linkto.tv/
- VideoClix http://www.videoclix.tv

The providers such as WireWax work on the following principle: Users upload a video, draw a box around the person or object that they want to make interactive – They then let the system perform automatic object detection and decide what they want to happen when a user clicks this link. Whether to show product information, display another video, show a map, a profile etc. Other providers such as Clickthrough (shown in Figure 11 below) understand their mission as to "change the way the world interacts with the computer screen". Their product also follows three goals that are similar for each of the competitors: a) provide products placement to the interactive realm b) measurement of online consumer engagement c) user interaction with the content by embedded click areas.

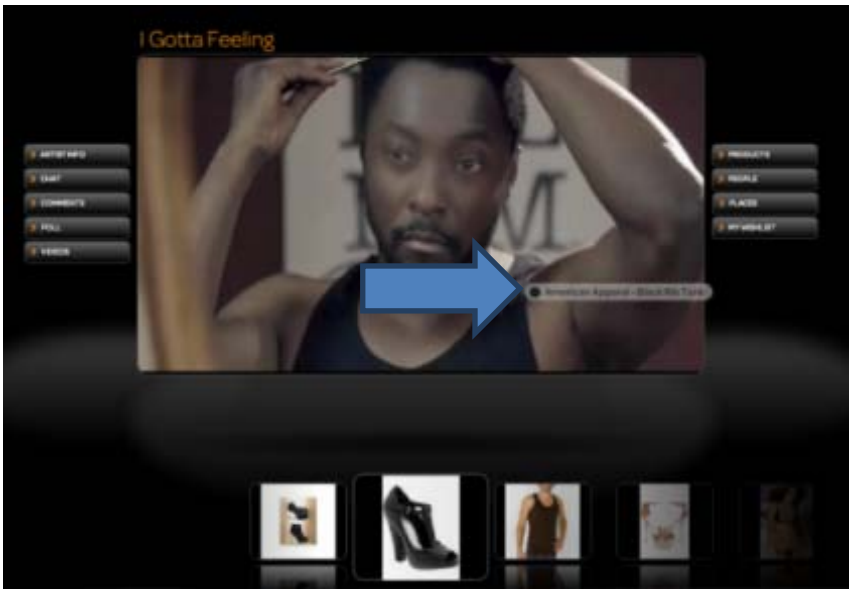

Figure 11: A user view of manually added Meta (product) information

Despite the very impressive results that are showcased on the company's websites the founders also critically note that similar solutions which had been previously been called "interactive video", T-commerce, video hot-spotting, hypermedia, and ad infinitum had failed outright or failed to get public adoption. Other vendors such as link.to are seeking to find market capitalization in specialized scenarios such as creating augmented fashion campaigns (see Figure 12 below) or providing their interactive player to companies that seek

to generate leads from consumers looking for help while watching tutorial videos (e.g. Belmont Thornton Payment Protection Insurance (PPI) use case).

Figure 12: Context aware displays of products side by side with the actual video content

In general we can postulate that a number of products providing deep video tagging or linking are already shipped out to existing customers, providing a mature technology. One of the crucial main steps in creating such deep tagged solutions seems to be the involved manual labor when placing the marks and links. This might be a hindrance in the wide adaption on the business side, since scaling this technique to thousands or millions of videos might not be possible. On the consumer side we see that despite the existence of such products their adaption is still low. Observations from this market segment might help LinkedTV to learn valuable industry insights and market entry barriers.

3.9 SmartTV

Smart TV, which is also sometimes referred to as "**Connected TV" (CTV)** or "**Hybrid TV**" **(HTV)**, (not to be confused with IPTV, Internet TV, or with Web TV), is the phrase used to describe the current trend of integration of the internet and Web 2.0 features into modern television sets and set-top boxes, as well as the technological convergence between computers and these television sets / set-top boxes. A Smart TV device is either a **television set with integrated internet capabilities** or a **set-top box for television** that offers more advanced computing ability and connectivity than a contemporary basic television set.

3.9.1 Studies regarding the acceptance of SmartTV

There are a number of studies showing that internet on big screens is becoming the de facto standard. The GfK (Jürgen Boyny, 2011) study of 2011 highlights the current developments in this sector in Germany. The results of the study show similarly to the developments in the general IPTV market (see chapter 2) a constant growth in the CE, IT and Telco sector. The sales of CE (e.g. TV), IT (e.g. Notebooks or Tablets) or Telco (e.g. Mobile phones or Smartphones) grew in 2011 by 4.4% (26.9 billion €). Nearly all of those devices are able to connect to the internet. The CE, IT and Telco products mainly differ through their screen diagonal. Especially for big flat TVs it seems more likely that these are the sort of devices that will come with a Smart TV standard, due to the bigger the screen (Figure 13).

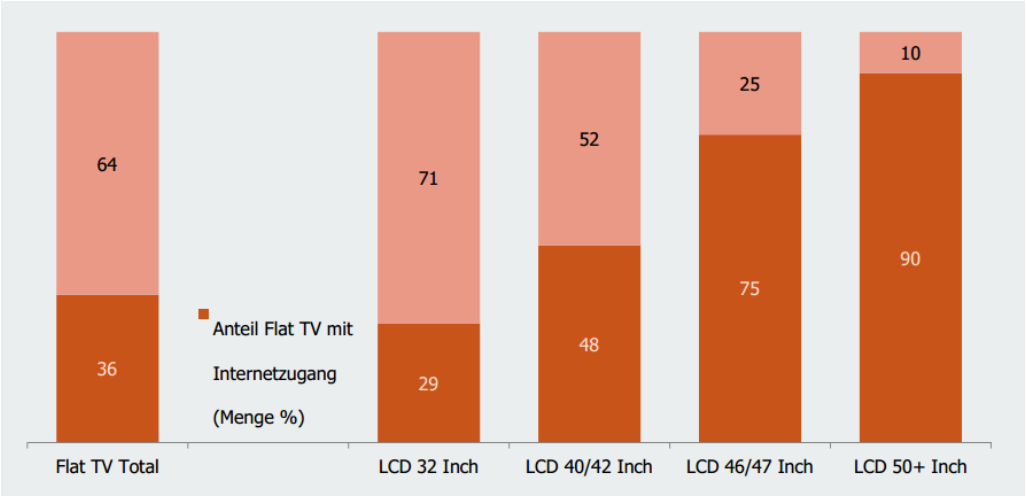

Figure 13: Amount of Flat TV with Internet Connection in %

In general every third sold Flat TV is able to connect to the internet. Both for TV as well as PC meanwhile the standard features of nearly every household and are often used at the same time. Most people decide to surf on other devices while watching TV (Figure 14).

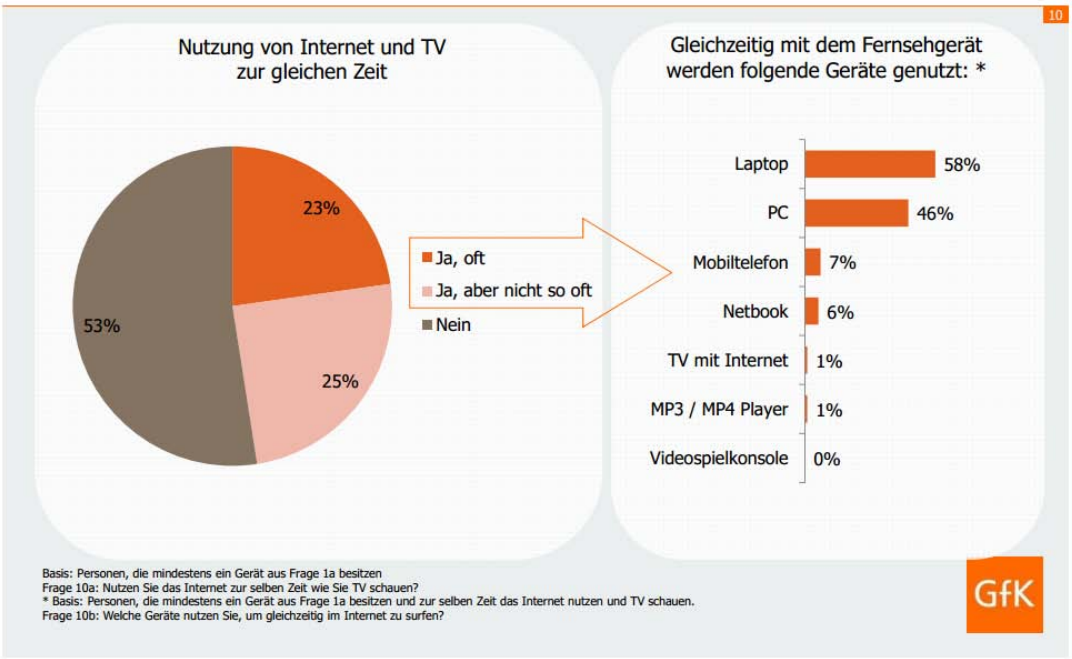

Figure 14: Usage of TV and another device at the same time

Although the internet option on Smart TVs is used by only 13% of the sample, more functionality of the TV Browsers and a keyboard as an additional input device next to the remote control will increase the attitude towards using the Smart TV internet option. Main reasons for current restraints of the respondents are the different ways of operating TVs and PCs and the currently constrained usability of the internet via Smart TV experience. TV is perceived as an entertainment device, the control of the browser with the remote is more difficult and the possibilities of TVs to install apps are restricted (Figure 15).

