The Connected TV Opportunity

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Abstract
There are many existing solutions in bringing Internet content into the domain of television. Earlier products have not been integrated in the television. Their success has been limited. Connected TV is a television that is directly connected to the Internet. There is no need for an external device to get Internet content on a television screen. Although when integrating the hardware in the television screen it makes it difficult to upgrade without replacing the whole television screen.

This report discusses what the prerequisites are for Connected TV to succeed as a Video On Demand service. Connected TV creates a new business arena, where old business models are outdated and new emerges. In theory Connected TV could bypass many operators in the existing content delivery value chain. A value chain that today consists of content owners, TV channels, re-distributors and access providers.

The methodologies used for this thesis are literature studies, expert interviews and expert surveys. Two relevant conferences have also been evaluated to complement this research.

The results are showing that Connected TV requires high bandwidth access on the current Internet access networks. The current Internet infrastructure in Sweden enables coverage of up to 54% of the Swedish households when using low quality services and less then 29% when using high quality services. The consumer will need to do an additional connection to the television to gain access to the Internet content and this could result in less potential users of Connected TV. Experts speak about the need for a standardized platform for Connected TV. At the moment of writing, almost every major consumer electronics company has its own proprietary platform. This makes it difficult and expensive for small VOD stores to gain access to Connected TV, because of the need to develop applications for several different platforms.

The connection to the Internet needs to be made as simple as possible for Connected TV. Wireless connection is thereby to prefer. An increased usage of Connected TV demands a greater supply of accessible Video On Demand content through Connected TV and this also demands shorter and more equal release windows for online Video On Demand.

Experts within the area of Connected TV agree that there needs to be a seamless integration of online video with the traditional broadcast streams on the Connected TV in order to make it easy for the consumer to choose from content and distributor.

Many different consumer electronics companies are developing competing platforms for Connected TVs and there is a lack of standardisation that could improve the ongoing development. There is yet no clear winning concept for these platforms and it is likely that Connected TV still is ahead of its time.

Connected TV will not go away and needs to be considered as a new channel of content for all content producers and content delivery companies, because most of the new televisions today comes with Internet Connectivity. Connected TV is like a trojan horse, it will enter the living room when consumers buy new televisions whether they asked for it or not.
Möjligheterna för Connected TV

Sammanfattning


De metoder som används i denna exjobbsrapport är litteraturstudier, expertintervjuer och expertenkäte. Två relevanta konferenser har också utvärderats för att komplettera denna studie.


Anslutningen till internet bör förenklas så mycket som möjligt för Connected TV. Trådlöst internet är därför att föredra. En ökad användning av Connected TV skulle även ställa krav på ett större utbud av innehåll via video on demand och releasefönstren bör därmed minskas för att tillgodose detta behov.

Experter inom området för Connected TV är eniga om att det bör vara en sömlös integrering av online-video med de traditionella broadcast-strömmarna i Connected TV, för att på så sätt underlätta för konsumenten att välja innehåll från olika leverantörer.

Många olika hemelektronikföretag utvecklar konkurrerande plattformar för Connected TV och det finns en brist på stardisering som skulle kunna främja den pågående utvecklingen. Det finns ännu inga tydliga tendenser för vinnande koncept bland de olika plattformarna och det är troligt att Connected TV är före sin tid.

Connected TV kommer inte att försvinna och det bör betraktas som ännu en kanal för distribution för innehållsproducerer och distributörer av medieinnehåll, då de flesta nya TV-skärmar redan har internet-åtkomst. Connected TV är likt en trojansk häst som kommer finnas i konsumenternas vardagsrum när de köper en ny TV vare sig de har efterfrågat internet-åtkomst i TV-skärmarna eller ej.
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Acronyms and definitions

3G - 3rd Generation mobile telephone network

4G - 4th Generation mobile telephone network

ADSL - Asynchronous Digital Subscriber Line. A technology used to deliver Internet the last mile to premises using the existing telephone copper network. Asynchronous meaning that it is not equal bandwidth uplink and downlink.

BR - Blue Ray. A disc possible to store HD and 3D quality movies and data.

Cable - Refers to Cable Broadcasting Companies

CE - Consumer Electronics. Consumer electronics companies produce televisions among other things.

DSL - Digital Subscriber Line. A technology used to deliver Internet the last mile to premises using the existing telephone copper network.

FTTN - Fiber To The Network. Meaning that fiber optic connections are accessible in the backbone network.

FTTP - Fiber To The Premisses. Meaning that fiber optic connection are accessible at the premises.

HD - High Definition. High definition resolution is 1080p (1080 vertical lines) for full HD and 720p (720 vertical lines) for HD ready.

HTTP - Hypertext Transfer Protocol. A network protocol used in the Internet to deliver data.

IPTV - Internet Protocol Television.

ISP - Internet Service Provider

iTV - Interactive Television.

LAN - Local Area Network

Microsoft Silverlight - A web application framework

MPEG - Moving Pictures Expert Group. A video compression algorithm

OTT - Over The Top. A term generally used when delivering video over the top of existing Internet access networks.

PON - Passive Optical Network

PSTN - Public Switched Telephone Network

PVR - Personal Video Recorder. Usually a set-top box with a hard drive that can record and time-shift broadcast television streams.

QoS - Quality of Service

Satellite - Refers to Satellite Broadcasting Companies
SD - **Standard Definition.** *Standard definition is 576 vertical lines.*

UI - **User Interface**

VOD - **Video On Demand.** *Video that starts at the request of the user.*

Wifi - **Refers to products that can access wireless networks or the networks themselves often based on the standard IEEE 802.11 specifications.**

xDSL - **Any Digital Subscriber Line.** *A technology used to deliver Internet the last mile to premises using the existing telephone copper network.*
1 Introduction

To connect a television to a computer is easier now than a few years ago, mainly due to more digital connections on the television. One of the new functions that can be found in the televisions is direct access to the Internet with Ethernet or Wi-Fi; this is called Connected TV. Connected TV is a way to get access to Internet content on the television without the use of a separate computer or set-top box as a link between the television and the Internet access network.

This work has been done in cooperation with Film2Home. Film2Home has contributed with contacts and information of the video on demand industry. Film2Home was founded in Sweden in 2001. It is a part of the Bonver Company, who is the leading distributor of home entertainment products in the Nordic region. Film2Home is a digital distributor of video on demand over the Internet. With their services it is possible to legally download or stream movies directly to the home computer. Film2Home rent and sell movies over the Internet and have digital distribution to other operators on the market. As part of the Bonver company they have over 20 years of experience and a close cooperation with all major Swedish and foreign studios. Film2Home wants to offer the biggest supply of new and old movies from all rights holders. Film2Home now has the ambition to make its service available to the public through Connected TV.

1.1 Objective

This final thesis is going to research how Film2Home could use Connected TV as a new channel for their digital film distribution. The main focus will be on what advantages and disadvantages Connected TV has compared to competing technologies.

1.2 Question formulation

What are the prerequisites for Connected TV to succeed within the area of future film distribution?

1.3 Research problem

To find out the prerequisites needed for Connected TV to succeed an analysis of the market as it is today needs to be done. What kind of role different actors in the business play and what the prospects are for the future. How the technology works and what the general problems and limitations are with video on demand for Connected TV.

1.4 Main goal

The main goal of this thesis is to present the prerequisites needed for Connected TV to succeed regarding technology, economics and social context. Another goal is also to present an overview of the Connected TV area of how it looks today and what the expectations are for the future.
1.4.1 Research questions

To give answers to the main problem the following research questions have to be answered:

- In what way can Connected TV be a part of the media landscape?
- How could the technology and existing infrastructure be limiting for Connected TV to succeed?
- Is Connected TV a threat to existing business models in the TV and movie industry?

To answer these questions, following research will be done:

- Research of what the broadband coverage is in comparison to the bandwidth needed for Connected TV.
- The Different platforms for Connected TV will be discussed in relation to earlier attempts in bringing Internet content on the television.
- Research of what the advantages and disadvantages of current VOD distribution systems compared to those of Connected TV.
- Research of different factors in current business models that can be critical for the development of Connected TV.

1.5 Scope

To cover all the prerequisites for Connected TV to succeed will be too extensive for this work. This report will focus on video on demand within Connected TV.

There will only be a minor evaluation of the existing platforms for Connected TV, this because they tend to change over time and might not look the same when this report is finished.

Due to limited time and money for writing this report, no larger surveys have been made. To compensate this a small group of experts have been interviewed and a survey has been handed out to all the experts.

This report will mainly focus on technical demands and infrastructure of Sweden. Other regions are mentioned, however the focus is on Sweden.

1.6 Audience

This report intention is to bring clarity to a market that many companies have had limited success in and it tries to identify key points one has to take in consideration when investing in products and services in the Connected TV area.

The audience that could benefit from reading this report are video on demand companies, broadcasting companies, consumer electronics companies and people that are generally interested in Connected TV.
2 Methodology

2.1 Methods to answer the research questions

2.1.1 Literature studies

This study is mainly a literature study. Relevant information have been gathered about Connected TV, media landscape and technical information. This literature have been found in libraries in forms of books and electronic articles accessed on the Internet.

The Connected TV area is relatively new and little has been published about it in scientific articles, however since this report focuses on the prerequisites for Connected TV to succeed, parts of the research have focused on similar video on demand systems.

2.1.2 Earlier work

No earlier work of relevance within the Connected TV area that are scientifically made has been found. This is therefore considered as an independent study within a new sector.

2.1.3 Expert interviews

Expert interviews have been done with major companies in the area of Connected TV to find out their perspectives of the Connected TV development.

Interviews were made using the method of semi-structured interview (Bell 2005:160), meaning the experts were asked predefined questions that they could answer freely. This structure was chosen to get as much information from the interviewees as possible regarding each question and this would gather different interesting perspectives from the experts.

The interviews except the first two with (Björn Sarnold and Josefine Persson) were recorded and later transcribed. The first two interviews were transcribed during the interview, this resulted in too much focus on the writing and therefore the rest of the interviews were recorded and later transcribed.

The results from the expert interviews are presented under the result and analysis part.

2.1.4 Expert survey

The expert survey was handed out to the expert group and involved seven questions that were asked to all participating experts. This was done to get quantitative results from the expert group.

These results are also compared with results from a larger online survey made by Cnet.com, to show similarities and differences in answers.

The results from the survey are presented under the section of results and analysis.
2.1.5 Conferences

Two conferences have been viewed to gain understanding of the industries thoughts on Connected TV.

The conferences were:

- Connected TV World Summit, 18th May 2010. This was viewed on a live video stream.
- The Next Big Thing Supersession, by Cnet on jan. 7 CES 2010. This was viewed on demand at the Internet. In the 31st of march. 2010.
3 Interactive television

3.1 Connected TV definition

Connected TV refers to televisions that can connect directly to the Internet.

It exists is no general name for televisions that have Internet access. Different names are; Internet enabled devices, net connected devices and connected devices. The most common name found during the research on the subject is Connected TV and this term will therefore be the reference name used in this report.

3.2 The evolution of interactive television

Interactive television that allows the users to interact with the television has been around for a long time and it has had limited success. Broadcasters have since long tried to bring this interactivity into the television screen. The experiments with interactive television start in the early days of television, as far back as the 1920s. The first experiments included one-way video and two way audio. In the 1950s CBS created an interactive television series, where a plastic sheet to cover the television was needed. Then during the "Winky Dink and You"-show the children where asked to help the character on the screen and for example paint a bridge on the screen. Apparently this had consequences for those children who did not buy the plastic sheet on the screen and some children painted right on the screen (Srivastava 2002:81).

According to Pyungho Kim the evolution of interactive television has developed through three different chronological stages (Kim 2009:538). The first stage is described as the interactive TV or ITV phase. This was when different cable companies developed a number of interactive services during the 1970s. The different use cases were interactive banking, polling, mail and news along with pay per view video. During this time the Warner Qube was developed. It was an interactive television service through a set-top box and offered by Warner Communications in the 1970s initially in Columbus, Ohio in the US(MBC 2010). Most of these early attempts were shut down in the 1980s due to lack of consumer interest and burdensome investments (Kim 2009:538).

One of the most successful projects when it comes to interactive TV was when BBC developed teletext, based on a project by Warner; Amex Qube where data was sent alongside with the analog signals (Srivastava 2002:82). Teletext is still used today in almost every television screen, which proves to the evidence of the success although the transmission technic has evolved since then.

The Qube project has affected the television industry in many ways. It brought the pay per view format and also evolved the roots of programming formats for MTV and Nickelodeon. The project was not sustainable because of high cost, low revenues and several technical problems with the upstream data (Srivastava 2002:83).

The second generation was in the 1990s when telecom companies entered the ITV business, these services consisted of VOD and TV channel retransmission however most of them also failed due to similar reasons as the first generation ITV (Kim 2009:538).
The third generation ITV starts in the beginning of 2000 when telecom companies once again started offering interactive television and this time called it IPTV (Kim 2009:538).

"Irrespective of the type of terminal, these early experiences with iTV suggest that price is of uttermost importance, as users are more reluctant to pay for expensive terminals." (Srivastava 2002:85).
3.3 Examples of recent attempts in bringing Internet content on TV

3.3.1 MSN TV by WebTV Networks

Microsoft bought the WebTV Networks in 1997. WebTV Networks had developed a software for set-top boxes from Sony and Philips. WebTV was designed to bring Internet content to the TV screen. The purpose was that the user should be able to send e-mails and browse the web through the interface of the television.

WebTV Plus was an improvement of the original WebTV, but it embedded the broadcast signal with the web content (Srivastava 2002:88).

In 2001 Microsoft renamed WebTV Networks to MSN TV (Microsoft 2001). Today the MSN TV STB is no longer available to buy, however Microsoft continues to support existing subscriptions according to MSN TV website (MSNTV 2010).

3.3.2 Windows XP Media Center Edition

Window XP Media Center Edition was released in 2002 by Microsoft as an attempt to integrate media content as a greater consumer experience. The Windows Media Center Edition was developed as the link between the Internet and the television to experience online content on a TV. Microsoft worked closely with Dolby Laboratories Inc., AMD and Philips among other companies to ensure a good user experience. Philips developed an IR remote control to easily control the OS and improve user experience (Microsoft 2002).

This attempt is different from MSN TV in the way that Windows XP Media Center Edition had to be installed on a personal computer that was connected to the television screen. The MSN TV was simply a STB which had far less processor power than the one of a PC (Microsoft 2006).