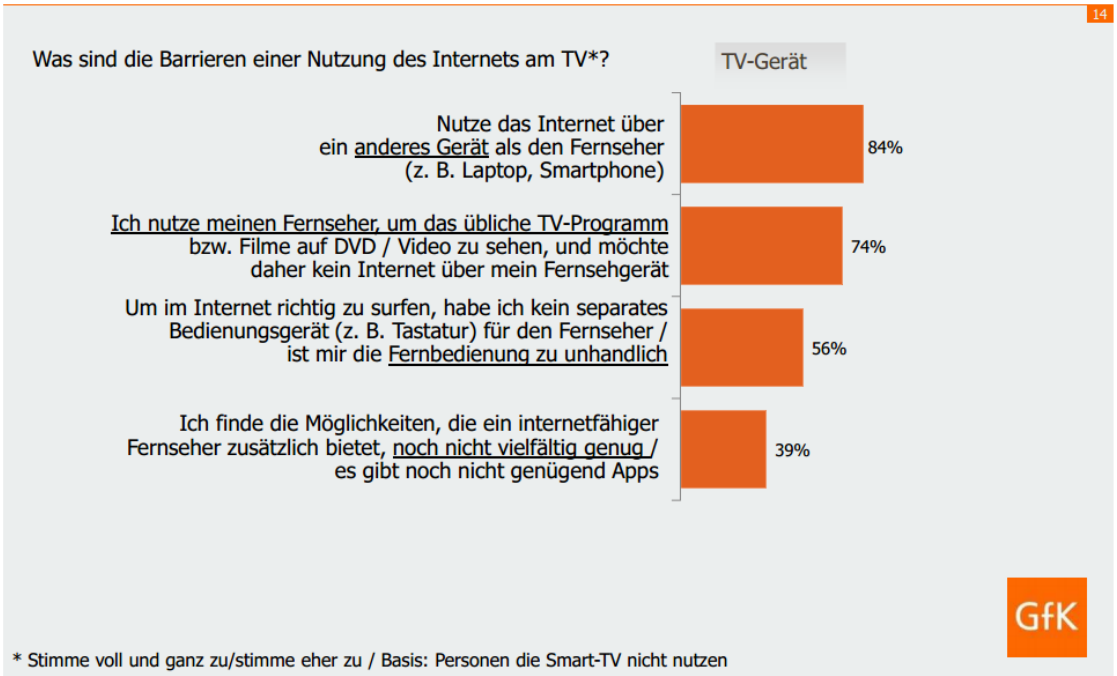

Figure 15: Restraints of respondents to use internet via TV

LinkedTV is trying to reduce the constraints of the user through implementing different solutions. The navigation via remote control will be simplified due to a special interface. The recommendations for the user will be fully automatic from his former actions and viewing decisions. Most functions will be able to reach via remote control clicks. The project integrates the internet more into the program. The gap between the TV as an entertainment device and information related functions will be lessened. The user doesn't need to surf on his notebook for additional information; instead the related information will be presented on the TV. This one one hand reveals that the potential use of LinkedTV functions is indeed a user's need. On the other hand we notice that users might be very critical to interface design decisions, and reluctant to adopt to new behaviors.

3.9.2 Competing Standards

Despite the standardization efforts (see chapter 3 above) and the fusion of multiple vendors and players, there are still a number of competing de facto standards trying to dominate the SmartTV market. Among those the most prominent movements are:

- **GoogleTV**[12]: Allows the use of all Google Services on TV, picture in picture service (PiP), personal start page, and TV-shows recommendations. It will be based on Android 2.1, Chrome, and Flash 10.1. Google TV already has a number of partners such as Sony for TVs, and Blu-ray players and Logitech, STB and Intel Atom Chipset for peripheral hardware. Google's rollout plans do not include the European region yet.

[12] http://www.google.com/tv/

- **Yahoo Connected TV**[13]: Is a widget based TV development kit, originating from Yahoo research. It integrates the Yahoo! Widgets Engine with a new television oriented user interface to enable internet connected applications to run and display on a 10-foot user interface. Yahoo announcement of distribution partnerships among which are LG, Vizio, Samsung, Sony and Toshiba. Yahoo plans a rollout of this technology in a Europe-wide fashion in almost 40 countries.
- **AppleTV**: The AppleTV platform is based on Apples successful ITunes store that creates the content and payment backbone. The AppleTV devices (first, second and third generation) so far have followed a strictly closed app paradigm. So far only a hand full of apple licensed partners were able to create applications for the AppleTV device. Despite the same standards as on the Iphone (iOS5) others third parties cannot simply add apps, as in the case of e.g. the apple IPhone. Additionally the system only connects and integrates other Apple devices.
- **Panasonic VIERA CAST Platform:** The Viera Cast Smart TV platform by Panasonic makes it possible to stream multimedia content from the Internet directly into select Viera HDTVs and Blu-ray disc players. Panasonic introduced Netflix video streaming service, Skype and Twitter to its Viera Cast line-up beginning with the 2010 model. The availability of services differs per region / country / language. For example: In the Netherlands it's mostly English content/services, but also some German (Bild.de, Tageschau). The apps can be downloaded in the App stores of providers. An example is shown in Figure 16 below.
- **Philips NetTV:** Net TV seems to be the older version of SmartTV effort in Philips televisions that allows specially customized Web pages for viewing on the TV. The Net TV pages use the open standard CE-HTML, providing services like YouTube, which are offered in a custom size and design. Thus, the larger font and the whole page to operate with the up, down, left and right buttons on the remote.
- **Samsung Internet @TV:** Samsung's Internet TV, enables the viewer to receive information from the Internet while at the same time watching conventional television programming. Samsung additionally supports downloadable apps, which can be often downloaded for free from its Samsung Apps store, in addition to existing services such as news, weather, stock market, YouTube videos, and movies. Samsung Apps offers for-fee premium services in a few countries including Korea and the United States. Samsung's internet @ TV is part of the Smart TV alliance with Philips and LG.

[13] http://connectedtv.yahoo.com/

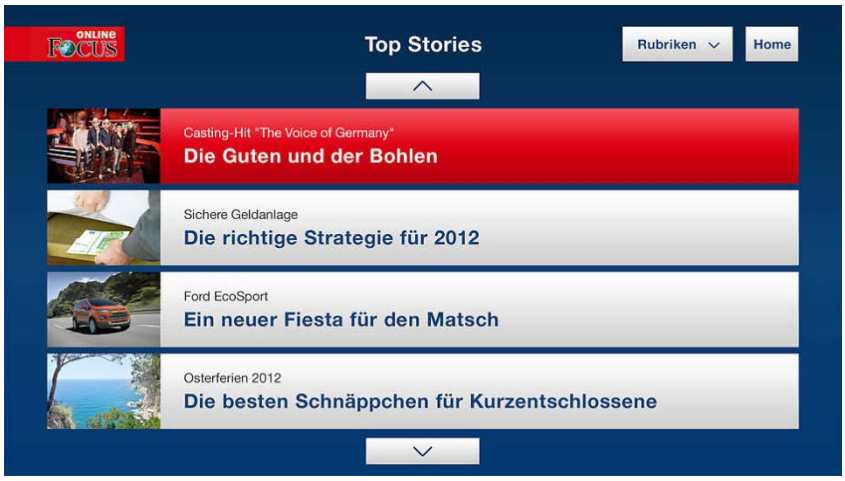

Figure 16: An example of the Focus Online app

HbbTV

We have shown above that a number of standards are right now competing for the dominance in the SmartTV sector. The most prominent and promising among those standards might be the European based HbbTV standard which combines a number of existing standards such as CE-HTML, Web sockets, HTML5 Canvas etc. (see Figure 17 below) and is supported by a number of vendors (e.g. LOEWE, Philips, LG, Sony, Samsung, HUmax, Techno Trend Görler, Inverto Set One, Smart, Vantage, Intek Digital, TechniSat, Vestel). The HbbTV consortium has over 50 supporting members from the CE and Broadcast industries. The HbbTV specification was developed by industry members of the consortium and is based on elements of existing standards and web technologies including the Open IPTV Forum, CEA, DVB, and W3C.

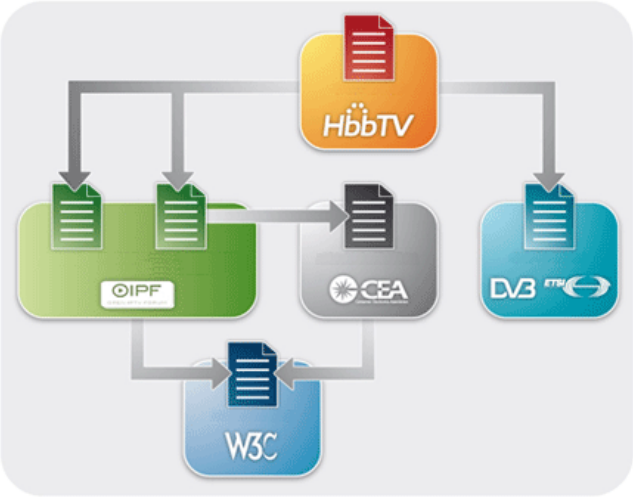

Figure 17: Overview over the main standards of HbbTV

Several countries worldwide, and in Europe in particular, have adopted the HbbTV standard and/or operated HbbTV services and trials. As at December 2011, HbbTV services are in

regular operation in France, Germany and Spain, with announcements of adoption in Austria, Czech Republic, Denmark, Netherlands, Poland, Switzerland, Turkey, and trials in Australia, China, Japan, and the US. The historical and future adaption curve of HbbTV is depicted in Figure 18 below.