3.3.3 Apple

Apple has also done previous attempts to bring internet content to the TV. The first one was the Macintosh Interactive Television Box. This box was developed between 1993-1995 and had the purpose to bring interactive television to the television set, however the project was cancelled in 1995 (TAM 2010).

Apple’s more recent attempt to bring Internet content to the television was in March 2007 when Apple TV started shipping (Apple 2007). The Apple TV was described in a press release from Apple “…an easy to use and fun way to wirelessly play all ones favourite iTunes® content from ones PC or Mac® on ones widescreen TV, including movies, TV shows, music, photos and podcasts.” (Apple 2007). The Apple TV is a set-top box that one can connect to the TV. The Apple TV does not integrate broadcast streams.
3.3.4 Myth TV

Myth TV is an open source software first developed in 2002. It runs on Linux and Mac OS X. The myth TV was developed to get a better television environment than the one provided by cable boxes (Myth TV 2010). The Myth TV software can work both as a PVR (personal video recorder) as well as aggregating online video. It can also play DVD and music, which makes it a fully functioning media center.

3.3.4 Eye TV

Elgato is a company that sells set-top boxes and software with their own developed Eye TV. The Eye TV software combined with a TV tuner works both with Mac OS X and Windows and makes the computer into a fully functioning PVR. It integrates an EPG (electronic program guide) that includes many different broadcast television distributors as well as online video (Elgato 2010).

3.3.4 Boxee

Boxee was founded in 2004 and was originally made as an open source software for the original Xbox. It allows one to stream video content from several major content distributors. The Boxee software lets one stream Content from Hulu and Netflix among others (Boxee 2010).

The software was implemented in a STB by D-link to easily connect directly to the television. The Boxee STB can connect to Facebook and Twitter which allows sharing of favourite programs between friends (Boxee, Box 2010). Boxee is focusing on online content and do not integrate cable, DTT or satellite TV broadcast streams.

The Boxee STB comes with a qwerty keyboard on the backside of the remote control, to make the navigation easier than with the regular television remote control buttons.

3.3.5 TiVo

Tivo was founded in 1997 by Jim Barton and Mike Ramsay. They developed a STB that could process analog video and record it on a hard drive for later viewing (TiVo history 2010). This digital recording of analog video signals made it possible for customers to time-shift their viewing habits and fast forward the commercials when watching time-shifted programming. The Tivo STB has since then evolved and integrated many new features. The Tivo today has the ability to stream movies on demand from Netflix, Amazon On Demand, Blockbuster On Demand and more (TiVo 2010). The Tivo also has a programming search interface called Premiere, this should make it easy to search for the content that one is looking for. The Tivo is still not available in Sweden but works in the US, Canada, Australia, New Zealand, Taiwan and United Kingdom (TiVo, availability 2010).

3.3.6 Xbox

The Xbox 360 from Microsoft is mainly a game console, however it has an integrated online video store called Zune Video. This VOD store offers a limited amount of major pictures that can be streamed directly to the Xbox (Xbox 2010).
3.3.7 Sony Playstation 3

Sony have announced that during 2010 they will add a service called MUBI to their playstation store. MUBI is a service that allows the user to stream movies instantly to their playstation. It is possible to either rent movies for a week or have a monthly subscription and some movies are free to view (Playstation 2010).

The Finnish broadcasting company Yle will make some of their programming offering as VOD at the 9th of September 2010 on Playstation 3. This will be the first Nordic Web TV application for playstation 3 (Yle 2010).

3.4 Research projects

3.4.1 Project Canvas

Project Canvas is a partnership between Arqiva, BBC, BT, C4, Five, ITV and Talk. Project canvas aim to make a standardised open platform for Connected TVs (Project Canvas 2010). According to their website the lack of an open platform for Internet connected devices creates two major concerns, these are:

• The fragmented market that has emerged with many closed platforms makes it hard for the free to air television to keep up the innovating pace. Closed proprietary platforms could keep customers that do not want payTV out of the Connected TV area.

• The need for a commercial relationship between Internet services and the TV platform combined with the fragmented market creates a problem.

3.4.2 HbbTv

Hybrid Broadcast Broadband TV is a European initiative that aims to seamless harmonise the convergence of the growing supply of Internet video and broadcast streams. It is based on existing standards and Internet technologies including Open IPTV Forum, DVB, CEA and W3C (HBBTV 2010).

The main goal is to seamless integrate both Internet video and traditional broadcast streams.

Among the partners of the project are Sony and Philips (HBBTV Supporters 2010), which both have their own managed platforms for delivering Internet video, Philips NetTV and Sony Internet TV.

3.4.3 Share it

Share it is a EU funded project to research a system for seamless integration of broadcast, stored and online content. The project is based on the TV Anytime Forum. The research partners for the project are from broadcasting industry, device manufactures, network operators and universities.
The main results of the project are a functional prototype and system specifications. The network model is based on P2P sharing. (Share it 2003).

3.5 Digital Convergence

The digital convergence has had limited effect on the television area. Mobile telephones have integrated more technology and now there is a new name of these advanced phones, “Smart Phones”. The smart phones are thin client computers that can integrate many new technologies. The Connected TVs are now also integrating processors and necessary hardware to gain access to the wide spectrum of online content.

Convergence according to Henry Jenkins does not depend on one delivery mechanism, he describes it as;

“Convergence represent a paradigm shift - a move from medium-specific content, toward the increased interdependence of communication systems, toward multiple ways of accessing media content, and toward ever more complex relations between top-down corporate media and bottom-up participatory culture” (Jenkings 2006:243).

This is happening in the television industry today, when television content not only can be accessed through broadcast channels but also On Demand, time-shifted for the convenience of the consumer. There are now several different distribution networks that are not only purpose built for the television but, that integrates all types of digital media. The wide spread Internet access is making this convergence possible as more devices gets connectivity.

Srivastava describes it a revolutionary step as any personal computer with the appropriate hardware can receive broadcast television (Srivastava 2002:60).

Jenkins describes the convergence within the media industry as economically driven, because it creates new business opportunities where media companies can sell their content over multiple channels of distributions. He also describes it as in some cases consumer driven, where the consumers are trying to get the media companies to listen to their interests. In other cases as corporate driven, where companies are trying to shape consumer behaviour (Jenkings 2006:243).

3.5.1 Apps

Different applications have since the beginning of computers been developed to solve different problems. It has been a relatively open environment for developers to develop applications for computers although many environments demands different software development kit. This has enabled for much innovation within the area of information technology.

Applications, or also known as apps are now widely being developed for different smart phone platforms. Among these platforms are Symbian, Research In Motion, Android market and Apple’s Appstore (Gartner 2010). Samsung have announced that their own app store for Samsung televisions (Samsung Apps 2010). Yahoo is an other example that offers the platform “Yahoo Connected TV” for developers to built “Widgets” for televisions that are enabled for Yahoo’s platform (Yahoo 2010). Widgets is the name for applications created for Yahoo’s Connected TV platform. Google TV will integrate the Android Market in their platform for Connected TV (Google TV FAQ 2010) which further integrates apps for the television.
4 Technical background

4.1 Broadband definition

According to PTS (Swedish postal and telecom agency) the definition of a broadband connection should have a transmission capacity of at least 2Mbit/s downstream. This definition is not globally accepted. The ITU (International TeleUnion) definition is 1,5-2Mbit/s and the OECD has defined it as 256kbit/s as minimum bandwidth (PTS 2009:17).

Bandwidth of different types of connections

<table>
<thead>
<tr>
<th>Type (Downstream)</th>
<th>Theoretical bandwidth</th>
<th>Variation</th>
<th>Normal experienced</th>
</tr>
</thead>
<tbody>
<tr>
<td>3G</td>
<td>384kbit/s</td>
<td>64-350kbit/s</td>
<td>100-200kbit/s</td>
</tr>
<tr>
<td>Turbo-3G</td>
<td>7,2Mbit/s</td>
<td>0,1-6Mbit/s</td>
<td>1-4Mbit/s</td>
</tr>
<tr>
<td>Turbo-3G+</td>
<td>14,4Mbit/s</td>
<td>0,1-10Mbit/s</td>
<td>2-6Mbit/s</td>
</tr>
<tr>
<td>ADSL1</td>
<td>8Mbit/s</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>ADSL2</td>
<td>13Mbit/s</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>ADSL2+</td>
<td>24Mbit/s</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>VDSL1</td>
<td>52Mbits/s</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>CABLE</td>
<td>50-100Mbit/s</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>PON</td>
<td>155Mbit/s-2,5Gbit/s</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 3.1 (source: Telia 2010, Jacobsen 2005:9, Understanding IPTV 2007:33)
4.2 Content Delivery Networks for video streaming

4.2.1 Broadcast

This is traditionally well used in television networks. Broadcast means that one send the same signal to all users of the network (Held 2007:18). Broadcast can be used in an IP network however it is not to be preferred because it easily floods the whole system when every packet is being delivered to all the users (Simpson 2008:250).

The figure below demonstrates Broadcast; the green users requested the packet and the red users did not.

![Broadcast](image)

*Fig. 4.1*

4.2.2 Multicast

This is the process when sending a single video signal to multiple users simultaneously that have joined the multicast group. (Held 2007:18). It is not to be confused with broadcasting, where the signal is sent to every user. When using multicasting every user receives the exact same stream at the same time in similarity to traditional broadcasting.

Multicasting uses special protocols to deliver the video stream inside the IP network, however rather than making copies to each of the receivers at the source; it makes the copies inside the network only where it is needed (Simpson 2008:250).

To make this copy of the stream the user must request to join a multicast stream and then the copy is made by the dedicated router inside the network.

To make multicasting work on a network; each of the IP routers inside the network needs to be able to handle multicasting, however this capability is not enabled in many networks (Simpson 2008:253). The Internet consists of many different networks that are not multicast enabled and therefore it is not possible to send multicasting over the public Internet (Digital Telecommunications 2009:72).

The figure below demonstrates multicast; the green users have requested to join the multicast stream, the red have not.
4.2.3 Unicast

This is the process when data is sent to a single destination (Held 2007:18). When sending multiple video streams over an IP network this creates an enormous load on the sending server, because it has to make a copy of the stream to each receiver (Simpson 2008:253).

Important to know about unicasting is that it allows the user to start, stop and fast forward the video stream as they prefer. This is not possible by multicasting (Simpson 2008:252).

The figure below demonstrates unicast; the green users have requested a unicast stream, the red have not.

4.2.4 P2PTV

This network uses a distributed system, where all users are participating with bandwidth. It helps to minimise the bandwidth load on the server side.

In a P2P network every host act as a client and server at the same time (Digital Telecommunications 2009:72)

The basic concept of a P2P network is that the clients do not always need to ask the server for a file transfer, they can simply ask any other client that already has a copy of the file for a transfer. This eliminates the problem of high bandwidth load at the server side when many clients are asking for file transfers at the same time (Simpson 2008:377).

BitTorrent is a modified technology for distributing files over a P2P network. A file in a BitTorrent P2P network is broken down in small pieces. Every client who then wish to request a file first need to download a Torrent file from a web-browser. This torrent file contains metadata about all the pieces of the original file. The client then need to have a BitTorrent program to start the download. The Torrent file is then sent of to a tracker, a server that keeps track of where all the pieces of the file are in the P2P network and then sends back a list of
those to the client. Then the client can download all the small pieces that make up for the original file from many different users in the P2P network. While doing this the client is also registered at the tracker to contribute to the P2P network with all the pieces of the file the client has downloaded (Simpson 2008:378).

A problem with the P2P network is usually that it saturates both downstream and upstream bandwidth for the clients. With asymmetrical bandwidth as for ADSL this puts much strain on the uplink bandwidth. This puts a heavy load on the ISPs, however it is of advantage for the content distributors and the receiving clients, because of faster download. The cost of the bandwidth have not disappeared with this technic it rather has moved from the content distributer to the receiving clients (Simpson 2008:379).

It exist a numerous amount of different BitTorrent client softwares. Vuze is one example. It uses the P2P BitTorrent protocol for sharing content between users. Vuze also integrates a media player for playing content and have sharing options to Android, iPad, Xbox, Samsung TVs and more (Vuze 2010).

The Swedish VOD company Voddler use a decentralised overlay P2P network when distributing streaming video to their customers. All clients needs to download Voddler's own P2P client software to use the service (Voddler, about 2010). The Voddler client allows the user to play, pause, jump forward and backward (Voddler, help 2010).

Soapcast use P2P technology and their own developed P2P protocol to distribute video efficiently. With soapcast it is possible for anyone to become a video broadcaster and reach a wide audience with minimal resources. Soapcast offers a freeware software. The software has been integrated in a STB that can connect to a television (Soapcast 2010).

The figure below shows an example of how a P2PTV network works. The small green rings are the clients and the lines in between the different connections.

![Diagram of P2P network](image)

**Fig. 4.4**
4.3 Streaming methods

4.3.1 True streaming

This is streaming in real time. It means that if a five minutes video clip is streamed, it is displayed to the viewer instantly and takes five minutes to play. This is the way traditional broadcast TV, satellite and cable TV works. It does not store any data at the viewer and it is possible to send live video (Simpson 2008:221).

4.3.2 Download and play

This is a technique often used in regular webpages, every time a user requests content; the whole file is sent to the user. The user can only start play the video content when the file generally is fully downloaded (Simpson 2008:224).

4.3.3 Progressive download/streaming

This is a technic that is good to use when streaming do not work properly. It breaks down the video stream into small blocks that is then transmitted to the player and when the segment is fully downloaded, the player can play it (Simpson 2008:224). Progressive download makes it possible to start playing a video file before it is fully downloaded. When playing a progressive downloaded video file the user sometimes experience some buffering time before the video starts (Kashyap, Bing 2010:274)

4.3.4 Dynamic streaming

The dynamic streaming is similar to progressive streaming, but the video file is encoded in different levels of bit rate. During playback the adaptive bit rate streaming accommodates to current available bandwidth and plays the most suitable file for current bandwidth conditions (Microsoft, msdn 2010).

It allows the viewer to seamlessly watch a film clip and if the available bandwidth should drop the player automatically adjust the video stream to a lower bit rate. This works the other way around when the available bandwidth is higher than the current stream, it then adjust to a stream with higher bit rate (INLET 2010).
4.4 IPTV

IPTV, Internet Protocol Television is a term generally used when sending video over IP networks. There is a bit of complication when using the term IPTV, because although it represents video over an IP network it is commonly known as video transport over private managed networks (Simpson 2008:2).

4.4.1 Managed IPTV networks

The term IPTV networks used in this report refers to large private managed IP networks used to distribute IPTV. The operator of a managed IPTV network has full control over its delivery chain, from the operator to the consumer: IPTV is like a walled garden service that uses the same model as conventional television (KIM 2009:540).

At the consumer end of the delivery chain the consumer need a STB that can convert the incoming IPTV stream to a video stream that can be watched on the television.

There are three main ways to distribute IPTV over managed networks and those are:

- Over the copper based network, originally used for telephony. This is done with the help of xDSL technology, that enables high speed broadband access over the copper network. The backbone of this type of system is a fiber network and only the last mile from the nearest base station is covered by the xDSL connection. This is usually referred to as FTTN, Fiber To The Neighbourhood (Held 2007:31).

- FTTP fiber to the premises, Over Fiber Lan connections. This requires the end user to have a fiber connection access at home (Held 2007:23).

- HFC, Hybrid Fiber Coax Network is the name for the system where cable operators have an activated return path that can be used for Internet connection, or pay per view (Simpson 2008:11). Cable TV operators can offer IPTV and On Demand services in this way. In Sweden cable company Com Hem offers a hybrid STB that can receive both DVB-C and IPTV via broadband (Mobil Business 2010).

Driving factors for IPTV

There are several advantages and disadvantages with a managed IPTV network.

Advantages

- Managed IPTV networks have a great advantage when it comes to QoS. Bottlenecks can be fixed more easily because they control the whole IP delivery chain, from the distributor to the consumer.

- Can make use of unicasting to offer VOD services

- Can make use of multicasting to stream content.

- The operator has full control of the value chain and can control what content the consumer can access.
• Closer customer billing relationships, where all expenses are shown on the same invoice. If the customer has a triple play subscription with, for example, broadband, telephony and IPTV they all show up on the same invoice.

• New commercial opportunities with more targeted advertising.

**Disadvantages**

• Limited supply of content, one single operator controls what content is available.
• Customers need to subscribe to access the service.
• Limited access to Internet content.
• Demand for customers to use an STB to access the service.
• Customers are limited to the user interface of the STB.
• Limited access to applications and games, customers have to accept the supply of the operator.

The main actors in IPTV in Sweden is Telia Sonera, Bredbandsbolaget/Viasat, Canaldigital and FastTV. Among these Telia Sonera has the biggest market share with 324 000 subscriptions (PTS Medieutveckling 2009). The total number of IPTV subscriptions in 2009 was 411 000 (PTS Statistik 2009). This makes the market share for TeliaSonera up to 96% of the IPTV market, which stands for about 8% of the total TV subscription market in Sweden. These figures could change over time due to a law change that forces TeliaSonera to offer bitstream access to competing companies. This could make it possible for competitors to TeliaSonera to offer IPTV services in TeliaSoneras copper network at reasonable and competitive prices.

Boxer recently announced that they will discontinue their IPTV service, because of the hardening competition and the need for more investments in HD for the terrestrial broadcasting network (Boxer 2010).

### 4.4.2 Internet Video

Internet video is a very broad term and involves all video distributed over the public Internet (Simpson 2008:3). One major example of internet video is Youtube.com, where people from all around the world can access millions of video clips. Web TV can also be considered as Internet Video

Internet video refers to video content that the consumer can reach through an Internet access network connection.

Access network is the connection between the premises and the backbone network provided by the ISP operator (Held 2007:19).
4.4.2.1 Connected TV

The Connected TV is based on the open infrastructure of the Internet. CE manufactures have chosen different approaches of how this online content is to be delivered.

Connected TV may or may not have a managed access but the content is distributed OTT of the public Internet.

Advantages

• Ability access to content from the public Internet

• No need for specific subscription to access a wide range of online content.

• Internet video can be watched on any internet connected device that supports the offered video codec.

Disadvantages

• Harder to maintain a good QoS, when no operator have full control over the chain of distribution.

• Slower downlink speeds could make the video to buffer before played.

• Need of a media player/software that can play the wide range of formats offered from different distributors.

• No ability to use multicasting.

4.4.2.2 Web TV

The definition of web TV is simple, it is TV distributed over the public Internet and usually through websites On Demand and sometimes live (Medieutveckling 2010:44). Web TV is a way for television channels to get their content online as catch up programming. SVT-play and Aftonbladet TV is examples of web TV in Sweden. SVT play offers many of their programs both on broadcast television and on the web (SVT 2010).
4.5 Connected TV coverage

4.5.1 Consumption

The Connected TV is a way to watch content that is brought to the customer through the Internet without the need of an external set top box. Web TV has become more popular over time and according to a recent report by World Internet Institute the people that some time used online video has increased about 10% between 2008 and 2009 to 36%, however the daily use is still low and people tend to complement their traditional TV viewing with internet video (Findahl, World Internet Institute 2009:38). The demography of the group watching internet video shows that younger persons in the ages between 16-25, 75% have used internet video and in the ages between 56-65 only 13% have sometime used internet video (Findahl, World Internet Institute 2009:40). If these figures are to be considered at least somewhat accurate they clearly show the differences in the age groups regarding the adoption of internet video.

4.5.2 Broadband demands

Connected TV will use the existing infrastructure of the public Internet to deliver content. This will put more strain on the infrastructure of the Internet and especially received bandwidth by the consumer.

The quality of streamed video content is increasing over time and the bit rate required decreases with the innovation of new streaming software.

According Simpson

“Today's compression algorithms are 20 to 30 percent more bandwidth efficient than those introduced three years ago” (Simpson 2008:235).

Although the bit rate for a certain kind of format decreases new formats with higher quality emerge, for example high bandwidth consuming 3D video and HD content.

Another aspect that needs to be considered regarding the bandwidth in the home environment is the different use of bandwidth among Internet connected devices. More connected devices in the home environment puts more strain on the customer received bandwidth. As well as what kind of broadband equipment the customers have installed in their homes, regarding routers and Wifi access points. These factors could also affect the performance of the inward bandwidth.

To use an online VOD service before Connected TV was available, a computer or media center needed to be the connection between the Internet and the television. With Connected TV the television itself access the Internet over the home broadband connection and this means that for example the computer do not need to be occupied for this purpose. When the computer is not occupied it allows the user to multitask using the same Internet connection. This could increase the bandwidth consumption of the Internet access.
It is hard to estimate the limiting bandwidth factors in the home environment. Especially in homes where many people live and share the broadband connection. According to PTS the amount of bandwidth needed for simultaneous use of low quality Internet-services in a household around 4Mbit/s and for high quality services around 12Mbit/s (PTS 2009:85).

A report made by A-focus requested by the Swedish competition authority claims that 42% of the Swedish households with television only have one television in their home and of the remaining part many households have two or more (KKV, RTVV 2009:69).

If these figures presents a somewhat accurate picture of how many televisions the Swedish households have, it could further increase the bandwidth use when using several VOD services simultaneously on different Connected TVs within the household.

According to Björn Sarnold, technical chief at film2home the necessary bandwidth to watch SD content is approximately 1,5Mbit/s and HD content is 3,4Mbit/s. The specifications for film2home in Philips NetTV is 2Mbit/s in SD and is approximately 5Mbit/s in HD according to Sarnold(source: mail correspondence 14/4 - 2010).

Voddler, another VOD service claims on their website that users need a stable connection of 3,5Mbit for SD content and 5Mbit/s to watch HD content (Voddler, Bandwidth 2010).

Headweb another VOD service recommends their users at least a 3Mbit/s broadband connection to watch their content (Headweb 2010).

These figures could confirm the necessary bandwidth needed in a household that PTS claims in (Fig 4.5). However these are just pointers, if for example a household has three Connected TVs and they are all streaming HD content individually the need for at least 3x 5Mbit/s =
15Mbit/s and this is only the absolute minimum for the video streaming feeds. If multitasking were to be involved it would further increase the bandwidth usage.

### 4.5.3 Broadband access in Sweden

According to a survey made by PTS in 2009, 73% answered that they had access to broadband at home. Out of these 73%, 75% had a connection with at least 2Mbit/s. 40% had access to over 10Mbit/s downstream and 20% had access to 21Mbit/s downstream (PTS 2009:77).

It will be a delimitation to hard-line internet connection as a way to connect the Connected TV to the Internet. Why mobile broadband is not regarded as an option is explained under the title of 4.4.4 Mobile broadband.

The figures below shows how many Swedish households that have access to hard-line internet access and with what downlink bandwidths.

![Number of hard-line broadband connections out of the number of households in the Swedish population 2009](image)

*Fig 4.6 (PTS statistikportal 2009)*

From *Fig 4.5 and 4.6* some conclusion can be made. If a household with simultaneous high quality use of the Internet; is to use VOD simultaneously on several connected TVs in the home the available bandwidth would not be enough. According to these figures the coverage of the Swedish population who can access this high resolution VOD simultaneously would be less than 29% of the Swedish households. The Swedish population that can access low resolution VOD would according to these figures be up to 54% if not used simultaneously within the household.
4.5.4 Mobile Broadband

Mobile broadband is considered to be a 3G access connection.

According to a survey made by Sifo and PTS in 2009 with 2245 respondents, 9% says that they only have a mobile broadband connection. In the ages of 21-30, 16% have a mobile internet connection (Sifo, PTS 2009:40).

In another survey made by Sifo and PTS in 2009, 21% of the respondents claims that they could consider changing their broadband connection at home to only use mobile broadband (Sifo, PTS 2009:44). These figures should be in consideration to that the respondents were not asked whether or not it would be limited data traffic on the mobile broadband connection that could potentially restrict them from using a bandwidth intense VOD services on Connected TV.

It is possible to watch Internet video with a mobile broadband connection. However since many operators restricts the amount of data that can be downloaded there is a high probability that those users will not connect their televisions to the Internet, because it could increase their data traffic too much.

To connect a TV to 3G mobile Internet, it first need to connect to an external 3G modem. The Connected TVs today only have an Ethernet or Wifi connection to access the Internet.

3G Today there are several different kinds of mobile broadband in Sweden. According to Telia the normal experienced bandwidth downstream is:

<table>
<thead>
<tr>
<th>Type (Downstream)</th>
<th>Theoretical bandwidth</th>
<th>Variation</th>
<th>Normal experienced</th>
</tr>
</thead>
<tbody>
<tr>
<td>3G</td>
<td>384kbit/s</td>
<td>64-350kbit/s</td>
<td>100-200kbit/s</td>
</tr>
<tr>
<td>Turbo-3G</td>
<td>7,2Mbit/s</td>
<td>0,1-6Mbit/s</td>
<td>1-4Mbit/s</td>
</tr>
<tr>
<td>Turbo-3G+</td>
<td>14,4Mbit/s</td>
<td>0,1-10Mbit/s</td>
<td>2-6Mbit/s</td>
</tr>
</tbody>
</table>

*Table 4.1 (source: Telia 2010)*

The data traffic restrictions differs between operators. Hi3G had a maximum of 20GB and after that they limit the speed of the connection to 200kbit/s but recently, Hi3G offer a flat rate mobile broadband that has no data limit (Tre 2010). Telia has a maximum of 20GB on Turbo3G+ and 30GB on their 4G network. Telenor has no data limit at all on their "FastPris Premium" subscription (Telenor 2010).

According to PTS the around 10% of the Swedish population with broadband primary use a mobile connection (PTS 2009:77, Fig.19).

When considering the need for bandwidth within a household as according to (Fig. 4.5) The demand for bandwidth with high resolution usage is around 12Mbit/s and Turbo 3G+ gives 2-6Mbit/s in normal use. This low average bandwidth rates excludes these users from the possibility to use high quality services simultaneously within the household consistently.
Considering low resolution (around 4Mbit/s) usage within a household with simultaneously use of Internet, some of the mobile broadband connections could be included. Although this requires the use of a 3G modem with a router to be able to connect the television to the Internet connection.

4.5.5 Net neutrality

Net neutrality is the concept that all traffic on the Internet should be treated the same way regardless where it is from or what it is, as long as it is not harming the access network (PTS Nätneutralitet 2009:7).

According to PTS net neutrality the user should be able to, within the space of “Best Effort”:

- Freely send and receive content.
- Freely use content services and programs that do not harm the network.

The operator should for the same Internet service:

- Not manipulate or down prioritise the data traffic for a user depending on what content, source or destination the data has.
- Give clear information in marketing and terms of agreement of the capacity and quality of the connection.

(PTS Nätneutralitet 2009:7).

The ISP should act according to “Best effort” when transferring and prioritising data traffic, however beside this operators are prioritising resources for more bandwidth demanding products (PTS Nätneutralitet 2009:8).

The net neutrality issue has been more discussed in the United States regarding Zillion TV, an On Demand service that streams video over the Internet and have partnered with several ISPs to ensure QoS. The Zillion TV is only available in the areas where Zillion TV has partnered with ISPs (DVB 2009:27).
4.6 Connected TV Platforms

At the moment of writing, there are many different platforms for Connected TV. Almost all major CE manufactures are developing different platforms and try to differentiate from others by this extra connectivity.

This is a short description of the different major platforms on the market today.

<table>
<thead>
<tr>
<th>CE Brand</th>
<th>Name of platform</th>
<th>Wifi connectivity</th>
<th>VOD</th>
<th>Application store</th>
</tr>
</thead>
<tbody>
<tr>
<td>Samsung</td>
<td>Internet@TV</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>LG</td>
<td>NetCast</td>
<td>Yes</td>
<td>Yes</td>
<td>Only selected apps</td>
</tr>
<tr>
<td>Panasonic</td>
<td>Vieracast</td>
<td>Yes</td>
<td>Yes</td>
<td>Only selected apps</td>
</tr>
<tr>
<td>Philips</td>
<td>NetTV</td>
<td>Yes</td>
<td>Yes</td>
<td>Only selected apps</td>
</tr>
<tr>
<td>Sony</td>
<td>Sony Internet TV</td>
<td>Yes</td>
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<td>Only selected apps</td>
</tr>
<tr>
<td>Sharp</td>
<td>Aquos Net</td>
<td>Yes</td>
<td>Yes</td>
<td>Only selected apps</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Non CE</th>
<th>Name of platform</th>
<th>VOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yahoo</td>
<td>Yahoo Connected TV</td>
<td>Yes</td>
</tr>
<tr>
<td>Google</td>
<td>Google TV</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Table 4.2
4.6.1 Samsung

Samsungs Connected TV platform is called Internet@TV and is a part of their Medi@2.0 platform, that combines USB movie input, DLNA and a service called Content Library. Content Library allows the user to access pre installed and downloadable information programs and games. The current categories of Content Library are Gallery, Wellness, Game, Children and Cooking (Samsung Media2.0 2010).