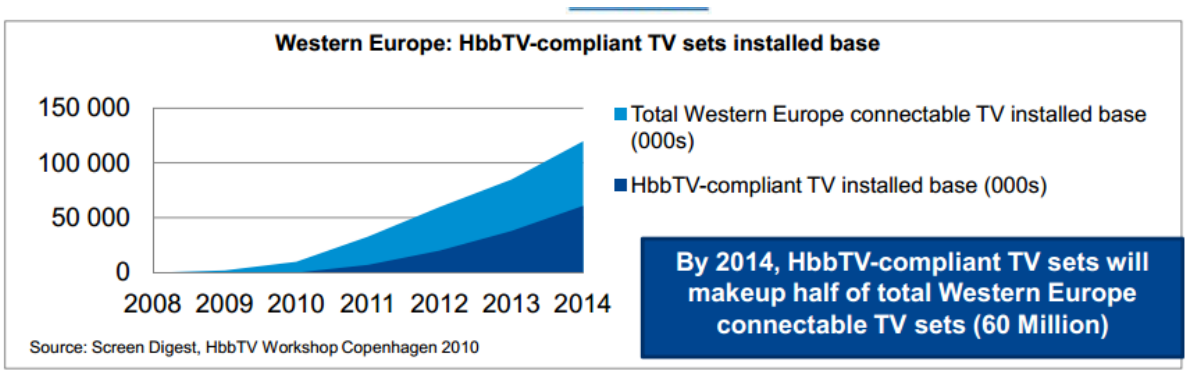

Figure 18: Shows the adaptation development of the HbbTV standard in Europe.

Integration of TV and VoD portals in HbbTV

HbbTV offers a unique way to integrate the already existing VoD archives of broadcasters with the TV experience. While so far the content was rather bound to a browsing experience, with the HbbTV solutions, the existing archive can also now be accessed on the TV screen, as shown in Figure 19 below. More information regarding the features and specifications of HbbTV can be found on http://www.HbbTV.org/.

Figure 19: Screenshot of the ARD Medienthek

3.9.3 Hardware vendors implementing SmartTV

As described above the competing standards are a result of a number of hardware vendors and players from the internet TV market that are already competing in the SmartTV market.

Sometimes this leads to the creation of a new proprietary standard (e.g. AppleTV), but sometimes the efforts are united under a platform, such as HbbTV or other alliances such as the SmartTV alliance. The most notable products are:

- **Vendors**:
  - LG NetCast [14]
  - Philips NetTV[15] based on the Open IPTV[16]
  - SmartTV Alliance [Philips + LG] http://www.smarttv-alliance.org/
  - Panasonic Viera Cast[17] / new platform is Viera Connect
  - Samsung Smart TV[18]
  - Sharp Aquos Net+ [19]
  - Sony: Internet TV
  - Toshiba Toshiba Places[20]
- **Smart TV Platforms**
  - HbbTV http://en.wikipedia.org/wiki/HbbTV
  - GoogleTV http://en.wikipedia.org/wiki/Googletv
  - Yahoo Connected TV http://en.wikipedia.org/wiki/Yahoo!_Connected_TV
  - Microsoft Mediaroom http://en.wikipedia.org/wiki/Microsoft_Mediaroom
  - UbuntuTV http://en.wikipedia.org/wiki/Ubuntu_TV

As already noted in the previous chapter we still see quite a variety of competing standards [21] where vendors are both creating own proprietary solutions but are also partly contributing to open standards such as HbbTV. Players from the internet TV market such as GoogleTV and Yahoo Connected TV might be able to repeat their mobile success by creating an operating system for TVs, which might become the de facto standard. Samsung on the other hand might be very successful in achieving a high penetration of their own standard, since every Samsung based TV set in the future might come pre-installed with a Samsung operating system – a strategic decision that has also been successull[22] for their smartphones as well,

[14] http://en.wikipedia.org/wiki/LG_Smart_TV

[15] http://en.wikipedia.org/w/index.php?title=Philips_NetTV&action=edit&redlink=1

[16] http://en.wikipedia.org/w/index.php?title=Open_IPTV_Forum&action=edit&redlink=1

[17] http://en.wikipedia.org/wiki/Viera_Cast

[18] http://en.wikipedia.org/wiki/Samsung_Smart_TV

[19] http://en.wikipedia.org/w/index.php?title=Aquos_Net+&action=edit&redlink=1

[20] http://en.wikipedia.org/w/index.php?title=Toshiba_Places&action=edit&redlink=1

[21] More information on the used technologies and standards for the given SmartTV labels can be found under http://www.samsungdforum.com/

[22] http://en.wikipedia.org/wiki/Mobile_operating_system

before switching to Android OS. Right now is seems hard to foresee if HbbTV, Samsung's solution or the internet players driven attempts will dominate the market. We might see a similar pattern that emerged in the mobile phone market, where the app based concept and the corresponding stores were a main key success component in dominating the market.

After all it might also come down to usability features, such as an easy navigation of web content on a TV screen (see Figure 20 below) which has for years hindered the proper development of a truly unified TV and Web solution. Here Apple TV's solution might come into play which is highly optimized for user experience, but so far lacks true app integration.

Figure 20: A browser implemented in a SmartTV solution

Finally beyond the vendors based attempts there are a number of middleware and third party providers which should be noted here, because they are partly cooperating and partly competing for the very same market in this area. Such providers are:

- OpenTV http://en.wikipedia.org/wiki/Opentv
- Miracle TV (STB OS) http://www.mitvcorp.com/home/
- Miniweb Interactive http://www.miniweb.tv/
- Ginga http://en.wikipedia.org/wiki/Ginga_(SBTVD_Middleware)
- True2Way http://en.wikipedia.org/wiki/Tru2way
- MeeGo http://en.wikipedia.org/wiki/MeeGo (discontinued)
- Titzen http://en.wikipedia.org/wiki/Tizen

3.9.4 Game console providers implementing SmartTV

The final set of very highly competitive players is consisting of game console providers which are also implementing SmartTV solutions. Among these the most prominent players are well known in the IPTV and computing sector (e.g. Sony, Microsoft), trying to find new applications for their existing products(PS3, XBoX360), or creating new gaming products (PS4, Xbox 720) that are already tailored towards the IPTV SmartTV market. The most noticeable are:

- Sony PlayStation 3[23]
- Sony PlayStation 4[24]: 3D, Blu-ray, GoogleTV
- Microsoft Xbox 360[25]
- Microsoft Xbox 720 http://www.businessinsider.com/microsoft-xbox-720-presentation-2012-6#-7
- Nintendo Wii2: Its main features will be HD, digital distribution, local storage http://en.wikipedia.org/wiki/Wii_U
- Valve Steam The big picture http://www.steampowered.com/steamworks/thebigpicture.php

The main leverage of game console providers against providers of TV-integrated SmartTV solutions is that game consoles in comparison allow for very CPU intensive operations. Since they have been built in for graphics intense gaming, their CPU power might also allow for a new kind of SmartTV applications (e.g. augmenting the video with information overlays in real-time). Finally game studios like steam show interest in “taking over” the TV screen for their own needs by taking advantage of their gaming platform (Steam) that has over 30 million players worldwide and spans multiple systems.

3.10 Combinations of different modules

Generally after reviewing the most related market segments a pattern seems emerge. If we treat the market segments as building blocks or modules, we see that these can be combined in different variations but are all creating either InteractiveTV or SmartTV solutions:

- Interactive TV
    - TV + OTT(broadcaster) → e.g. Canal+, Premiere, Sky
    - TV + OTT(network operator) → e.g. T-Entertain, Virgin TV
    - TV + OTT (agnostic) → e.g. Boxee, AppleTV, Roku

[23] http://en.wikipedia.org/wiki/PlayStation_3

[24] http://www.techradar.com/news/gaming/consoles/ps4-release-date-news-and-rumours-937822

[25] http://en.wikipedia.org/wiki/Xbox_360

  - TV + OTT(cloud service) → e.g. Action vision
  - PC + TV → HTPC / PVR → e.g. XMBC, Microsoft Media center
  - PC → Internet TV → e.g. Youtube, Veoh, Wilmaa, Zatoo, …
- Smart TV
  - TV + own OS → e.g. Panasonic, Samsung
  - TV + other OS → e.g. GoogleTV, HbbTV
  - TV + Game console (as a high performance OTT) → Xbox 360, PlayStation 3

In all of these cases the three building blocks are the TV set, an operating system and an OTT box. In some cases the OTT box is already integrated in the TV where we then rather talk about a SmartTV, in the cases where the OTT is an external periphery the solution is rather considered as an interactive TV solution. The differences are marginal though. We have seen that depending on which player is offering the OTT we either have broadcasters, network operators, or agnostic players competing for the TV screen. In some cases the TV set is not even an integral part of the solution in the cases of Internet TV (e.g. Youtube or Wilmaa). Finally regarding the implementation of SmartTV we see competing standards trying to dominate the market by either vendors pushing their own operating systems and app stores, or agnostic providers such as Google pushing the distribution of their own operating systems with respective app stores on TVs. Finally due to the wide acceptance of gaming periphery also game console vendors and studios are emerging on the SmartTV landscape, seeking to provide solutions that will use of their dominance in the game entertainment sector, to get hold of the emerging IPTV market.

3.11 Trend 1 Social TV

Before attempting a comparative analysis of LinkedTV with the described players from the described markets we would like to point out two TV trends that might be overlooked in a pure market analysis because their integration takes place on a horizontal level spanning multiple markets and industries. Social television is a general term for technology that supports communication and social interaction in either the context of watching television, or related to TV content. It also includes the study of television-related social behavior, devices and networks. Social TV has gained a lot in importance in the last years (Unterhaltungselektronik, 2011), also fuelled through the wide acceptance of social networks like Facebook or Twitter. Its importance in improving the TV experience has been demonstrated in a number of field trials (e.g. TNO field trial (Omar Niamut, Martijn Staal, Hans Stokking, Erik Boertjes, 2008)

It is possible to distinguish between different perspectives on the social TV development. While some companies are user based and try to enhance the user's TV experience by social enhancements, other companies focus on better analytics resulting from the fusion of social network with TV features. Additionally we have already seen hardware vendors (such

as Boxee) that create specialized OTT boxes that support social features. Remotely related we can also include purely web based efforts the cover the social remote consumption of content such as chill.com or Google hangouts. Finally we also see that the mobile trend leads to applications which combine the social aspects with an interface which is based on a mobile device. A number of notable socially based solutions is provided below:

- Analytics:
  - Social Guide intelligence http://sgi.socialguide.com/
  - Bluefin Labs http://bluefinlabs.com/
  - Trendrr http://trendrr.tv/
- OTT
  - Boxee http://en.wikipedia.org/wiki/Boxee
- IPhone
  - Peel http://itunes.apple.com/us/app/peel-personalized-tv-experience/id384977370?mt=8
  - Show You http://itunes.apple.com/ch/app/showyou/id422698201?mt=8
- Web
  - Chill TV http://chill.com/
  - Google Hangouts

3.12 Trend 2: Second screen

The second horizontal trend (see (Smartclip, 2012)) seems to emerge among the second screen paradigm. Second Screen is a term that refers to an additional electronic device (e.g. tablet, smartphone) that allows a television audience to interact with the content they are consuming, whether it is TV Shows, movies, music, or video games, extra data is displayed on a portable device synchronized with the content being viewed on television.

Second screen seems to be emerging not so much from the vendors need to use a second screen in order to provide additional content, but simply from the fact that users these days possess a number of devices which are used to consume additional material during their TV experience, as show in in Figure 21 below.

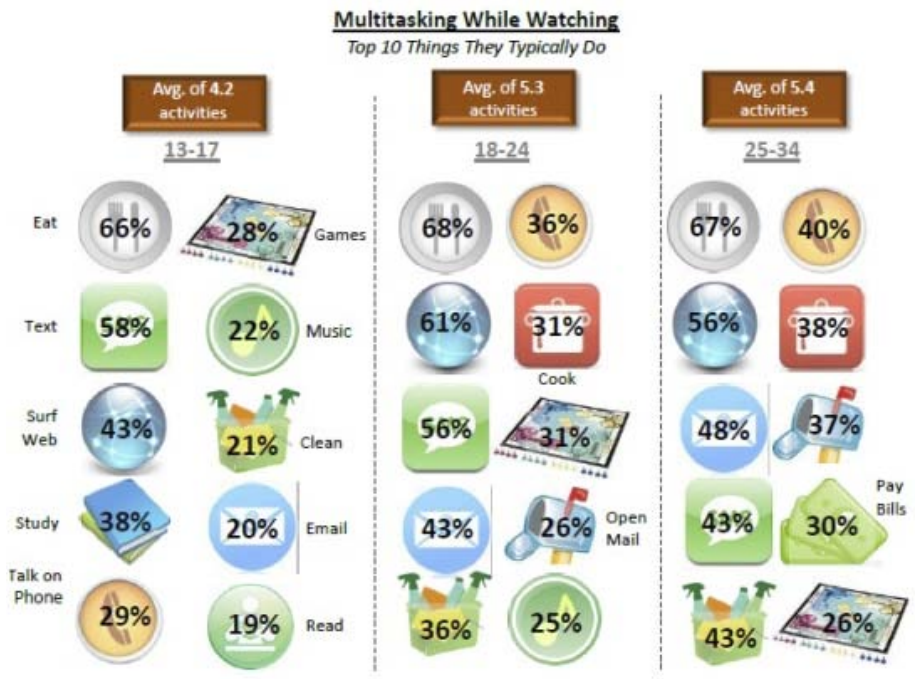

Figure 21: Overview over multitasking of users while watching TV. Source: Cable & Telecommunications Association for Marketing (Megan O'Neill, 2011)

A number of vendors that are dedicated on providing second screen solution are listed below:

- Intonow http://www.intonow.com/ci
- Xbox Smart Glass http://en.wikipedia.org/wiki/Xbox_SmartGlass
- Wii U http://en.wikipedia.org/wiki/Wii_U
- Zeebox http://zeebox.com/
- Sky News App for iPad

3.13 Current and past European Union and worldwide TV projects

Finally there are a number of noncommercial or academic projects that are also highly influential in the IPTV market, by either helping to define standards or cooperating with vendors and trying to create new solutions. The most notable of such projects are:

- LinkedTV http://www.LinkedTV.eu/
- NM2 http://www.ist-nm2.org/about/overview.html
- Notube Project [2009-2012] http://notube.tv/
- Eureka ITEA2 Wellcom Project [2007 -2009] http://en.wikipedia.org/wiki/Eureka_ITEA2_WellCom_Project
- DTV4All http://www.psp-dtv4all.org/
- HBB Next Project http://www.hbb-next.eu

Additionally there are myriads of either historical or similar video annotation projects (e.g. VideoAnnEx, EVA System, Vannotea eSports System, various TRECVID related projects), which have a slightly stronger focus on the video annotation part, which will be not covered in this market overview.

4 LinkedTV's features and goals

The LinkedTV project includes the rich browsing experience people know already from the Web to television, enriches the access to audio-visual programming with associated content and allows people to seamlessly delve into and browse content within the programme itself at the level of individual objects on screen or things which are mentioned or referred to.

To achieve these ambitions that create the unique USP, LinkedTV is organized in different work packages with individual scopes. To explain the goals of the project that will set LinkedTV apart from its competitors the main tasks of each work package will be listed and then summarized in Table 6 below.

Work package 1 and 2 are responsible for the content detection in time and space. Content should be annotated automatically or semi automatically. Therefore entity classifications tool with language support in English, German, Dutch and French are implemented as well as tools for decomposition of content to meaningful segments, video segmentation, speaker segmentation, concept detection, detection of topics and themes, multilingual text/video/audio analysis, clustering and annotation. Furthermore content labeling with rich semantic descriptions and identification of similar content by the use of dimensionality reduction, nearest neighbor classification and learning techniques will be provided. Especially for WP2 this accordingly means to create API and necessary interfaces, to address media fragments, to use multimedia metadata models for hyper videos, to link external web content to similar annotations of content, to generate genre specific information gathering templates[26] and to use web mining techniques to retrieve additional content from the web.

Work package 3 will create the hyper video interaction interfaces for supporting information browsing, organization, presentation and higher level tasks such as information gathering.

Work package 4 is capable of user tracking and profiling with respect to activity and behavior processing, content filtering based on users preferences resp. interests and social and content-based personalization methodologies. They will elaborate recommendations based on the semantic relationships and context between the user's preferences and the available content items. Additionally information about interests derivable from the user's profiles on social networks will be included. User profiles will be extended and refined on the basis of user activity and social profiles.

The scenarios of work package 6 also describe the efforts to create a product that matches a practical need. RBB on the one hand needs an indication of the source of information. The user should see content related to a specific segment or entity. This includes getting an idea of what is behind a link. Furthermore the user should be able to see and access related sources, without them having to leave the LinkedTV interface. Sound and Vision on the other

[26] These will provide the necessary granularity and adaptability to the users request and interests

hand point out an additionally effort. In their profile, users should be able to see the information sources they have tagged as favorites

To find a potential marked for the LinkedTV project the four most notable project goals have been summarized in Table 6.

Table 6: Most notable project goals for Linked TV

Hypervideo Analysis	Automatic/semiautomatic annotation of content in time and space: • Languages: English, German, Dutch
	Identify similar content • dimensionality reduction, nearest neighbor classification, and learning techniques
Linking Video to Web content	Linking external web content to similar annotations of content
	Generation genre specific information gathering templates
Interface and Presentation	Intuitive, transparent user interface with second screen solution
Personalization and Contextualization	User tracking and profiling, with respect to activity and behavior processing
	Content filtering based on their preferences and interests
	Elaborate recommendations based on the semantic relationships and context between the user's preferences and the available content items
	Extend and refine user profile on the basis of user activity and social profiles

To relate the visions of LinkedTV more clearly to a market segment an overview of potential products and services that were identified by partners for common exploitation and described in D8.1 (Stanoevska-Slabeva, 2012) is given in Figure 22.