In early 2010 Samsung launched an online HDTV application store for the Internet@TV service. This is according to Samsung the worlds first HDTV application store. The application store will at the beginning only consist of free material and premium material will be available for purchase in the summer of 2010 (Samsung apps 2010). This platform will also be available in Blue-ray players and Home theatre systems upgraded with the latest internet@TV.

The Samsung Internet@TV will enable connectivity with Samsung mobile phones, that could act as remote controls for the TV as well as game controllers for Internet@TV games (Samsung news 2010).

For developers:

The Samsung App store will be open for developers to build applications with the Samsung apps developers kit SDK (Samsung latest news 2010).

4.6.2 LG

LG Netcast is LG Electronics Connected TV platform. LG Netcast allows the user to connect newer models of LG TVs to the Internet. The platform has integrated Yahoo Widgets to access a broad amount of online content. LG has also partnered with some content delivery companies to offer VOD services.

Among the current services are, Cinema now, Netflix, Vudu, Pandora, Youtube and Yahoo Widgets (LG 2010).

For developers:

The LG Netcast portal only consists of selected content and is therefore considered as a closed platform regarding the openness for developers to reach the LG customer base.

4.6.3 Panasonic

Panasonic Vieracast is the name of Panasonic’s platform for Connected TV. Vieracast offers a selection of online services accessible on newer Panasonic TVs. Among the services presented are Netflix, Amazon On Demand, Pandora, Skype, Twitter and Youtube (Panasonic 2010).

For developers:

The platform could not be considered as an open platform, because there is no open SDK for developers to access and build applications and it consists only of selected content.
4.6.4 Sony

Sony Internet TV is the name of Sonys Connected TV platform. They have recently partnered with Google, Intel and Logitech to offer a new platform based on Google TV (Sony news 2010).

The current Sony Internet TV platform consists of two different on demand services, BAVIA Internet Video and BRAVIA Internet Widgets (Sony 2010).

The BRAVIA Internet Video allows the user to access content from selected sources by Sony. These includes Youtube, Netflix, FIFA World Cup Collection and some Web based TV channels with news and sports.

The BRAVIA Internet Widgets contains widgets from Facebook, Twitter, Yahoo, and more.

For developers:

The platform could not be considered as an open platform for developers, because it consists only of selected content. When Sony integrate Google TV it will open up for android developers to build applications that can be accessed via Google TV.

4.6.6 Sharp

AquosNET is the name of Sharps Connected TV platform. It allows the user to access Internet content from selected sources, among these are Netflix, Pandora, VUDU and Yahoo (Gismo tv 2010).

For developers:

The AqousNET could not be considered as an open platform for developers because it only consists of selected content.

4.6.7 Philips

Philips NetTV is the name of Philips Connected TV platform. Philips refers to it as an open solution where developers easily can build their own interface based on the open CE-HTML specifications (Philips 2010).

The global services available today (2010-07-13) are according to Philips website Youtube, News and Weather and Ebay (Philips explanation of NetTV 2009). Philips have announced that there will be Swedish content providers as well (Philips news 2009).

For developers:

It is not a fully open platform, because who wish to develop for NetTV must have their service validated and approved by Philips before it can be accessible through the NetTV portal (Philips 2010).
4.6.8 Google TV

Google announced at their I/O conference 20th of May 2010 that they are going to introduce Google TV (Google I/O 2010). Google TV is an Android based open platform to bring all the content of the Web and TV together in a seamless experience.

Google have partnered with Sony, Intel, Dish Networks and Logitech for the Google TV project (Google TV 2010).

The Google TV will be integrated in Sonys Internet TVs and Logitech will build a STB that will work with Google TV (Logitech 2010). There will be a QWERTY remote control to control the Google TV (Sony InternetTV 2010).

The Google TV will offer a Google Crome search interface that allows the users to type in what they are looking for and the results will be both Web content and content from broadcast TV networks (Introducing Google TV 2010).

*For developers:*

The Google TV is announced to go on sale in fall of 2010 and will integrate the Android market for Google TV in early 2011 (Google TV FAQ 2010). The Google TV is an open platform for developers to build android based applications.

4.6.9 Yahoo Widgets

Yahoo Connected TV Widgets are thin applications made for Connected TVs that support Yahoo Widgets. These widgets are made for the Connected TVs to have overlaid on the TV screen, accessible through a widget button on the remote control (Yahoo 2010).

There are many different widgets to choose from that the user can download to their Connected TV, among these are Youtube, Blockbuster On Demand, Amazon Video On Demand, Yahoo news and weather, Facebook, Twitter and more (Yahoo TV widgets 2010).

Yahoo Connected TV widgets are available in TVs from Samsung, Sony, LG and Vizio (Yahoo TV widgets 2010).

The Yahoo Connected TV platform offers a wide range of content from the Internet, however it is made for the TV experience (Yahoo 2010).

*For developers:*

This is an open platform, however the developers need to get their widgets approved by Yahoo (source: Interview with Chirlene Chandrapal 2010, Yahoo Connected TV Europe).
5 Bussiness models

5.1 Market shares TV

According to DisplaySearch the market shares of the different TV manufactures in the third quarter of 2009. These are rankings based on global revenue shares.

![Market shares chart]

*Fig. 5.1 (Display Search 2009)*

Different market shares of Connected TV platforms are in correlation to what brand of TV as of today. Yahoo widgets differs in this way because they are found on many different platforms.

Sony should be taken into special consideration in the Connected TV area, because Sony owns content production companies and could therefore more easily create the necessarily relations between content owners and consumers. Sony will soon be introducing the Google TV platform in their televisions. Depending on the outcome of how widely accepted Google TV is for customers, Sony could increase their market share.

Samsung is considered to have the biggest market share and their Connected TV platform “Internet@TV” will further extend their TV application market with premium content available for purchase during the second half of 2010.
5.2 Different TV subscriptions and market shares

Fig. 5.2 (PTS Statistikportal 2009¹)

According to these figures, IPTV still has a small market share of the total TV subscriptions in Sweden compared to the traditional broadcast mediums. IPTV, including both xDSL and LAN connections have about 9% of the total TV subscription market. IPTV - LAN subscriptions increased by 66% between 2008 and 2009. IPTV - xDSL subscriptions increased around 3% between 2008 and 2009.

These figures do not include how many of the Cable TV subscriptions that are packeted with a VOD service. The Comhem On Demand service was launched in 2009 (Comhem 2009). The number of current Comhem On Demand subscriptions have not been found.

These figures also shows that the subscriptions to digital Cable have increased 20% between 2008 and 2009.

¹ The figures for Digital - Dish have been estimated for 2009, because lack of numbers from Viasat
5.3 Value chain in the TV industry

According to Pagani (Pagani 2003:14) this is how the value chain in the TV industry was like in 2003.

The content producers at the top, then TV channels who redistributes the content down in the value chain. Then there are the multichannel networks that redistribute to Cable Operators. Satellite platforms that redistribute to satellite operators. After that the Cable, Satellite and Terrestrial broadcasters distribute through the access providers to the TV Audience.

This value chain by Pagani do not integrate IPTV. IPTV could in this case be at the similar level as the Cable, Satellite and Terrestrial broadcasters but with the further ability to aggregate content direct from the content producers/owners.
5.3.1 Possible Value chain for Connected TV

The value chain described in (fig 5.3) differs to the one for Connected TV. In theory it is possible for Connected TV to bypass the traditional value chain by simply aggregating content directly over the public Internet from content providers. This is made possible by the diversity of content available online on the public web. A VOD service on Connected TV delivered over the public Internet could use this new value network to gain direct access to the consumers living room and making new customer relationships between content owners and consumers.

5.3.2 New customer relationships

Content production companies have the ability to distribute their content directly over the public Internet to access the living rooms of Connected TV owners, without the need to go through broadcasters and other content delivering companies.

Hulu.com is an example where major content owner companies cooperate to offer a VOD service over the public Internet. Hulu.com is owned by NBC Universal, News Corp., The Walt Disney Company, Providence Equity Partners and the Hulu team (Hulu 2010).

The company Boxee provides a STB for televisions or a software for the computer to access online content and stream it to the television. Boxee have tried offering Hulu to their customers. However this led to that Hulu forced Boxee to remove access to their service because the content providers requested it (Hulu Blog 2009)(Boxee Blog 2009).

When the content distributors and the content producers are the same, the value chain is even shorter. This is the case with Sony who own both content production and consumer electronics manufacturing.
5.3.3 Opportunity for existing operators

The Connected TVs are part of the converging media market and all the major CE companies are providing platforms for Connected TV and integrating Internet connectivity in their newest televisions. This means that whether a customer asks for a Connected TV or not, they are highly likely to get one when they buy a new TV. IPTV, Cable, Terrestrial and Satellite operators in Sweden offers their own managed access VOD services.

<table>
<thead>
<tr>
<th>Operator</th>
<th>VOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>ComHem</td>
<td>ComHem On Demand</td>
</tr>
<tr>
<td>Viasat</td>
<td>Viasat On Demand</td>
</tr>
<tr>
<td>Telia</td>
<td>Telia Digital TV</td>
</tr>
<tr>
<td>Canal Digital</td>
<td>IPTV</td>
</tr>
</tbody>
</table>

Table 5.1 Source: (Comhem On Demand 2010, Viasat 2010, Telia DigitalTV 2010, Canaldigital 2010)

These services can be considered as competitors to the VOD services on Connected TV and they need an external STB to work. There is one exception for Viasat who also offer On Demand services on the Web.

5.4 Release windows

To maximise the profits of a movie, the movie industry has something referred to as release windows.

In these release windows different distributors have some sort of exclusive rights to show the movie within their own window (KKV, RTVV 2009:49). First the movie runs in the cinemas and then after some time, around 4-6 month it is released in the window referred to as "Home entertainment". In this window it is released on physical rental, and Download To Own. Sometimes it is released simultaneously on VOD and sometimes there is a further delay until it is released on VOD. After around 6 month the next window opens for Pay TV, where the premium channels have their exclusive rights. After around 12 months it is time for the "Free to air" window. Not all movies fits in the Cinema window and therefore shows up directly in some other window (KKV, RTVV 2009:49).

According to Björn Sarnold in mail correspondence (29/4 2010) these release windows can differ between the different content production companies. Sarnold describes it as one movie can be shown on VOD for 90 to 180 days and then be removed in favour for the "Pay TV" window and after that be available on VOD again. Sarnold also says that the sizes of the release windows are shrinking and that some companies release VOD at the same time as DVD, Blueray Disc or Download To Own.
The figure below shows how the release windows are distributed.

Fig. 5.5 (KKV, RTVV 2009:49)

Apple announced in a press release first of May 2008 that they will be releasing some of their new movie titles in iTunes the same day that they are released on DVD (Apple 2008). The movies on iTunes are today only available within the United States.

Connected TV VOD should fit in within the VOD release window, however regarding to why not Boxee could support the Hulu.com service there is more complexity to it.

5.4.1 Simultaneous release

This refers to movies that are released at the same time on several different mediums. The movies could show up on the cinemas and at the same time be available as VOD or Download To Own. This makes the viewer in charge of where and how they want to watch the movie, and it differs from the traditional release windows (Wired 2005).

5.5 DRM

DRM, Digital Rights Management is an essential part of Internet video. DRM describes the system of protecting content from unauthorised usage. It is the distributor’s responsibility that there is no unauthorised access to the content and if the distributor fail to do this, there can be severe legal consequences (Simpson 2008:298).

The DRM system also has the mean to make sure the content owner gets the right payment when the video is watched. In a regular DRM system the viewer needs to obtain a digital key to unlock the video (Simpson 2008:303).
6 Results and Analysis

6.1 Contribution

This report aim to present an overview of the Connected TV area and list criteria needed for VOD in Connected TV. At current time the landscape of Connected TV is still in a very unstable phase and many different platforms are likely to change or emerge in the future. This report will help online VOD stores that to gain knowledge in Connected TV.

6.2 Validity and reliability

Validity means that the study should present credible results and analysis and that the study actually measures and describes what it is supposed to regarding aim and objectives (Bell 2005:117). The interviews as part of the research have the intention of keeping high validity. However because they only gather important views on Connected TV from experts, they should not be regarded as facts, however rather as statements and opinions from the experts.

Reliability means that the study is performed in a correct way, and that if it was to be done again with similar methods the outcome would be the same (Bell 2005:117). This report aim to have high reliability and the survey that is handed to the expert group involves some questions that are compared to a larger study made by Cnet.com to increase the reliability. The same questions are asked during the interviews and aim to create a high reliability, however since it is a semi-structured interview the answers could differ a lot between different persons. To increase this reliability the experts chosen for interviews are from many different areas, that are correspond to Connected TV in some way. The experts are from the following areas of work:

- TV application developing company
- IPTV Operator
- VOD Company
- TV Salesperson
- TV manufacture company
- Connected TV platform Company

This report intend to create high validity and reliability, however since the Connected TV area is undergoing much change during the time of writing the outcome of this report is general and limited to the current conditions of time.
6.3 Connected TV for online VOD stores

Connected TV offers a whole new opportunity for online VOD stores to reach a wider audience with their content. The VOD stores that have emerged during the piracy era of the 21st century have mainly focused on establish themselves on web-pages. This is a way to meet the illegal file-sharing on its own playground, however what one has to consider is why that playground is in a computer based online environment.

The main element of watching moving pictures has since long been a television screen or in a cinema. It is reasonably to believe that one reason to why people watch movies on their small computer screen instead of the large television screen is that it is easier to find the content they want, when they want it. 80% of the participants of a survey made by Synovate claimed that they want to be able to watch their favourite TV-shows and programs when they want and 51% claimed that they want to be able to fast forward (KKV, RTVV 2009:74). According to MMS report "Rörliga Bilder 2009:1" the consumption of moving pictures by standard linear form is lower in the ages of 16-25, than the ages between 41-65 (KKV, RTVV 2009:90). This is explained by younger people tend to consume more moving pictures, but through other than linear distribution forms.

The content in the television have for a long time been controlled by broadcast companies, governments and content owners. The digital revolution that has already has shaken the music industry and turned their business models upside down is also disturbing the existing business models of the movie industry. In theory a Connected TV that can access all the content on the public Internet could bypass the existing value chain of the television industry and create a direct relationship between the content owners and the consumers without having to pass through many different distributors and operators.