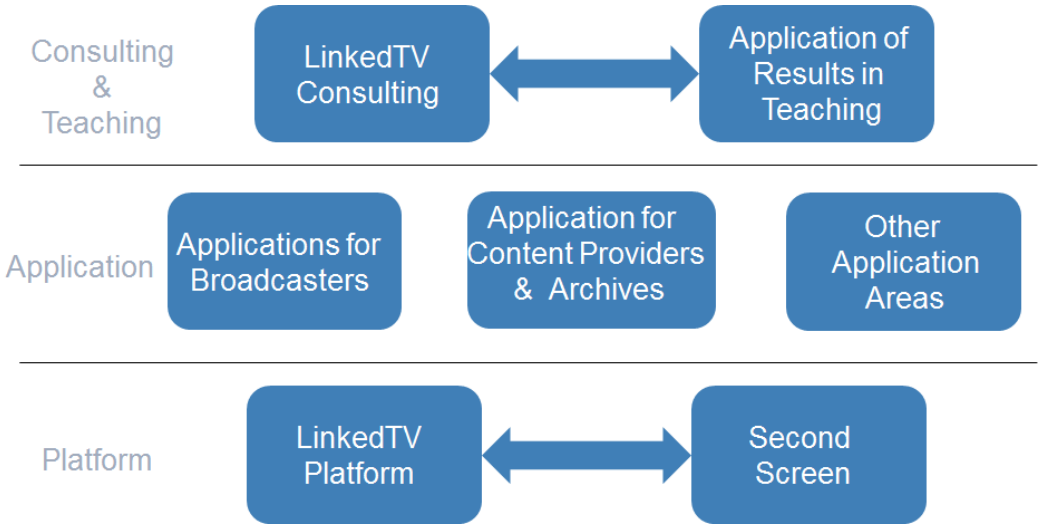

Figure 22: Summary and overview of LinkedTV results with potential for common exploitation

The potential results are divided and clustered in three layers: the technology and platform layer, the application layer and the consulting and teaching layer. Each component of the three layers is described shortly below.

Platform layer

The LinkedTV platform integrates all the results in terms of personalization, user interfaces, and automatic annotation of content and second screen synchronization. The platform is intended to be built according to the current cloud paradigm in software as a service (SaaS) manner. That mean the software and associated data are centrally hosted on the cloud and could be accessed by users using a thin client via a web browser.

Consulting layer

On the consulting layer consulting and teaching services are summarized that are possible by joining the specific innovative and complementary competencies of LinkedTV partners. By combining the complementary expertise, competitive consulting services can be developed. Teaching is the second type of common exploitation activities that can be developed in particular in context of specialized continuous or executive education. Specifically developed teaching modules based on LinkedTV results can be provided on the market jointly by universities and industry partners.

Application layer

On the application layer products and services are summarized that can be developed for specific customers based on the LinkedTV platform. Main target customers for applications within LinkedTV are TV stations and broadcasting companies as well as content providers.

The end application for TV and broadcasters provides additional and specific use of content, real time interactivity, support for new advertising approaches and a synchronization of linear TV with the second screen. For content providers and archives the application provides support for automatic annotation of content, new structuring layers on available content as well as efficient and attractive management and reviews of the available content.

Therefore especially the application layer will be focused on within our competitor analysis. We will compare the mentioned LinkedTV features with products of Telco provider, OTT network agnostic providers, Non-OTT network agnostic providers, broadcast providers, internet TV providers, SmartTV and specific video layer providers in order to detect LinkedTV's niche for potential products.

5 Competitor analysis

The comparison of LinkedTV with the sectors will be structured as follows. For each sector only a number of prominent and representative players have been chosen and contrasted against the feautres of the LinkedTV application layer. The players represent the state of the art in their market and show how LinkedTV performs against those players.

5.1 Comparison interactive TV: Telco Provider

		Telco Providers				
	Linked TV	T-Entertain	SwissCom	BT Vision	Virgin TV & Tivo Partnership	AT&T Multiview
Hypervideo Analysis	To video related content automatically/semi auto-matically annotated, similar content identified	Movie related information, actor related information, ratings,	Movie related information, actor related information, movies with same actor, more of this series	None	Movie related information, actor related information, movies with same actor, more of this series, Subtitles, Audio Description	None
Linking Video to Web content	Fragments of TV content clickable, compreh. descriptions	Scan QR Code on Website show on TV	Swisscom TV Apps: weather, news, pictures from own album, search	None	Apps Concept, Iplayer on TV, Spotify on TV, Twitter and FB on TV	Mobile Apps, Voicemail App, Weather APP, Calling on Screen, And during the NFL season you can track your Yahoo! Sports Fantasy Football team from within the U-bar. / Pizza order from Screen
Interface	Second screen, Kinect camera	EPG in Web and mobile	EPG and watch on TV, PC and mobile, Mobile APP	EPG on PC	EPG on TV, PC, Mobile, Apps concept	4 Screens at once
Personalization	History, collab. Filtering, ontologies	Journalistic tips of the day, recommendation of movies by rating 10 movies, naming favorite actors leads to recommendation of current movies with that actor on TV	Recommendation of similar movies and shows, also same actors (collab filtering), Set movies and programs as favorites	None	TiVO Suggestions, User uses thumbs up/down rating of running shows, wishlists movies starring favorite actors	U-Bar presonalizable, Multiview personalizable
Contextualization	Time, location, actions, physical state, mood , attention	None	None	None	None	None
Social Aspects	None	See Comments from other users	Recommend on Twitter, FB, Email	None	Webapps with FB and Twitter	None

Details		[1 Website][27]	[1 Website][28] [2 User Manual UPC Box][29] [3 User Manual Swiss Box][30]	[1 Website][31]	[1 Website][32] [2 User Manual TiVO Box][33]	[1 Website][34]

Table 7: Telco Provider vs. LinkedTV

Competitors of the Telco Provider section improve on LinkedTV only in the trend of implemented social aspects. The personalization task is fulfilled quite well by all 4 competitors. In that case the most competitors seem to provide equally comparable features as those of LinkedTV. However, contextualization among those products is totally missing and a linking of web content to to the TV program is only partly provided by AT&T Multiview in a very basic form of a sport tracker during the NFL Season. Other providers offer Twitter, Spotify, News, Weather or provider related apps that aren't related to the running program. A similar situation can be found in the hypervideo analysis area. Nearly all providers offer movie or actor related information. Swisscom and Virgin TV & Tivo Partnership even provide similar content like series or movies of the same actor. But in fact that is a very basic form of the LinkedTV goal as well. LinkedTV tries to connect to different sources of information with relation to the currently running program. It will be able to link the annotated content and show the user similar or related information while watching. The interface in LinkedTV will fulfill the requirements to control everything easily via remote control. As mentioned in chapter 4 the usage of internet on the TV will increase if functions are easier to control with the remote control. The competitors in this area seem to not have focused strongly on this aspect. They seem to have a different focus and cover other fields like EPG, 4 screens or mobile app concepts, which are rather a commodity.

We can summarize those insights as follows: LinkedTV's unique characteristics compared to Telco provider are mainly Hypervideo analysis, Linking Video to Web content, the Interface and the Contextualization.

[27] http://www.entertain.de/

[28] http://web.tvair.swisscom.ch/

[29] http://www.upc-cablecom.ch/user_manual_thomson_philips_pace_cisco_fs01.pdf

[30] http://shop.swisscom.ch/onlineshop/documents/content/non_products/bw_tv/bw_09/plus/plus_bedienen_de.pdf

[31] http://www.productsandservices.bt.com/products/tv

[32] https://my.virginmedia.com/discover/tv/tivo/

[33] http://shop.virginmedia.com/content/dam/allyours/pdf/tivo_complete_guide.pdf

[34] http://www.att.com/u-verse/explore/uverse-applications.jsp

5.2 Comparison interactive TV: OTT network agnostic

	OTT Network Agnostic Providers			
	AppleTV	Boxee Box D-Link	Roku	Project Canvas/Youview
Hypervideo Analysis	All Info on Items from ITunes Store	Genre, Title, Year, Actors and Director. Metadata IMDB (also MP3)	None	None
Linking Video to Web content	Streaming from ITunes and Icloud, Youtube, Vimeo, MLB (game plans, real-time scores, statistics tables), WSJ (News clips), Users Pictures and Music	Apps concept: MLB, NHL, Pandora, Flickr, Vimeo (100+) Boxee intelligently blends live broadcast TV with shows and movies from the Internet to give you one interface for everything you want to watch.	Netflix, huluplus, amazon VoD, crackle, hbo-go, Pandora, angry birds, ufc, wsj, … blinkx, blip.tv, break.com…	App Store-style resource
Interface	Ipad/Ipod Remote, Airplay Technology ioS on Screen	Boxee Qwerty Remote	Special remote, Iphone App	Beta phase
Personalization	Genius Technology for recommendation	Get show recommendations from your friends while you channel surf, and easily remove channels that don't speak your language.	None (except for apps)	Beta
Contextualization	None	None	None	None
Social Aspects	None	Get recommendation from friends (FB /Twitter), Sharing / Follow the activity of other Boxee users who were added as friends / publicly rate and recommend content. / control what media appear in the activity feed in order to maintain privacy.	None	Twitter / Facebook
Details	[1 Website][35]	[1 User Support Forum][36] [2 User Manual][37] [3 LiveBoxee][38]	[1] Website[39] [2 Manual][40]	[1 Mockup of the project prototype][41] [Cooperation of major Broadcasting companies]

Table 8: OTT network agnostic vs. LinkedTV

Similarly to the Telco Providers in this segment we find no contextualization at all. Providers in this area don't score regarding hypervideo analysis and Linking Video to Web content as well, although the solutions offer more details in comparison to the Telco Provider. Here more applications are provided and more information regarding the program is offered, but different sources with additional information about the watched content are still missing. However the interface solutions are much better (e.g. a special remote in the case of AppleTV) and could might compare to the envisioned standards of LinkedTV. The features of

[35] http://www.apple.com/chde/appletv/specs.html

[36] http://support.boxee.tv/forums

[37] http://download.xtreamer.net/Drivers/Ultra/PDF/BOXEE-USER-MANUAL.pdf

[38] http://www.boxee.tv/live

[39] http://www.roku.com/roku-channel-store

[40] http://www.roku.com/Libraries/Roku_Player_Documents/Roku-HD-QSG.sflb.ashx

[41] http://paidcontent.org/2009/11/13/419-bbcs-huggers-gives-project-canvas-iptv-preview-says-were-not-doing-soci/

personalization and social aspects seem to be implemented, although only Boxee shows highly specialized social features.

5.3 Comparison interactive TV: Non-OTT network agnostic

	Non-OTT network Agnostic Providers (Plattforms / HTPCs/ PVRs)			
	CloudTV	HbbTV	XBMC	Windows Media Center
Hypervideo Analysis	None	Additional information to the program e.g. in a cooking program the recipe	Webscraping synopses, reviews, movie posters, titles, genre classification, and other similar data.	None
Linking Video to Web content	Applications running on the Cloud (Webvideo on STB) Browser in the Cloud, Webbased Authoring	Interactive features via internet connection	BBC iplayer, Hulu, Netflix, Veoh, Youtube, Pandora, Flickr, EPGs, email clients, instant messanging, train tables, home automation, Games…	Hosting its own IE
Interface	Multi Screen	EPG, news, apps	Additional Webinterface, Skinnable GUI,	Webinterface, Integrated into Windows7
Personalization	Personalized mosaics(Apps) /TV Apps Advanced Advertising	Personalized teletext: category, color, size	None	None
Contextualization	None	None	None	None
Social Aspects	FB Twitter Integration	None	None	None
Details	[1 Website][42] [2 Whitepaper][43]	[1 Website][44] [1 PDF][45] [2 PDF][46] [4 PDF][47]	[1 Architecture][48]	[1 Website][49]

Table 9: Non-OTT network agnostic vs. LinkedTV

Similar to the Telco providers and OTT network agnostic providers, Non-OTT network agnostic provider lack a more complex implementation of hypervideo analysis and more content related web linking. The interfaces are in the fashion of the telco provider. There are no solutions for an easy handling of complex options, but all of the products provide EPGs or skinnable GUIs. The personalization is limited to personalized apps, advertising and Teletext, colors or size. Content recommendations and contextualization features are missing. Even the social aspects are neglected except for a Twitter integration of CloudTV. LinkedTV

[42] http://www.acftivevideo.com/

[43] http://www.activevideo.com/files/pdf/CloudTV_Technology_022912.pdf

[44] http://www.ard-digital.de/Empfang--Technik/HbbTV/HbbTV

[45] http://tech.ebu.ch/docs/techreview/trev_2010-Q1_HbbTV.pdf

[46] http://www.hbbtv.org/pages/news_events/Sym-12-2011/3.1%20-%20Germany%20APS%20ASTRA%20-%20HD-Forum%20Symposium%20111205.pdf

[47] http://www.tv-plattform.de/images/stories/pdf/hybrid-tv_white-book_2011.pdf

[48] http://en.wikipedia.org/wiki/File:XBMC_Architecture_Overview_Schematic.png

[49] http://en.wikipedia.org/wiki/Windows_Media_Center

seems to be able to distinguish itself especially in comparison with the Non-OTT network agnostic software.

5.4 Comparison interactive TV: Broadcast Providers

	Broadcast Providers (VoD)					
	BBC Iplayer	RTE	ARD Mediathek	Canal+(France), OTT can be bought additionally	SVT	Mediaset Premium
Hypervideo Analysis	Information about program	Information about program	Information about program	Information about program	Information about program	Information about program
Linking Video to Web content	None	None	None	Video can be embedded to own site, blogs, webpages etc. embedded	Video can be embedded to own site	None
Interface (e.g. Second Screen)	Synchronized different devices	None	None	EPG, HD, WIFI with Hardware, on different devices	Remote via cellphone, EPG, on different devices	On different devices, EPG
Personalization	favorite programs, personalized Iplayer home page, login, user data, recommendations friends, most popular, for you (by behavior)	List of recently watched videos, recommendation most popular	Recommendation most popular, best rated, most common terms	Login via Facebook or canal+ id, record function with hardware	None	Login required, most seen recommendation
Contextualization	None	None	None	None	None	None
Social Aspects	Recommendations via Facebook, Twitter, recommendations appear in friends Iplayer home pages, watch with friends (MSN)	Share Facebook, twitter, mail	share Facebook, twitter, del.icio.us,mister-wong, digg, yigg, google+	Recommendations via Facebook, Twitter, google+, see people, that liked it on Facebook	share Facebook, twitter, google+,	share Facebook, twitter
Details	[1 Website][50]	[1 Website][51]	[1 Website][52]	[1 Website][53]	[1 Website][54]	[1 Website][55]

Table 10: Broadcast provider vs. LinkedTV

Broadcast providers are quite similar to Telco providers except for the option of linked web content that is missing completely. Hypervideo analysis is only related to program information. The features of the interfaces often concentrate on synchronized devices, which go into the same direction of the planned second screen solutions of LinkedTV. The personalization corresponds to the goals of LinkedTV especially the BBC Iplayer provides a lot of interesting solutions which could be build upon. Contextualization is missing once again, but social aspects are particularly well implemented. All in all LinkedTV's unique

[50] http://www.bbc.co.uk/blogs/bbcinternet/2010/05/introducing_the_all_new_bbc_ip.html

[51] http://www.protocall.ie/resources/video/how-to-use-the-rte-player/

[52] http://www.mediathek.ard.de/

[53] http://www.canalplus.fr/

[54] http://www.svtplay.se/

[55] http://play.mediasetpremium.it/home

characteristics compared to broadcast provider are once more hypervideo analysis, linking of video to web content, the interface and the contextualization.

5.5 Comparison with Internet TV

	Internet TV Providers (VoD/OVSP/OVP)					
	Youtube	Amazon Instant Video	Netflix	Hulu	Limelight	Wilmaa
Hypervideo Analysis	Closed Captions (translated)	None / Actors, Plot etc..	Closed Captions	Closed Captions	Closed Captions	Actors, Infos in EPG
Linking Video to Web content	Comments, Embedding, Linking, Ratings, Deep linking	Comments		Ratings, Comments, Forum, Embedding	Searchable videos	None
Interface	HTML5, Smartphones, Xbox, AppleTV…	Xbox, Tivo, Bravia	Game consoles, SmartTV, PC, Mobile, API	Game consoles, SmartTV, PC, Mobile,	B2B CMS, CC Search integration	Jump back to start, zapping, App
Personalization	Recommendation based on coll. Filtering, Past user history, Social Network	History, collab filtering	1Mio Netflix contest	Favorites, Based on personal favorites	Ad-server integration	Live Quotes, Live Likes, Favorites
Contextualization	Localization	Localization	Localization	None (Localization)	None	None
Social Aspects	Embedding on any HTML page	Amazon users	Cancelled own Friends feature / FB integration	Email, FB, Twitter	Email, FB, Twitter	FB, Twitter
Details	[1 Website][56]	[1 Website][57]	[1 Website][58]	[1 Website][59]	[1 Website][60] [2 Forum][61]	[1 Website][62]

Table 11: Internet TV vs. LinkedTV

Internet TV has in contrast to the other providers very well implemented social aspects. A main distinction are the contextualization options of the internet TV providers. The interfaces are able to adapt to the context of the device the Internet TV is used on. Although mostly laptops or smartphones are used to watch Internet TV, the interaces might as well adopt to big flat TVs (e.g. Youtube). Therefore the requirements are hardly comparable to LinkedTV. The personalization is comparable to BBC Iplayer. Recommendations based on collaborative filtering, user history and social networks offers LinkedTV rather a point of reference than a

[56] http://en.wikipedia.org/wiki/Youtube

[57] http://en.wikipedia.org/wiki/Amazon_Instant_Video

[58] http://en.wikipedia.org/wiki/Netflix

[59] http://en.wikipedia.org/wiki/Hulu

[60] http://www.limelightvideoplatform.com/product/search-inside/

[61] http://www.hulu.com/discussions/18

[62] http://www.wilmaa.com/info/de/

unique characteristic. The USPs of LinkedTV in comparison with InternetTV is the option to annotate the content automatically or semi automatically in order to find similar content and link it to different sources.

5.6 Comparison Internet Specific Video Layer Providers

	Internet Specific Video Layer Providers				
	WireWax (technology provider)	Clickthrough (Music Videos)	AttractTV (Technology Provider)	Videoclicks (Technology Provider)	Linkto (Technology Provider)
Hypervideo Analysis	Every customer can add information manually	Videos are analyzed, linking to information about products, places, people		Automatically analyses the video, tracks places, peoples, products	Every customer can add information manually
Linking Video to Web content	Videos are taggable	Links to shops related to seen product, links to similar products, more infos with links to webpages	Widgets for online content provider, allowing the viewer to interact with the show	Linking the analyzed content is open to the customer	Videos are taggable
Interface		Lists, links, video hover, chats, comments, polls	Widgets can be chosen		Interface of the player can be customized
Personalization	Login via Facebook, create own videos with tagging	Comments , chat, favorites, wishlists for products	Widgets can be adapted, new widgets can be created	Content can be linked to own ads	Content can be linked to own reference pages
Contextualization	Metrics of customers: interaction & retention : see how your viewers have interacted, live world view: see the globe light up with your viewers, time of day: see when viewers are watching, social spot: social trends and see where your video is mentioned, embedded location: see what websites have embedded your video, Devices: see what devices viewers are using to interact			Customers behavior can be tracked via metrics	User behavior tracking
Social Aspects	See Contextualization	Comments, chats, polls	Social widgets like Facebook, twitter etc.	Videos on the page , the product can be shared, voted	Fully interactive shareable on Facebook
Details	https://studio.wirewax.com/ Target Group marketing, Create a complete custom experience for your audience by adding extra features and functions that can generate engagement and revenue.	http://www.clikthrough.com/ Product placement in videos	http://www.attractv.com/ Target group: Online video publishers	http://www.videoclix.tv Product placement in videos	http://www.linkto.tv/ Product placement in videos

Table 12: Specific Video Layer Provider vs. LinkedTV

The comparison with the presented internet video layer provider is quite difficult. The so far mentioned USPs can no longer be considered unique characteristics in this market. Hypervideo analysis and linking video to Web content in the sense of LinkedTV are important features of these competitors as well. Additionally most vendors also implement social aspects. However, the target group of the video layer provider should be is different. The sectors are mainly marketing and product advertising. Furthermore, most of the applied approaches for hypervideo analysis and annotation of content is manual and not automated

as proposed by LinkedTV. LinkedTVs options could be either to distinguish itself by targeting other sectors or learn from these competitors and provide similar automated solutions for the same sectors.