6.4 Possible reasons to limited success for Internet on TV

There are several aspects that one has to keep in mind when considering why earlier attempts in bringing Internet content on television only have reached a limited audience.

At the year of 2000, only 3000 Swedish broadband subscriptions had a downlink and uplink bandwidth of at least 2Mbit/s (PTS Statistikportal 2009). This in comparison to figures from 2009 when 54% of the Swedish households had access to a broadband connection of at least 2Mbit/s downlink as described in (Fig. 4.6). The issue of widespread broadband access is therefore most definitely critical when trying to bring Internet video content to the television screen.

Web TV Networks had a primary goal to integrate Internet and mail in the television, however it did not at the time of introduction have a broadband connection. It integrated only a dial up modem. Later when Microsoft bought Web TV, and renamed it MSN TV they made it a broadband service that integrated a media player. The MSN TV is no longer sold but existing customers can still use the service, because the lack of consumer interest in the product.

The standard definition television screens did not have as high resolution as HDTVs today at the introduction of Web TV, and they where not close to the resolution of a computer screen. Yet they where to have an integrated web browser to show content from the Internet on the low resolution television screen as well as be able to write and send emails. It is reasonably to believe that this had negative effect of the success of the Web TV and similar STBs.
Broadcast signals were only integrated in some early connected devices, but for example the Web TV Plus tried to integrate broadcast signals.

The Windows Media Center Edition was created to fully integrate a PC as a media center in the living room. This has also had a limited success and one reason to it could be because the consumer has to buy another expensive computer.

“Irrespective of the type of terminal, these early experiences with iTV suggest that price is of uttermost importance, as users are more reluctant to pay for expensive terminals.” (Srivastava 2002:85).

If customers are more reluctant to pay for expensive terminals for their televisions it is reasonably to believe that the expensive STBs did not reach a wide audience. This is most probably one reason to why connected STBs or even todays Connected TVs only have limited hardware resources.

Other companies that have made serious attempts in bringing Internet content to the television are Apple, Boxee, TIVO, Xbox and Sony Play station 3. They all only deliver Internet video. They do not integrate the broadcast signal. This puts the user in a position of having to make an active choice from where to access content. This way of distributing content could be a successful way to access consumers if all content where accessible through the public Internet on a legal way. That is not the case of today where content is distributed over various different networks.

Another limiting factor for all connected devices trying to deliver as rich content as possible over the Internet, is the system with release windows. Now the rights holders have a new way to control the media when it is accessible online. Online VOD is far from always considered the same way as physical rental of DVD or BR disc. This could easily be another reason to the limiting success of online VOD services as of today although they are growing bigger every year.

To access content from the public Internet to the TV screen, the customer must make an active choice and cannot stay put in the commonly known passive environment of the television experience. The remote control has approximately looked the same for decades, with simple buttons for navigation between linear channels of television. It has worked well with the laid back ten foot experience and not many channels to choose from. With Internet Video accessible via the television screen a large amount of new On Demand content is available and the user have to in a simple way be able to search for content. Some of the early connected devices for example Web TV came not only with a remote control that was similar to the commonly known remote control of a TV, however with a full qwerty keyboard similar to the ones of computers. The full size keyboard might have been good to navigate on the screen, however for customers that are used to only have a small remote control on their coffee-table this definitely was a big change. CE manufactures today that produces Connected TVs are integrating qwerty keyboards in basic remote controls, it can be considered as a compromise between the old remote controls and full size computer keyboards. It remains to see if this is the right path to go. Another option for a remote control could be to integrate support for game pads as remote controls for the Connected TV. The game pad for video games has been developed for easy navigation in games on television which could be an advantage. Sony Internet TV have adopted the user interface of the Play Station 3 (Sony 2010)(Sony PS3 2010) and it could therefore be easy to integrate the game pad of the Play Station as remote control. Some Connected TV platforms will also have the ability to use the smart phone as a remote control, this could help decrease the costs for CE manufactures who might not need to sell additional expensive remote controls with their televisions.
6.5 Similarities between Connected TV and earlier connected devices

The Connected TV platforms are in one sense very similar to the earlier STBs developed by Boxee and VOD in Playstation 3 and Xbox 360. The major difference is that in Connected TV the hardware is integrated directly in the television. This makes it easier for the consumer who no longer needs an external STB or computer to access the content available on the public Internet. A similar development can be seen when DVB, digital video broadcasting where introduced in Sweden. At the beginning their was a need for an external STB to convert the digital signal to analog for the television. Later on when the old analog terrestrial television broadcasting net was completely shut down in Sweden many televisions already had integrated STBs for receiving the digital broadcast signal.

Some CE manufactures have created a hybrid remote control that is at the size of a standard remote control that also integrates a qwerty keyboard, one example is Vizio (Vizio 2010). Other vendors relies on the more commonly known remote control for their Connected TVs and have a special button to access Internet content and then uses the regular remote control keys to navigate. Google TV will integrate a remote control with a qwerty keyboard (Google TV Developer 2010). The Apple TV can be controlled with not only the small remote control that is standard but also via an Iphone, and the Iphone has an integrated virtual touch qwerty keyboard.

If the trend with integrated qwerty keyboards in remote controls for Connected devices continues it is likely to believe that it could be an integrated part of all Connected TVs in the future.

6.6 Business Models

The old business models within the television and movie industry is slowly changing. Making more content available on demand and over the public Internet and the release windows tend to shrink.

The fact that VOD is considered different than physical rental within the release windows in some cases could possibly slow down the development towards more online VOD content.

CE companies now are trying to establish new Connected TV platforms on the market that can deliver VOD content and possibly bypass traditional cable, satellite, terrestrial or IPTV operators. This could result in harder competition for the viewers. It also creates an opportunity in lower costs for consumers, if the digital distribution cost for VOD is lower than those of physical rental and there is an ability to bypass several operators in the value chain.

Connected TV could access a greater supply of content for the consumer; however this depends on rights management issues if the content owners allow access to their content on a global scale.

The television industry have had a walled garden for their subscribers (Srivastava 2002:99), however Connected TV could in theory change this. The fact that most new televisions integrates connectivity makes this impossible for the TV operators to control, they can only accept this new situation and try to take advantage of the new business opportunities and new distribution channels that are emerging.
With Connected TV the choice of what to watch and where to watch it is moving from TV operators to consumers.

VOD in Connected TV could be considered a direct competitor to IPTV delivered VOD, because both are delivered to the TV screen. Both IPTV VOD and Connected TV delivered VOD could also be considered as competitors to the physical DVD and BR rental industry.

DRM is no exception for VOD services in Connected TV. The Connected TV could have an advantage compared to personal computer based services, because the platform owner can have full control over what is allowed on the platform.

It is always a possibility that unauthorised access to content could happen with a Connected TV. The DRM protection for the Connected TV should be considered in the same way as of Internet video.

The fact that the Connected TV set have direct Internet access and not via a set-top box or a blue ray player could be an advantage of securing digital rights. The advantage is mainly depending on the inability to record movies that are under rental rights if the right type of DRM is used.
6.7 Coverage for Connected TV VOD

Connected TV VOD is delivered OTT on the access networks to the consumers, this puts demand on network neutrality at the ISPs side. The consumer also has to access enough bandwidth to view the content. According to (FIG 4.5 & 4.6) less than 29% of the Swedish households can access high resolution services with simultaneous use of Internet in the home environment.

The inability to use multicast technology when delivering live content OTT (over the top) to a Connected TV will put a heavier load on the CDN (content delivery networks) if using unicast. If a P2P CDN is available for the Connected TV, it would help to decrease the bandwidth load of the sending server.

The different streaming methods presented under the chapter 4.2 could all be used in Connected TV. If users are more reluctant to wait for the video to buffer, progressive streaming should be avoided. Dynamic streaming is preferred because it drops the bit rate when downlink bandwidth is not enough rather than stop the video for buffering. True streaming is good for live content and easier to secure DRM because the video is not stored at the receiver. To make use of download and play the Connected TV needs to be able to store the full movie which creates a demand for cheap and expandable storage in the Connected TV.

The people who only have a 3G mobile broadband connection are increasing. This could easily cause an issue for the Connected TV, because it do not always support enough bandwidth. Should people start unsubscribing their regular wired broadband subscriptions and fully switch to small 3G broadband adapters it would mean that TV manufactures needs to take this in consideration. Some 3G modems are integrated with routers, which allow them to share the mobile broadband connection over Wifi. For example Hi3G offers Huawei B260a as a modem, this makes the modem act like a Wifi access point (Tre Mobil 2010).

Most of the Connected TV screens today comes with an ethernet connection and few have an additional wifi adaptor and very few have wifi built in. None of the screens have ability to connect to 3G, unless the 3G connection is converted into a ethernet or wifi connection.

The unstable bandwidth in mobile broadband connections is why it will not be considered as an option for Connected TV in this report. However the ongoing development of 4G should be in consideration, because it is around ten times faster than 3G connections (Telia 4G 2010) and could be an alternative for the Connected TVs if it hits the broad market. There are many factors involved in the actual coverage of mobile broadband connections that can support Connected TV VOD. As the distance to the nearest base station and how many users that are connected to the same base station (Telia 2010).

Another aspect that could be considered as a technical limitation for Connected TV is that the consumer really need an additional connection to the device. Most Connected TVs today comes with an Ethernet contact, that the consumer needs to connect with a cable to access the Internet. Some devices do support Wifi connection which simplify the connection a lot if the consumer has a wifi network at home, comparing to ethernet connections. The fact that the consumer need an additional cable if not using Wifi could result in that consumers do not connect their televisions.

The Connected TVs today are regarded as thin clients, meaning that they do not have equally amount of processing power as a computer. This requests efficient compression algorithms and standardised formats of the online video for it to be shown without stuttering or long time buffering on the Connected TV.
When integrating computer hardware in the Connected TV, CE manufactures have to regard the issue that consumers might not buy a new television within the same period as they buy a new computer to upgrade the hardware. This could result in that customers own old Connected TVs that cannot integrate the latest services, although the Connected TVs could do software updates to enhance their capabilities. It could also result in the case that older Connected TVs are not able to play new and enhanced video formats with different encoding.

### 6.8 Future of Connected TV

#### 6.8.1 Results from expert interviews

The experts interviews were made both in person and over telephone. The questions were predefined and asked to all experts interviewed. They were also asked to fill in a short survey. The purpose of these interviews was to gain information about what experts within the TV and online Video industry thought about the future of Connected TV.

The answers are opinions and should not be regarded as facts, however they do point put interesting views about the prerequisites for Connected TV to succeed as a VOD delivery system.

Under the topic 2.2 *Validity and reliability* there is a list of the people interviewed and what professions they have.

**In what way can Connected TV be a threat to the established Cable, Dish or IPTV distributors?**

There was a common notion among the experts that there is a potential threat to traditional broadcasters, however some argued that this threat also could be considered as an opportunity to expand their content to non subscribers.

Shirlene Shandrapal from Yahoo Connected TV:

"However for the cable provider and the other subscription service providers there is nothing to stop them from making that content available on connected devices. So it is the same service that is technically being delivered through a different route."

**How could the diversity of different platforms for Connected TV affect the end users?**

All the experts agreed that it will be confusing for the consumer in the beginning, when there are many different platforms with different interfaces.

Johan Klefström from Samsung;

"...I believe that the consumers will have to live with many different platforms in the same way as we have seen on the cellphone market a period ahead"

To relate back to the different platforms described under technical background, it is understandable that it could be confusion for the consumer when there are many different platforms to choose from.

Some of the experts pointed out the need for a standard, or a common set of frameworks to simplify for the end user and as well for platform owners and developers.
Per Nordqvist, salesman at El Giganten;

“It is like everything else, very tricky for the end user when there is no standard.”

Fredrik Andersson, Accedo Broadband;

“There will be confusion and frustration. At the same time people own TV devices that have several years of lifetime, therefore the probability that you have several different systems at home are not that big.”

**How could a more open or a more controlled platform be good for Connected TV?**

An open platform meaning that anyone can develop applications for it and in a controlled platform the platform owner decides what services are made available.

The interviewed IPTV operator mentioned the opportunity with a managed accessed platform for the operator to make a full commitment.

“Then you can make a full commitment to the customer and guarantee that the TV-service end-to-end will work. You can also complement with adding access to some open services.”

This argument rises new questions about who is going to be responsible for the support issues for Connected TV.

Fredrik Andersson, Accedo Broadband made a similar remark but about the expectations of TV:

“The TV-experience is if possible even more safe area than the cellphone, where we over a long time got used to that there are different use-cases in a cellphone. If there is an interruption in the Olympic finals then hundreds of thousands of people are calling SVT, so there is a high expectation that with TV everything should work.”

There were similar opinions that the platforms initially will be controlled in a way to ensure QoS and that it probably will evolve towards more openness in the future.

**What do you see as the greatest opportunities for Connected TV?**

There were similar opinions that Connected TV will change the way we engage and interact with the TV.

Björn Sanold and Josefin Persson at film2home both said that Connected TV would enable their VOD service to reach a wider audience.

**What will be the biggest challenge for Connected TV?**

There were different opinions of what would be the biggest challenge for Connected TV. Among these were technical limitations of the connected device, that it did not contain enough hardware to support good QoS and that there is not unlimited amount of bandwidth in the access networks. Others pointed out the need for a common standard and that people actually need to replace their old TV with a Connected one.

**What is the biggest problem in watching full length movies over the Internet today?**

The main argument among the experts was that it is too difficult to find and then view content from the Internet.
In this case one key differentiator in Connected TV could be searching and aggregating content and presenting it in the right way for the consumer.

**What kind of role will Connected TV play in the future?**

Shirlene Shandrapal from Yahoo Connected TV describes Connected TV as something that is part of our life.

"I think it will evolve and I think it will get better and I think it will become something we take for granted."

The interviewed IPTV operator;

"I think it could be a complement to other TV-services"

Fredrik Andersson, Accedo Broadband;

"Often there is a high belief in new technology. I believe that people are slower to new changes than you usually believe. I believe that Connected TV and the existing systems will coexist under a long period of time."

**6.8.2 Results from expert survey**

These are some of the results from the expert survey, the rest of the results can be found in the appendix. The seven experts were given the same survey and some questions were not answered by all experts.