5.7 Comparison with SmartTV

	Smart TV				**Game Console**		
	Samsung	Philips	LG	Google TV	Playstation	XBox	Wii
Hypervideo Analysis			Pulls information about films from internet	None	Download different apps, e.g. BBC Iplayer, Netflix, mubi, canal+ on game consoles		
Linking Video to Web content	Apps can be installed	Apps can be installed, used while watching	Apps can be installed	App based, Chrome integrated, Youtube Integrated			
Interface	synchronized devices, 3d	synchronized devices, Multiview, EPG, 3d	synchronized devices, 3d	Second Screen Integration			
Personalization	Recommendation based on behavior, including social network information (twitter, Facebook), ratings		Login, personalized apps etc.	None			
Contextualization	Gestures controle			None	Gestures with Kinect Camera / PS3 Eye possible		
Social Aspects	Access facebook, skype, twitter from tv	Access facebook, twitter from tv	Access facebook, twitter from tv	None	Watch movies virtually together with friends in PS3 online environment	None	None
Details	[1 Website][63]	[1 Website][64]	[1 Website][65]	[1 Website][66]			

Table 13: SmartTV vs. LinkedTV

The last comparison in the application layer is LinkedTV vs. SmartTV. Similar to most of the compared sectors except for the video layer provider the producst offer no hypervideo analysis and linking of web content in the sense of LinkedTV. Interface and personalization is provided on the same level of LinkedTV's requirements. Social aspects are implemented similarly to most of the compared sectors by offering Facebook, Twitter and Skype on the TV screen. Additionally Samsungs SmartTV solution and the game consoles vendors have successfully implemented gestures features, which show that the user tracking concept of the University of Mons (compare Table 6) indeed has a high market potential.

[63] http://www.samsung.com/us/video/tvs/UN55ES7550FXZA-features

[64] http://www.newscenter.philips.com/de_de/standard/news/consumerlifestyle/20100310_philips_bringt_smart_tv_ins_heimische_wohnzimmer.wpd

[65] http://www.youtube.com/watch?v=IKjsVWwWhMU

[66] http://www.google.com/tv/index.html

6 Discussion and Conclusions

After reviewing most prominent products and vendors from each market and comparing them to the features offered by LinkedTV, we would like to discuss the implications and potential requirements that result from this comparison. The requirements will create a base for discussions regarding LinkedTV's envisioned market niche and the potential LinkedTV product(s).

6.1 Discussion regarding hypervideo analysis

We have seen that most commercial OTT / SmartTV solutions don't offer hypertext analysis, but instead use a combination of web scraping / movie databases or manual entries to create the electronic program guide (EPG). Among prominent internet video providers (e.g. Youtube, Netflix etc.) we have found that numerous players already use automatic speech recognition (ASR) in order to provide closed captioning for their programme. Finally among broadcasters, depending on the country, the TV programme is often equipped with manually coded high quality subtitles (e.g. BBC). Although EPGs and close captioning seem to have become a commodity in the IPTV era, they often still lack detail regarding the contents and meta-information about the show. LinkedTV's hypervideo technology might be able to step in, and create a rich source of information that can be tapped using a service paradigm. Therefore, almost all vendors that equip their systems with EPGs or use some form of close captioning, could be seen potential partners and a potential market for the LinkedTV technology. On the other hand we see that there are a numerous academic projects and proprietary efforts, especially in specific domains (such as e.g. surveillance, retail and transportation), which already use different combinations of hypervideo analysis. These solutions are often successful because of their very specified domain (see above), that makes e.g. the detection of certain objects (e.g. quality control) or events (e.g. persons in prohibited areas of the picture) successful. On the other hand we see the different manual approach on hypervideo annotation, which is mainly applied among the solutions that are providing video overlay layers. Here the annotation is usually created by numerous editors by hand with a very specific goal in mind e.g. drive sales of a certain product in the promotion video. These annotations usually have a high quality because they have been created by trained staff and were limited to only a very few number of promotional videos. Tightly related to this form of annotation we find that there are already numerous tools available for video annotation, which are already or might at some point be used to interoperate with the video overlay providers. Subsuming this overview we see a requirement for LinkedTV to find an automated hypervideo analysis solution that will fulfill mainly two perquisites: The LinkedTV solution should be able to work with video material from nonspecific domains, in order to be able to operate as generic service provider that is able to enrich video material. The quality of the automatic annotations must meet the standards that are set by manual encoding (as being done for close captions or manual hypervideo annotation).

6.2 Discussion regarding the linkage of video with web content

Regarding the linkage of video content with web content, we found that most of today's products only make limited use of the fusion of web and TV. They mostly only link to additional TV-shows, actors or plot contents regarding the show (e.g. XMBC, T-Entertain OTT or ITunes). If such providers were to include more entities that can be linked to, then LinkedTV might come into play as a potential source of information. Therefore almost all products from the different markets could potentially use LinkedTV's technical solutions. Regarding the linkage of users and TV-material we see the social revolution unfolding on the TV Screen. Providers such as AppleTV, Roku or Boxee already include user generated comments and rating in their solutions. Here we see potential for LinkedTV in helping to include or aggregate the myriads or already existing comments or ratings on TV-shows into their repository by for example using highly structured sources such as IMDB or open social media alternatives (e.g. Twitter comments on certain movies or TV-shows). Finally regarding the close integration of video with web content, we also see a number of SmartTV vendors that have chosen a different path: Instead of closely integrating web and TV content alongside, they have created closed repositories of specialized applications (app stores), in which each app provides specific web content on the screen. Although this approach actually uncouples the power that LinkedTV is trying to harness, this approach also relaxes a number of quality and user interface issues that go along with a tightly coupled approach. Instead in the app paradigm, each piece of web information is curated by editors and presented in a "TV acceptable" manner. This concept might even turn the way we think about linking video with web content upside down: Instead of a user selecting a TV programme first and then obtaining interesting additional information on the viewed content, the user might chose to select an app that reflects his interest (e.g. EBay) first, and then let the application find relevant TV content that is available on the items that the user is interested in. The third way of linking the TV and web world, attempted by providing various browsers for the TV screen that should potentially be able to automatically transform the web pages in such a way browsing the web on TV feels actually as comfortable as on the computer. This problem has so far never been solved properly (yet is still tackled by numerous companies e.g. Samsung or Steam Big Screen) and hinders the acceptance of web browsing on the TV. Instead users and vendors are shifting towards the second screen paradigm, where browsing is performed on one device and watching on another. Regarding the side by side integration of TV and web content that goes by the "red button" functionality has also opened new perspectives: A number of already available HbbTV applications seem to be potentially able to actually enrich the TV experience, but more user studies are needed in order to find out which kind of enrichment is actually needed by the user. Here LinkedTV's strengths might come into play by providing new ways of presenting the linked material and also providing new types of linked material to the user. Finally regarding the linkage of TV and web on the internet we have found numerous projects offer the technology for a manually encoded video overlay layer (e.g. WireWax, Clickthrough) and a simple form of overlay layers already exists since

2008 on YouTube. Yet the results of the acceptance of such overlay layers are rather mixed. LinkedTV might explore the success factors and scenarios of popular products.

6.3 Discussion regarding the recommendation features

The competitor analysis shows that the majority of commercial OTT boxes already offer recommendation for movies as a standard feature (e.g. TiVo, T-Entertain, and Netflix). A number of VoD providers have already developed either their own recommendation engines or are cooperating in providing recommendations for their users. For example Amazon's collaborative filtering system has the advantage to be based on a huge data corpus that is driven by their insights from sales. YouTube has switched from a random walks approach[67] to also a collaborative filtering approach, where the data corpus is not based on entire TV-shows or movies but on the myriad of available short clips on the platform. The provider additionally includes historical behavioral data such as comments, likes and clicks. The third notable player is Netflix, who provides his own highly competitive recommendation engine (i.e. 1 Mio Netflix competition), which is now integrated in a number of other existing solutions (e.g. Roku, SmartTV apps or AppleTV). However, the standard way in TV personalization seems to be conducted by aggregated household preferences. OTT boxes are not bothering the users with login and/or switching users and cannot benefit to do this automatically by physical recognition of users (provided user consensus). It has been noted how this is a major disadvantage (e.g. children's preferences aggregated with parents' preferences, guests adding their own circumstantial preferences to the household preferences).