**Fig. 6.1**

<table>
<thead>
<tr>
<th>What service would especially make you choose a Connected TV as your next TV?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Video On Demand, movies that starts whenever you want them to</td>
</tr>
<tr>
<td>Access to pictures from foto applications (Flic, Picasa etc.)</td>
</tr>
<tr>
<td>Social applications for Facebook, Twitter, YouTube etc.)</td>
</tr>
<tr>
<td>News (over the top) directly on the TV screen</td>
</tr>
<tr>
<td>Surf the web</td>
</tr>
<tr>
<td>Games</td>
</tr>
</tbody>
</table>

**Fig. 6.2**

<table>
<thead>
<tr>
<th>Have you used VOD on your TV-set before and in what way?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes, through a computer connected to the TV-set (Online videostore)</td>
</tr>
<tr>
<td>Yes, through IPTV</td>
</tr>
<tr>
<td>Yes, through Connected TV</td>
</tr>
<tr>
<td>Yes, through some other device (gaming consol etc.)</td>
</tr>
<tr>
<td>No, never used VOD</td>
</tr>
</tbody>
</table>

Fig. 6.2
Would you consider cancelling your current TV subscription if you could access the same amount of content On Demand with a Connected TV?

Fig. 6.3

What do you think is the BIGGEST obstacle in watching VOD on a TV-set today?

Fig. 6.4

Do you believe Connected TV will replace the existing linear distribution forms of TV? or simply complement them?

Fig. 6.5

Fig. 6.1 displays the result that four out of six experts answered that VOD could be the main argument to choose a Connected TV. Srivastava believed this in 2002; “VOD is the Killer application” (Srivastava 2002:100), with this meaning that it is the main application for interactive television.

Two experts choose the option “Surf the web”, but what they wish to search for on the web was not asked.

Fig. 6.2 displays the result that five out of seven experts chose “Yes, through a computer connected to the TV-set” were they have watched VOD before and one chose IPTV and one Connected TV. The fact that five out of seven chose that they watched it with the computer connected to the television, could easily be the result of that Connected TV and IPTV not have a large market share.

Fig. 6.3 displays the result that six out of seven experts would prefer to watch content On Demand. It does not say that the they would prefer a Connected TV in front of other devices but it does confirm the picture that people want to consume more On Demand content.

Fig. 6.4 displays the result that it was no single point that got increasingly more answers than others. This can be the result of a faulty defined question or the fact that all these answers are good examples of obstacles in watching Online Video.
Fig. 6.5 displays the result that six out of seven experts answered that Connected TV will only complement the existing linear distribution forms. This is also what the experts said in the semi-structured interview.

It also tells of convergence in history were it rarely happens that one technology directly replaces older technology, but rather integrates it and creates new opportunities.

### 6.8.3 Results from Internet poll by Cnet.com

During CES 2010 (Computer Electronics Association), Cnet had a conference on January 7. The name of the conference was “The next Big Thing Supersession”. The objective of the conference was to gather industry leaders from broadcasting companies to VOD and IPTV operators to find out what could be expected in the future of the On Demand World.

Before this conference Cnet made an online survey on their website where they asked visitors to answer a few questions about online video and how it will be a part of our lives in the future. The same questions where then asked during the conference to the expert panel, represented by Boxee, Code Advisors, Verizon, Samsung, Comcast and three moderators from Cnet.
Summary of remarks made.

**Fig. 6.6** displays the result that most people that have answered considers Internet-connected TVs to be the best way for getting TV over the Internet. If this is true Connected TV has a good customer base to start from.

**Fig. 6.7** displays the result that more than 50% people answering this question considered Internet Connected TVs and Game Consoles succeed first and best in the living room.

When the same question was asked to the expert panel, some of the experts argued that the Blue-Ray Player reasonably should have gotten more votes. The main argument was all the extra features that a Blue-Ray Player brings, with 3D and ability to play Blue-Ray Discs.

"blueray is going to do well and set-top boxes aswell" (Avner Rowen, Boxee).

Considering that Blue Ray have not yet received similar acceptance as the DVD player it is difficult to predict what role it might have in the future media landscape.
Fig. 6.8 displays the result a different opinion than if comparing these answers to the answers from the expert group interviewed for this report. The Cnet survey resulted in 50% between dominate or augment for Internet-delivered TV and video. The expert group interviewed for this report were asked a similar question, “Do you think Connected TV will replace the existing linear distribution forms of TV or simply complement them?”. Six out of seven experts told that it will only complement the existing linear distribution forms.

In the Cnet expert panel, the representative from Samsung commented;

"We see it as being complementary".

Another remark made by the representative from Samsung:

"It is important to have the same SDK across platforms".

This meaning that all Connected TV platforms should have the same SDK, to simplify program development and make the connected environment a common experience across platforms.

Other important statements made by the expert panel in Cnet Supersession:

The system with release windows needs to change to fit the connected environment.

- "It’s an outdated distribution system with certain release windows"

There is a need for new business models so that the content owners can get paid for their material.

- "Do not matter where you watch it or how, we need to figure out a way to count it and get paid for it"

All content needs to be accessible though the same device.

- "Aggregate TV shows should be possible in a TV-set and access the same show through several different content providers."
6.8.4 Results from Connected TV summit

The Connected TV Summit, produced by Videonet was held the 18th of May 2010 in London. It was viewed though live streaming on "www.connectedtvsummit.com".

The summit gathered speakers from BBC, Samsung, Sony, Lovefilm, Harris Broadcast, Yahoo and more. The conference was about Connected TV and what industry leader has to say about the future of Connected TV.

These are important points discussed during the conference. They are to be considered as opinions by the speakers, but they do create a clearer view of what industry leaders believes about Connected TV.

Many of the experts believe that the TV industry will change in the next couple of years.

Peter King from Strategy Analysis describes that consumers want the best of two worlds, they want both PayTV and OTT content.

Another point made by an IPTV operator is that they do not see Connected TV as a threat.

One major consensus during the discussions in the conference is that when bringing in connectivity and online content into the television experience, there is a need to do this in a seamless fashion.

So Saida from Sony said that about 50% of their connected consumers actually connects their TV to access catch up TV.

Since Connected TV is relatively new these 50% probably consist of early adopters and when this reaches a wider audience it is likely that this figure decreases.

From Lovefilm, Lezly Mackenzie talked about that small VOD companies do not have the resources to be on multiple platforms and that DVD has a limited life time.

It is easy to realise that developing applications for all different Connected TV platforms can be an expensive procedure.

From Samsung Vassilis Seferidis see Connected TV as a way to differentiate their product from others.

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6.8.5 Technical Forecast

Fig. 6.9 According to a recent network forecast report by Cisco, June 2010 (Cisco 2010)

If the above forecast made by Cisco would make the right prediction of the over all IP traffic, it shows how cable VOD and Internet-Video-to-TV are increasing a lot more than IPTV VOD. Between 2009 and 2014 Cisco predicts that the global IP traffic will increase by factor four. Cisco also project that by 2014 91% of global IP consumer traffic will consist of various forms of video (TV, VOD, Internet Video and P2P) and 51% out of this traffic will be streaming video (Cisco 2010).
This is the same forecast when aggregating the figures for Internet Video, Cable VOD, IPTV VOD and Internet-Video-to-TV. In this case Connected TV would be involved by Internet-Video-to-TV.

This forecast describes the projections of the Global IP video traffic, and not just the Swedish traffic. Although these are some interesting figures, this is a forecast and the reality might not evolve in the same way.

According to these figures IPTV IP traffic will not increase as much as Internet Video, Cable VOD or Internet-Video-to-TV between 2009 to 2014.

Another interesting notation about these figures is that Internet-Video-to-TV IP traffic will increase with about factor 24 between 2009 and 2014. This should be in relation to an increased IP traffic by factor 7 for Internet Video, factor 4,4 for IPTV VOD, factor 4 for Cable VOD.

According to these figures, Internet-Video-to-TV is thereby the fastest growing IP traffic consumer.
6.9 Future scenario

Based upon the results from the expert interviews, conferences and the technical and economical background of this report, three different development paths are emerging. These are examples of key mechanisms that are driving the future development of Connected TV.

6.9.1 Platform

This scenario sets the primary key mechanism to the future of Connected TV as a standardisation of the platforms. A main issue for all Connected TV platform operators is that there is no standardised way to present Internet Content on the television.

In this scenario it emerges two major platforms that are highly superior to the other platforms. These platforms offers similar services but in a slightly different way. These platforms attracts new CE manufactures to adopt the platform and this makes them standard of Connected TV. There is now a possibility for the consumer to choose television and the platform will not play as big part any more, because most CE manufactures have adopted one of the two major platforms. The platforms are differentiating factors for the CE manufactures, however quality and price is still important.

6.9.2 Economical

In this scenario the differentiating factor for each CE manufactures to have their own platforms is greater in an economical view than the need to adopt another platform as a way to standardise Connected TV. There will be a great diversity of platforms and each will have limited number of services, this will constrain the development and overall use of Connected TV. Platform owners get additional incomes from their platform services.

6.9.3 Infrastructure

In this scenario the IP infrastructure will not evolve at the same pace as the increasing consumption of online video. This results in bad VOD services in Connected TVs and low usage of VOD in Connected TV. Managed IPTV services will evolve and integrate some Internet content and take the largest market share of VOD, because they can offer a higher QoS than Internet video.
7 Conclusions

The goal of this thesis was to list key factors that need to be regarded in the future development of Connected TV. This report have researched and analysed major issues that can be limiting for Connected TV to succeed as a VOD service, however the aspects of user experience and user interface have not been researched. This report have therefore only partly listed aspects that can be limiting for Connected TV VOD.

This report has regarded many different issues that Connected TV is facing now and in the future. Many aspects needs to be considered to draw any conclusions of what the prerequisites are for Connected TV to succeed as a VOD platform.

First of all, it need exist a customer base that is able to use VOD through Connected TV. The Internet access networks need to be able to carry VOD OTT to a large amount of people. As described under the topic broadband access in Sweden, around 29% of the Swedish households can access high quality online service and up to 54% can access low quality online service. These figures presents good conditions if the majority of people accept to view low quality online video on Connected TVs.

When connecting the television to the internet, some kind of modem with internet access at the premises is a prerequisite. However, the action of connecting the television needs to be simple. Most Connected TVs during the time of writing do not have integrated Wi-Fi connections and have to be connected through a cable to the Internet. Considering the fact that the consumers will have to put another cable in their living room is not something that is a persuading argument for the consumer to connect the TV.

It needs to be enough available online content that the consumer can access through their Connected TV to make it a serious option to other forms of television and video. The release windows for online VOD needs to be the same as for physical DVD or BR rental for it to be able to compete with similar supply of content, this is not the case today and could be a limiting factor.

The diversity of Connected TV platforms is another issue that might slow down the overall use and acceptance of Connected TV. As mentioned by experts in the conferences, it needs to be a seamless integration of the Connected TV with the traditional broadcast streams. In most platforms today, the user has to leave the traditional television experience with the press of a button to access the Connected TV platform. Other options are to have small widgets overlaid on the screen to access online content, as for Yahoo’s Connected TV platform. To summarise these platforms, they are changing over time and it will probably take some time before there is any convergence. The Google TV platform will present a different approach to this seamless integration of online and broadcast content than other Connected TV platforms. The Google TV will merge traditional broadcast with online video and present it equally and not differentiate one from the other.

The competition for VOD in Connected TV are from physical rental and IPTV VOD. The fact that IPTV not only distributes VOD over their managed IP networks but also redistributes multicast streams of the traditional broadcasts gives Connected TV a small advantage in one case. This advantage is because the Connected TV not only use the Internet connection to access content, but also the traditional broadcast streams through terrestrial, cable or satellite networks even if though it would require a STB to receive the stream. This could probably decrease the average bandwidth load on the Internet access network during simultaneous
view of traditional broadcast streams and online VOD within a household. When people have several television screens at their homes, it is reasonably to believe that if all televisions only would use IPTV there would be high usage of the accessible bandwidth. This is just a small advantage that Connected TV could have towards IPTV, because likewise if all the televisions in the home receive online VOD there would also be high usage of the available bandwidth.

Some of the traditional broadcast and IPTV companies do not regard Connected TV as a direct threat. As experts said during the interviews, it can also be regarded as an opportunity to get yet another channel of content distribution.

The fact that many of the new televisions that arrives on the market today have connectivity leads to that the Connected TV is on its way into the living room, whether the customer ordered it to or not. This is something that needs to be considered by traditional broadcast and IPTV companies and there is nothing that say that they cannot offer similar or better services, however their customer base are likely to own a Connected TV within a couple of years.
8 Further research

Connected TV as it is today is not a stable area and many different companies tries to do similar things in different ways. It is therefore necessary to do further research within the area of Connected TV. This study have focused on the prerequisites for Connected TV to succeed as a VOD service. Connected TV have many functionalities which have not been covered in this report.

There are several different use cases that needs to be evaluated and improved and other to be invented. A user study can be done to map what services a customer wants in a Connected TV. Further research within the area of interaction design and implementation of Connected TV could suggest improvements and the user experience of a Connected TV could be evaluated and tested.

An evaluation study of the different Connected TV platforms is important to see if there are any winning trends in the current platforms. Further research could also result in suggestions of improvement to the platform owners.

Research could also be done in an economical point of view regarding the economical growth in Connected TV and if there are limiting factors that could affect the development and market shares of Connected TV. An economical research could also include an analysis of the customer base for Connected TV and how much they are willing to pay for a Connected TV.

Television gaming is one area that is very closely related to Connected TV and could easily be a key factor for the ongoing development of Connected TV. Games in Connected TVs can also be evaluated to see if there are any tendencies towards television gaming moving from external game set-top boxes to more integrated solutions in Connected TV.

In a technical point of view further research can be done to see what technical components are best suited for Connected TV regarding price and performance. This could also include research of the ability to upgrade the hardware in a Connected TV when it is outdated.

These are all suggestions for how to continue this work in the area of Connected TV and hopefully this report could act as a keystone for further research.
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10 Appendix

10.1 Expert interview questions

10.1.1 Intervjufrågor

1. På vilket sätt kan Connected TV vara ett hot mot etablerade Kabel/Sattelit-TV/IPTV-leverantörer?

2. Hur kan mångfalden av plattformslösningar för Connected TV påverka användarna?

3. Hur kan en öppen eller kontrollerad plattform för Connected TV vara att föredra och varför?

4. Vad ser du främst för möjligheter med Connected TV?

5. Vad kommer vara den största utmaningen för Connected TV?

6. Vad är största problemet med att se film över internet idag?

7. Vilken roll tror du att Connected TV kommer att ha I framtiden?

10.1.2 Interview Questions

1. In what way can Connected TV be a threat to the established Cable, Dish or IPTV distributors?

2. How could the diversity of different platforms for Connected TV affect the end users?

3. How could a more open or a more controlled platform be good for Connected TV?

4. What do you see as the greatest opportunities for Connected TV?

5. What will be the biggest challenge for Connected TV?

6. What is the biggest problem in watching full length movies over the Internet today?

7. What kind of role will Connected TV play in the future?
10.2 Transcriptions of expert interviews

(Interviews where made in both swedish and english and are not translated)

10.2.1 Samsung, Johan Kefström, Content & Services Marketing Manager, 2010-05-18

På vilket sätt kan Connected TV vara ett hot mot etablerade Kabel/Sattelit-TV/IPTV-leverantörer?