The recommendation approach proposed by LinkedTV is compared to the prevailing recommendation of videos, focusing on the video content and recommends concepts in the video and content for that concept. Thus, it can be considered as complementary to prevailing recommendation approaches focusing on the selection of videos. Here potential LinkedTV advantages might be developed by acknowledging the fact that TVs in many households are used by multiple users, and using this context based approach in finding either better or other recommendations for a user. The second potential advantage of a LinkedTV solution might lie in the fact, that most recommendation engines only recommend other video material, where LinkedTV might recommend different sorts of entities such as websites, (e.g. Wikipedia entries), that might be equally relevant for the user at the given time. Yet some challenges remain: Such as finding a way of individual addressability of a user in e.g. a HbbTV context implying technical & legal issues, and secondly given the rather (so far) small corpus of LinkedTV, even when being able to provide better recommendations than the status quo, the recommended video items will only be limited to the LinkedTV corpus. Additionally the recommendation task has to address legal issues such as certain content providers only being able to link to items only for a certain amount of time (see RBB scenario). Finally we also like to highlight a different development in the recommendation market where certain groups of users completely omit built in recommendation engines of

[67] http://glinden.blogspot.de/2011/02/youtube-uses-amazons-recommendation.html

OTT boxes or providers and either rely on social clues (Facebook or Twitter) or use meta providers (such as hunch.com or Pintrest.com) that provide different types of recommended material based on the aggregation of a myriad of self-provided user attributes and interests.

6.4 Discussion regarding the LinkedTV interface

As already mentioned in the previous chapter, the discussion on TV interfaces is complex and fragmented (e.g. app paradigm vs. red button paradigm, vs. TV browsers). Additionally the discussion is also fuelled by the duality of the second screen vs. 10 feet interface paradigm. What we found among established products, is that their way of reacting to these developments is to provide 10 feet interfaces, but additionally adding second screen, web and mobile interface options. Some providers chose to outsource certain complex tasks e.g. programme planning on web interfaces (T-Entertain), while still offering the possibility to review the settings on a regular TV interface. Second screen solutions seem to be mostly realized as IPhone or IPad, respectively Android apps, that yet in most cases lack a complete integration with the TV content. Beyond the efforts from the vendor's side, we have also seen that users have chosen by themselves to use their second screen devices to access either related content or completely unrelated content while watching TV. In some cases vendors have also acknowledged the fact that the TV screen might even become the second screen, as in the example of AppleTV, where a user browses the web and then projects selected web clips or videos on the TV screen in order to share them with the others. Finally the red button paradigm that might be considered as hybrid of both approaches (10feet vs. second screen) will have to first prove its usefulness. This is where LinkedTV's potential might come into play: By exploring different types of prototypes that match the user's needs, the power of this paradigm might be harnessed. For this task the user's needs regarding this type interface will have to be evaluated in depth. Regarding the implementation of gestures we already find companies such as Samsung that are already providing features such as speech detection, face detection and gesture detection in some of their appliances, by harnessing their leverage of controlling both hardware of the TV screen and the operating system. In other cases game console providers have acknowledged the fact that their products are highly capable of capturing gestures. Here the already socially accepted webcam (e.g. PS3) and other handheld devices (e.g. Wii U) are used as innovative devices to control the TV in innovative ways. On the backend side of TV-show production and curation, we have seen that there are already a numerous competitors that offer complex solutions that both provide a user interface for content creators and curator (e.g. Limelight) to annotate and manage content and make it easy to publish this material to a certain user base on the frontend. One of LinkedTV's strengths might lie in acknowledging the fact, that the processes that are needed to transform a raw video into an annotated hypervideo linked are complex. A potential LinkedTV product might help reduce this complexity by providing smart interfaces that harness the power of the underlying automated video annotation engine. Finally certain practical aspects have to be kept in mind, as for example that an actual integration of an innovative LinkedTV interface on household devices

will only be possible, when these devices possess enough CPU power to run the envisioned LinkedTV interfaces.

6.5 Discussion regarding the contextualization of LinkedTV

The discussion regarding the contextualization of LinkedTV is tightly coupled with the issues already discussed in the interface section. Yet here in general we would like to introduce the question of how big is the user's need for contextualization, actually is? In our market research we have only rarely found products that provide the extensive features that are envisioned in LinkedTV. This might have either legal or technical issues, or simply have to deal with the user acceptance of certain devices (e.g. webcam) or techniques (user login on TV screen) that are needed in order to provide such a service. What we found in most products are very simple contextualization features such localization of their content (e.g. Youtube, Wilmaa) or different versions of the same material that can either be viewed and interacted with on mobile phones or large TV screens. Regarding the contextualization of a user's position towards screen, we find that those especially game console products such as the Xbox 360/720, or ps3/4 Panasonic provide cameras which are tolerated by the users. Such systems might be the first innovators providing a contextualization of the display of material based on the user's position in space. Finally we also see that certain TV vendors such as Samsung provides potential contextualization of content using the camera, in regard to the user's position, which has been discussed in the previous chapter.

6.6 Discussion regarding the content provided on LinkedTV

From the competitor analysis we see that both the broadcasters (e.g. BBC) and the internet TV players such as Amazon, Hulu, Netflix or Youtube have both access to a huge repository of content because of their strategic alliances and partnerships. This results in a wide reuse of existing TV content not only among allied broadcasters but also along the value chain, where e.g. HBO produced material is disseminated through a Netflix account that is consumed through a Boxee OTT box. Additionally all major TV channels have immersed their content into the web by running own VoD portals, which usually give access to recently screened material and at some degree to archive material. Although LinkedTV has RBB as a consortium member, and thus has potentially access to offer access to a big content corpus, its efforts are dwarfed by the magnitude of material that is provided through its potential competitors. LinkedTV might need to establish strategic connections to additional broadcasters and other players along the value chain, to understand how the LinkedTV platform might help in the complicated process from production to dissemination of TV material. Harnessing the industry knowledge of consortium members, might help to explore opportunities for the project to either integrate more third party content into the platform, or make the platform open to customers who want to integrate their content onto the platform in such a way that it benefits both sides. Finally it is also worth thinking about how a holistic approach regarding the perspective of content management and curation on the

producer/broadcaster side, and the perspective of interested users accessing the content through e.g. HbbTV devices might help to create an even competitive product.

6.7 Discussion regarding current trends

Regarding the discussion on current trends we find that a variety of social TV features have already been implemented in agnostic third party OTT boxes (e.g. Boxee), and have become the de facto standard among players in the internet TV market. One might argue that the success of portals like YouTube is partly due to their heavy possibility to share and comment on content.

Despite of the growing importance of Social TV, it is not the focus of the research R & D activities of the project. However, given the growing importance of the trend towards social TV, the Linked TV consortium is observing the developments in this area very carefuly and is considering the integration of such features alongside the hypervideo experience, by reusing exsisting solutions in HTML5 and HbbTV. Thereby, the focus of LinkedTV is rather the sharing of content and concepts contained in the video, than social sharing of videos and information about videos. Only a minimal integration of social features, might benefit the project both in the envisioned recommendation tasks, and in a potential user adaption or at least dissemination of the project.

Regarding LinkedTV's position in respect to the mobile trend, there is also untapped potential. What we find is that the various IPhone and IPad based second screen solutions that are used by major players in the IPTV market not only offer various innovative possibilities in terms of user interfaces, but have a strong potential to be the actual bridge that needs to be crossed in order to obtain a linkage between web and TV.

6.8 Conclusion regarding the USP of LinkedTV

Regarding a differentiation and the USP of the project, we have seen that there is a multilayered perspective on the potential exploitation outcomes. So far the envisioned scenarios do not converge towards one product, that solves a highly defined set of user needs, but rather show opportunities and paths that might be explored. The faster a clear vision and along with it a (set) of potential products can be defined the better the chances for LinkedTV to establish itself in the very crowded market. As mentioned in chapter 4 we see a number of possibilities for LinkedTV to find a place in this very mature market:

- LinkedTV as a HbbTV product:
- LinkedTV as a new format
- LinkedTV as a platform
- LinkedTV as a service
- LinkedTV as technology provider
- LinkedTV integrated into existing VoD portals

In order to find the potentially best alternative it will become crucial to determine the limiting factors of the project and to find a common vision. LinkedTV will need to determine both its position in the value chain of IPTV and find a niche in the corresponding markets. We seek to find answers to the questions that have been raised in the discussion by developing online questionnaires for the consortium partners, who in their role as industry experts are much more qualified to highlight the potentials and risks of each alternative.

6.9 Next Steps in WP8 and the market analysis

D8.2 is the first deliverable related to the market analyses. This first deliverable was focused on general trends and pointed out potential competing, complementary and future developments on the IPTV market. This global and generic focus was necessary in order to set the scene for further in-depth market analyses addressing the end user and potential business customers of Linked TV.

Based on the overview provided in the deliverable, it was possible to position the innovations and potential products of Linked TV in current market developments and trends. It is also possible to:

- understand and prioritize requirements in the development.
- better focus exploitation activities during and after the project.
- focus better next steps in the market research.

The findings of this broad market analyses are the bases for the future activities in the project. In particular the following activities are planned and already performed:

- Based on the overview of existing players and emerging players on the IPTV market, more detailed value networks for different IPTV ecosystems will be conceptualized and the Linked default products will be positioned within these value networks.
- Based on the value networks, potential customers and partners will be identified, which are active on the market and can be direct customers of Linked TV and that furthermore might also be invited to participate in the advisory board of the project.
- Potential interview partners will be identified based on the value networks in order to participate in the more detailed market analyses.
- The findings will also be used in order to focus and further define the methodology for the end user market research.

The next steps in the market analysis will involve in-depth empirical analysis of the market requirements and potential from the perspective of business and end user customers of the LinkedTV technology.

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