Du frågar ur vilket perspektiv det är ett hot? och det som de ofta säger är att de är oroliga för att deras boxutbud ska konkurreras ut av det som kommer bli tillgängligt på Connected TV. Det är de största farhågorna att deras tjänster inte är åtråvärda om den här möjligheten finns. Men däremot handlar det väldigt mycket om att de ska se möjligheterna och inte se hoten i det här istället.

Hur vi profilerar vår lösning idag är att ha de web-baserade tjänsterna och integrera dom i TV:n eller blue-rayspelarna i hemmabiosystem.

Så det är inte då broadcast sändningarna eller det utbud som de generellt har, utan mer catch-up och VOD-tjänster.

Du tror inte att man kan hoppa över hela broadcastkedjan med ett internetdistributionssystem?

Nej, inte som det är utformat idag.

Däremot är det viktigt att de inser vilket mervärde det här kan ge dem och de konsumenter de har på box-sidan. Det finns ju flera IP-leverantörer som har web-tjänster som de inte har i boxen och att de då kanske kan erbjuda dessa istället.

Hur kan mångfalden av plattformslösningar för Connected TV påverka användarna?

Jag tror inte att själva internetuppkopplingen är av högsta prioritet när en konsument köper en TV idag.

Naturligtvis är alla måna om att det ska innehålla ett stort mervärde och då är det viktigt med användbarhet, ett gott utbud av tjänster med den funktionalitet som konsumenten eftersträvar. De är de tjänster med bästa omdöme som kommer föredras när man tittar på Connected TV.

Däremot tror jag att användaren kommer att få leva med en mängd olika plattformar på samma sätt som vi har satt på mobilssidan även en period framöver.

Ser ni på Samsung Connected TV som ett sätt att differentiera er produkt från andra TV-leverantörer?

Det är en av beståndsdelarna hur vi differentierar oss, däremot tror jag att applikationsutbuden kommer vara snarlicha mellan olika leverantörer, men användarupplevelsen kommer särskilja sig.

Hur enkelt och snabbt det går att navigera sig i systemet.
Även hur man framhåver de olika tjänsteleverantörerna i sin tjänst och det tror jag särskiljer oss från många andra.

Jag tror att det är skåliga plattformen som differentierar oss mot andra.

Hur kan en öppen eller kontrollerad plattform för Connected TV vara att föredra och varför?
En stängd plattform gör att man själv kan utnyttja den hårdvara som man utvecklat och har kontroll på själva plattformen, så att man kan göra den anpassningsbara till den hårdvaran som man tar fram. En öppen har de fördelar att den är mer vedertagen standard som många kan utveckla för, så det finns för och nackdelar med båda.

*Vad ser du främst för möjligheter med Connected TV?*

Jag tror att Connected TV gör att tjänsteleverantörer på ett enkelt sätt kan integreras i användarnas vardagsrum. Det förenklar hela processen från att man exempelvis beställer en film och aktiverar den på sin TV.

*Vad kommer vara den största utmaningen för Connected TV?*

Jag tror att den främsta utmaningen är att bibehålla någon form av plattformsstabilitet. Sen tror jag att det är oerhört viktigt att den som erbjuder sina tjänster och applikationer förstår vilka möjligheter som finns och hur de kan förstå vilket värde de kan få ut av det här.

*Vad är största problemet med att se film över internet idag?*

Om jag utgår från mig personligen så tycker jag att det är utbudet, det fysiska utbudet är bättre.

*Vilken roll tror du att Connected TV kommer att ha I framtiden?*

10.2.2 film2home, Josefin Persson, Chief of digital distribution, 2010-05-05

På vilket sätt kan Connected TV vara ett hot mot etablerade Kabel/Sattelit-TV/IPTV-leverantörer?

Att man ej längre kommer vara bunden till någon speciell leverentör är ett hot. Telia ser det troligtvis om ett hot då det faktiskt är en direct konkurrent till Telia IPTV. Telia har dock en stark fakturarelation till sina kunder och den är inte att underskatta. Framförallt så kommer det att finnas flera olika videobutiker att välja mellan, detta är självklart ett hot mot telias videobutik.

Hur kan mångfalden av plattformslösningar för Connected TV påverka användarna?

Vi började prata med Yahoo om att använda oss av deras plattform, som skulle vara någon form av standard på området. Det visade sig dock senare att flera av de stora elektroniktillverkarna gått ifrån Yahoo och tagit fram egna plattformar. Det är idag ingen av de stora som kör Yahoo. Det kommer kanske vara fem stora olika plattformslösningar nu och det kommer ju vara negativt för konsumenterna. Då det ofta är svårt att navigera mellan olika gränssnitt och inte finns något standardiserat.

Jag hoppas givetvis på en gemensam standard och det kommer troligtvis bli så att man satsar på kanske två olika plattformar. Man kommer tröttna av att satsa på alla olika. Kanske blir det LG och Samsung för vår del då de är störst här i vårt geografiska område. Det finns inget standardiserat namn ännu för denna teknik, jag säger NetTV

Hur kan en öppen eller kontrollerad plattform för Connected TV vara att föredra och varför?


Vad ser du främst för möjligheter med Connected TV?

Att vi kommer nå ut till fler hushåll med vår tjänst.

Vad kommer vara den största utmaningen för Connected TV?

Det kommer vara att ändra folks beteende till att konsumera On Demand via TV och inte bara via datorn.

Vad är största problemet med att se film över internet idag?

Bandbredden är största problemet idag, men då inte främst att folk inte har tillräcklig bandbredd utan att de tror att de inte har tillräcklig bandbredd. Framförallt måste man få folk att våga använda den här typen av tjänst. Vi har sett att folk har en rädsla för att testa vår
tjänst, men om de till exempel får ett erbjudande om en gratiskod så är de mer villiga att testa tjänsten för första gången.

Vilken roll tror du att Connected TV kommer att ha i framtiden?

Jag hoppas att det konkurrerar ut IPTV. Paketera med TV kommer minska och elektroniktillverkarnas roll kommer öka.
10.2.3 film2home, Björn Sarnold, Technical chief, 2010-05-05

På vilket sätt kan Connected TV vara ett hot mot etablerade Kabel/Satellit-TV/IPTV-leverantörer?

Det kommer framförallt vara ett hot genom att man kommer kunna gå runt det faktum att man är låst till ett system. Framförallt att man binder upp sig till en leverantör.

Hur kan mångfalden av plattformslösningar för Connected TV påverka användarna?


Hur kan en öppen eller kontrollerad plattform för Connected TV vara att föredra och varför?


Vad ser du främst för möjligheter med Connected TV?

Vi slipper en mellanpart i vår distribution, detta är även bättre för kunden som får fler valmöjligheter.

Vad kommer vara den största utmaningen för Connected TV?

Att få fram en gemensam standard och behålla fördelarna en TV har gentemot en PC. En PC behöver man koppla med sladd osv. för att få upp bilden på en TV detta är jobbigare än om man får det i TVn direkt. Jag tror att man har mycket högre förväntningar på att det ska funka på en TV gentemot en PC. Om man tittar på TV så ska det fungera.

Vad är största problemet med att se film över internet idag?


Vilken roll tror du att Connected TV kommer att ha I framtiden?

Det beror på hur det utvecklas. Det måste vara mycket bättre än PC. När nätet är tillräckligt snabbt kommer det att ersätta IPTV. TV-tillverkarna trevar idag om hur mycket datorkraft de ska sätta in i TVn. Jag tycker att det borde gå att uppradera processorn i TVn genom att bara byta ut ett kort.
10.2.4 Accedo Broadband, Fredrik Andersson, VP Business and Development, 2010-05-19

På vilket sätt kan Connected TV vara ett hot mot etablerade Kabel/Sattelit-TV/IPTV-leverantörer?


Sen kommer det alltid finnas mer aggressivare kanaler och innehållsleverantörer som uppstickare. Ett klassiskt exempel är Film2Home, de har absolut ingenting att förlora utan kan bara vinna på det här. Det är möjligt att det kommer dyka upp nya aggregatörer och kanaler som inte har något att förlora och successivt kommer även då existerande kanaler och innehållsleverantörer se det här som en möjlighet också. Det är som en gungbräda, någonstans gungar det över när de måste vara med. Ån så länge är det många som håller tillbaka för att bevaka sina existerande affärsmodeller.


Där är vi inte än, då alla TV-leverantörer säger att de inte ska gå in i content-branschen, men jag tror att frestelsen kommer vara för stor när man har en stor marknad. Det kan då bli en enorm förändring om de väljer att göra det här, vilket inte alls är säkert. Det känns ändå rimligt att åtminstone de stora aktörerna gör detta.

Det skulle då rent teoretiskt kunna vara ett hot mot exempelvis Film2Home. Sen kommer det alltid finnas ett behov av lokala aktörer, för exempelvis Samsung kommer aldrig orka förhandla med alla svenska filmbolag.

Ser man till de trettio till fyrtio blockbusters per år, så känns det rimligt att en aktör som exempelvis Samsung troligtvis kommer ha best deal på dessa om kanske tio år.

Hur kan mångfalden av plattformslösningar för Connected TV påverka användarna?

Det kommer uppstå förvirring helt klar och frustration. Samtidigt så är det så att de flesta sitter med TV-system med flera års livslängd, så sannolikheten att man skulle ha flera olika system hemma är nog inte så stor. Man kan dra paralleller till en telefon. Det gör lite ont att byta till en Iphone eller till Android innan man vänjer sig. Ån så länge kan man ta vilken TV som helst för att de är så lika, men det blir nog en liten inlärningströskel på sikt även där. Teoretiskt borde det inte göra ondare än vad det gör att byta telefon, vilket ibland gör lite ont men efter några veckor så är man inne i det.

**Hur kan en öppen eller kontrollerad plattform för Connected TV vara att föredra och varför?**

Initialt så är alla plattformar stängda och med stängda menar jag att man inte kan publicera innehåll som inte är godkänt i förväg av plattformsägaren. Det kommer nog vara så de närmsta åren då de är värdigt rätta för att användarna ska bli utsatta för så att säga dåligt content eller dåligt fungerande content. TV-upplevelsen är om möjligt ännu mer fredad än mobiltelefonen, där vi under en längre tid har vart oss vid att det finns olika use-case i en telefon. Blir det avbrott i OS-finalen så ringer det hundratusentals människor till SVT, så det finns en enorm förväntan på TV att allt ska fungera som det ska. Telefoner har vi nu haft i tio till femton år och vi vet att de kraschar ibland och då är det bara att starta om, men det är inte riktigt accepterat i TV-världen. Jag tror att vi tyvårr kommer acceptera det mer om några år, men jag tror att det finns en ambition hos de flesta plattformsägarna att man ska skapa den här upplevelsen som inte störs av bruset. Det är fördelarna med en stängd plattform.


**Vad ser du främst för möjligheter med Connected TV?**

Vilken roll tror du att Connected TV kommer att ha i framtiden?

Vad kommer vara den största utmaningen för Connected TV?

De har ett problem nu att säkra relevant innehåll, för trots allt så kan man i teorin tycka att SVT play, TV4 anytime och alla dessa borde stå och jubla, men de gör inte det för att det är en hönan och ägget situation. De säger ungefär till Philips och Samsung att; kom igen när ni när några hundra tusen, varför ska vi utveckla applikationer som inte når någon slutkund?

Sen har de ett problem i slutkundsledet, där generellt sett försäljare i butik har svårt att sälja lite mer avancerade produkter. Det vet jag att exempelvis Microsoft och medi center hade jätteproblem med. Hade man där haft alla dessa, TV4 Anytime och SVT play klara så hade det varit mycket lättare med försäljningsargumenten.


Det finns dock enka lösningar på detta som exempelvis om film2home tillsammans med Philips paketerar med någon gratisfilm och en micropopcornpåse, grattis konsument nu kan du koppla in. Det känns enkelt, men det gäller ändå att någon väljer att koppla in.

Vad är största problemet med att se film över internet idag?


Det går men samtidigt vet jag att det är ingenting som min mamma skulle vara i närheten av att åstadkomma. Jag tycker själv att jag är hyfsat teknikkunnig, men jag tycker att det är på gränsen till för jobbigt. Vilket gör att jag ser fram emot när nu PS3an ska lansera en VOD-store då vet jag att det streamas direkt och att det funkar och är HD.

Convenience faktorn känns extremt viktig och den tappar man lite på PC tycker jag.

Sen finns det andra fördelar med PC att ha en lite mer mobil åtkomst, då du kan hyra film i stugan eller så.

Men jag tror ändå att TV är filmens rätta element.

Sen tycker jag att man ligger steget efter med rättigheter, men det har inget med plattformen att göra. Det är inte aktörernas fel, det är Hollywoods fel som väljer att ha sina fönster och sina affärsmodeller. Det är inget som enskilda aktörer kan justera.

Vilken roll tror du att Connected TV kommer att ha i framtiden?
Om de lyckas så bra som branschen tror så skulle man kunna tro att folk klipper sina existerande operatörsabonnemang.
Jag tror framförallt på video on demand och catch-up tjänster, för det finns ett invant beteende hos folk, även om det är så att säga fel medium på PCn. Användningen på SVT play är jättehög och kan man bara flytta det till det rätta elementet så borde det få en exponentiell effekt kan man tycka.
Om folk kan komma åt det här i sin TV så borde det förändra tittarmönstret ganska mycket. Om man lyckas göra det här lättbegripligt och användbart för konsumenten.
Det återstår att se med appar, det är inte på något sätt bevisat att folk vill hålla på med applikationer vid TVn.
Personligen så tror jag att det finns en marknad där, men jag tror kanske inte att den är lika stor som i mobilvärlden. Du har ett familjeperspektiv kontra ett individuellt perspektiv i telefonen.

Då kan det vara lite märkligt att ha Facebook i TVn osv.
Exakt, jag tror att Facebook kommer vara vad man i TV-världen kallar för CNN-effekt, att alla operatörer måste ha med CNN i kanalpaketet för att folk gillar det och köper det gärna men det är nästan aldrig någon som tittar.
Jag tror att det är lite på samma sätt med Facebook. Det är schysst att ha Facebook i TVn, men sen inser man när man kommer hem att man kanske inte vill att ens mamma ska se vad ens kampisar säger hela tiden. Om inte Facebook gör något smart och faktiskt utvecklar något. Det man gjort nu är bara en rå översättning av vad som finns i PCn till TVn, det kan finnas andra sätt att göra det här.
Till exempel så kanske det stora med Facebook i TVn snarare handlar om en social gemenskap när du tittar på saker och att du faktiskt kommunicerar med dina kampisar. När man tittar på något gemensamt men virtuellt.

Lite som Spotify gjort nu när de integrerat en liten del av facebook
Det kanske är det som är en rätt Facebook i TVn, men nu har man bara gjort en rå översättning av det normala Facebook.
In what way can Connected TV be a threat to the established Cable, Dish or IPTV distributors?

For you are specifically asking about a threat. Their is a degree of threat in so far as a lot of these current services that are available on cable, such as VOD services or subscription based content services can in theory be delivered direct over broadband into a television. So there is in that sense a fundamental threat. However for the cable provider and the other subscription service providers there is nothing to stop them from making that content available on connected devices. So it is the same service that is technically being delivered through a different route. So they can maintain those products and services. In fact they can actually expand them because they can offer them to non-subscribers, non-cable users etc. So although it is a threat it is also I think a significant opportunity.

How could the diversity of different platforms for Connected TV affect the end users?

I think it undoubtedly going to create confusion for users. We have seen this in other industries. I think what we see now is the market, where all of the elements are right for this medium. People are more educated in terms of application models, connectivity and they also have more expectations of the devices that they are bying. The costs of TVs are coming down and broadband penetration is increasing. So there is very different terms taking place that makes this a great time and creates the demand and appetite for these products. With that in mind there is an opportunity for many players to try and take advantage of that. Now what happens in any industry that goes through this is that you have many different players that will jump into this space and try and grab their opportunity. Over time after you have seen the initial fragmentation you will start to see some consolidation. I think we are going through that process of fragmentation where there is the appetite and there is the audience being developed and various of products and services will start coming into the market. They may not necessarily survive the next two to three years, but they will make it confusing to the user because there will be a lot of initial choice and confusion and clutter and a lot heavier before it is getting better.

How could a more open or a more controlled platform be good for Connected TV?

This is such an early market; if you think about the web and how far it has come from what it was ten to fifteen years ago you can see where we are today in terms of openness. Now with the TV there is different challenges cause ultimately you are in a shared living room environment and you need to be mindful of that there is probably children in the room. So I think there is an element of being sensible, but I think that you could still over time develop services that maybe adult but make you for example protect children from. In our initial approach, yes it is an open platform but we have some restrictions as we do not today accept adult or gambling. Now that is not to say we will not in the future and that we are not looking at it now. Right now we want to make services easy to come onto the platform, we have an open SDK so that people can develop and submit it and then we go through a QA process to make sure it does not break the TV and then it can go into production mode.
But like you say there is a degree of control in that environment and I think it is to early to make a decision on how successful some of the less safe content will be or how that is managed in terms of the process.

But I do think that we in the future we will see more of those services that are currently maybe not available come onto these devices.

Good examples on that is sports betting, it is gambling, it is adult. I think all of those services will eventually come onto these platforms.

Maybe the browser experience, where you bring all the content of the Internet is one way to do it?

Well I think that the challenge you are going to get with the browser experience is that; in order to support a browser experience the TV needs to be as good as a computer. Now if you make a TV as good as a computer it is going to cost twice as much.

I think there is also the limitation that you are ten foot away from your television, I mean that you can not just put a page from the Internet on your TV because you are not sitting that close to it.

I think content has to be repurposed for the TV. It is not about replacing the TV with a PC. It is about being clever about adapting content to the TV.

*What do you see as the greatest opportunities for Connected TV?*

That is a bit of a tricky one, because I think there are so many wonderful use cases for the connected TV.

The thing that makes it wonderful for one person does not necessarily makes it wonderful for another:

This is a mass market product but what I think it does have is the power to deliver something for everyone.

If you are the young kid and you like play station, you could access applications that allow you to access cheat codes as for the game and that are pretty seamless by your remote control.

Now that is a great application if you are sixteen or seventeen but it is not great if you are sixty.

If you are sixty and you could have archive content with video services and programs that you watched when you were younger, or maybe the ability to communicate with your grand children in Australia instantly via a camera that is built into your TV that allows you to have voice and web access. Then these things becomes very powerful and very indispensible applications in the future, but again we are so early in this game that all of these applications that we see today in my opinion are pretty basic. They are not showcasing the best of what this could do, because you are only just starting and getting people innovating and thinking about it.

This is the beginning, it is only just an infant in its stage of development.

I think the best is yet to come in the next two to three or four years and it will be very exciting, because if you use a mobile analogy and look at apple who have 135’000 applications.

Once upon a time you bought your phone so that you could make a call, today you buy a phone because it can give you a 135’000 applications.

I think the beauty is that it changes the way that we engages with TV, it allows us to do different things in our living room and it allows us to do the things in the living room that we are doing today with mobiles and PCs but with a single device.

*What will be the biggest challenge for Connected TV?*

I think it is a lot of broadcast politics.

*Do you think it is the Hollywood?*

No those are the studios and no it is not Hollywood.

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It is a mindset of thinking that the user only wants to do stuff that is related to what they are watching, because we know that users are doing lots of different things. Things that are related to what they are watching. I think that is a very strong, very powerful and very core experience to the connected TV.

But in addition to that, some of the applications that we have seen developers come up with is for example; I had one the other day where you maybe have a TV in your bedroom and you have a home automation system that you could control with your remote control and it switches of your lights and it might adjusts your heating and all that sort of stuff but you are lying in bed doing it.

So it is the last thing you do before you go to bed, or if someone rings the doorbell you can see their face pop up on the TV or the phone rings and you got caller id that surfaces on your TV. Or you want to be notified about a particular program that is on another channel that you are not watching.

I mean there is a hundred of great things that you can do.

But I think that the broadcasters do feel threatened, because they have known and experienced TV pretty much for the same way in about seventy years.

They also have to think differently about content for the consumer, because content is not just consumed on the TV; it is for example consumed on the mobil, the PC and the Ipad.

So the way that we think about programs and all of the content around programming, behind the scenes, interviews, video footage, tweets and stars having their own twitter feeds etc. All of that can be pulled in to create a nice world that people can experience, beyond just what they see on the TV.

The biggest obstacle is probably in Europe some of the broadcast oppositions and also some of the new technologies that are coming out.

Although they are an improvement on the TV I think they have limitations and if those technical limitations will not do it I think they will slow down the process.

What is the biggest problem in watching full length movies over the Internet today?

I think that there is two main considerations that drives on demand viewing.

One is that most people want to watch these things at their convenience.

So if they miss the linear broadcast, or maybe if it is not even showing and they want to watch it at their own time.

They typically go to their PC, because it is the only place where it is available.

If you would have put catch up TV services and VOD services like in Sweden you have film2home and things like that.

If that was made available on your TV, you could have the same experience but you have it on a screen that better lends itself to a film experience.

Now that is obviously different if it is short form vs. long form.

The other things that goes hand in hand with that is; if you watching a movie you probably prefer to watch it in better quality. If you can watch it in high definition, you would.

I don not think that people will necessarily avoid poorer quality video.

I think that the biggest driving factor is the ability to get it when they want it over the quality of it.

I think the quality is probably a secondary factor. It is still an important factor but I do not think that it is a key factor.

If it was, YouTube would be a failure and you only have to look at the success of YouTube to realize that the quality of video is not an obstacle to viewing.

Then again YouTube has become big cause being watched on a small screen and the quality issue might not be as high as on a big screen.

Well a lot of people actually watch it via their Internet connection on their TV. It is a very popular use case.
I think Sony where doing some research, they polled 46'000 of their users of which 55% connected their Internet to their TV and they asked them what they did. I think video category came on number three or number four. But what they where doing was watching the web just swapping one screen for another screen. So people are prepared to do it today. People always asked me if stuff is not in HD will people watch it? But fifteen years ago we did not have HD and we sat trough films.

What kind of role will Connected TV play in the future?

I think connected TV will be a way of life. I think the forecast are by the end of 2015 six out of ten TVs will be Internet enabled worldwide. Now if 60% of all TVs that are available for sale are connected TVs it could potentially be higher and that is only five years away and it is going to be a fairly basic requirement.
I think anyone who is about to invest in the cost of a TV, although they are coming down it is still a considerable purchase. Will hopefully want to have things like connectivity and 3D and all of the other things that the smart TVs can do and will do in the future.
I think the future of connected TV is guaranteed in that sense it will not go away.
I think it will evolve and I think it will get better and I think it will become something we take for granted.
I think we will look back and wonder how we could survive without it.
It is definitely not a flash in the pan.
Do you think the broadcast system will disappear and that we will only be connected? Absolutely not.
I think TV will always have a roll to play and I think that in the end of the day, things like live television matches, reality TV shows and breaking news are experiences that are time sensitive and only a linear broadcast can deliver.
Yes you could do it by a live streaming and potentially maybe what happens is that all that could really change and it is not what you do but how you deliver it.
Although I think you have to change what you do as well to move with the times. But I think the delivery mechanisms will change to adapt to demand.
But ultimately linear broadcast or live streaming will always have a roll to play.
**10.2.6 IPTV Operator, 2010-06-17**

På vilket sätt kan Connected TV vara ett hot mot etablerade Kabel/Satellit-TV/IPTV- leverantörer?

Ja det är ju klart att det självklara svaret är att det finns en konkurrent till och det gör ju att det är fler som ska dela på kakan. 
Sen vem som får kunden, det beror på vad man har för erbjudande så att säga. 

Så visst är det så att alla alternativa sätt att konsumera video är ett hot mot nuvarande tjänster, oberoende om man är IPTV-operatör/Kabeltv-operatör eller vad man nu må vara. 

Å andra sidan så är det så att det redan finns väldigt mycket på internet. 
Sen kan man se på det som så, att de som är så att säga inbåtta TV-seriefantaster, de laddar fortfarande ner från internet och använder en proxy för att ha en dold ip-adress. Så att de finns ju många sätt att konsumera video på.

**Hur kan mångfalden av plattformslösningar för Connected TV påverka användarna?**

Jag tror att det kan vara ett problem framför allt för att få ett bra innehåll. 
Har du flera Connected TV devices i hemmet så fungerar det olika, men det största problemet med det är att man har olika widgetsystem, med Yahoo tv på en och vissa tillverkare tar fram tjänster för den och andra kan absolut inte samarbeta med Yahoo för de gör sina tjänster bara på en annan plattform. 

Apple TV har också en egen plattform redan idag osv. 
Det är vad jag tror om fragmenteringen på tjänstenivå, men kanske inte på hårdvara. 
Sen får det inte heller vara svårt för användarna att använda tjänsterna.

**Hur kan en öppen eller kontrollerad plattform för Connected TV vara att föredra och varför?**

Sen har du ytterligare ett alternativ till och det är en plattform som kan vara managerad av en IPTV service provider. 
Innehållsmässigt vill man ha det öppet, men om det inte fungerar och tjänsterna inte fungerar så får man problem. Det kan bli jätteåliga tjänster. 
För Apple så fungerar det ju väldigt bra med appstore, som måste godkännas på någon form. 
Möjligheten för användare att ladda hem sina egna applikationer, det tror jag kanske är en sak som skulle kunna vara en differiator.

**Om man ser till en helt kontrollerad plattform, exempelvis en IPTV, där en operatör sköter allting. Vad finns det för fördelar med en sån?**

Då kan man göra ett helhetsåtagande till kunden och garantera att TV-tjänsten end-to-end att den ska fungera. Då kan man komplettera med att man faktiskt kan komma åt vissa öppna tjänster också. 
Då kan du matcha så att du får bandbredd så att det fungerar ihop med tjänsten. 
Med en service provider så är det någon som tar ansvar för helhetsåtagandet mot kunden.

**Vad ser du främst för möjligheter med Connected TV?**

Dels så tror jag att det ger ett större utbud och även andra saker än bara tv som man skulle kunna ladda hem och köra, personaliserat som de vill ha det, om man nu lyckas med det.

**Vad kommer vara den största utmaningen för Connected TV?**
Jag tror ett av det vanligaste felen när det gäller kundservice och IPTV kan vara en utmaning, när kunden ringen in och säger att det inte fungerar och att de inte kan det här, kan inte koppla upp det här osv. Då kan dom exempelvis inte ringa Philips och säga att de inte kan koppla upp sin TV. Jag får den inte att fungera ihop med mitt Internet. Då ringer de till internetleverantören som säger; ja jag kan ju se här att du har 8Mbit, det är inga fel på din lina, vi kan mata här och se att du har 8Mbit i ena riktningen och 1Mbit uppströms, det ser jättebra ut.

Och även att det kanske inte fungerar ihop med min dlna-server i hemmet. Sen finns det fler problem, ibland ser man att det exempelvis finns oberänsat av bandbredd, men det är egentligen en sanning med modifikation.

I dagarna har till exempel Telia släppt en del HDTV till ADSL-kunder och vad sammanföll detta med? Jo, Telia håller också på att gå över till MPEG4 på massa kanaler, alltså att de går ner i bandbredd. Slutsatsen är egentligen att det är väldigt trångt i accessnäten redan och många IPTV leverantörer använder multicast och om man nu ska gå över till unicast så tar det ännu mer bandbredd och det är trångt redan innan.

Om man går in på hembioforum så kan man se att HDTV är ganska eftertraktat idag och då är det en utmaning att få till HDTV via Connected TV också.

Vad är största problemet med att se film över internet idag?

Dels så är det väl mängden innehåll som ska vara lagligt och dels så är det även kvaliteten. Det jag har sett har det inte varit särskilt jättehög kvalitet på, men det är i och för sig olika.

Vilken roll tror du att Connected TV kommer att ha I framtiden?

Jag tror att det kan vara ett komplement till andra TV-tjänster. Alla dessa problem eller hot kan ju faktiskt undanröjas genom att samarbeta mellan olika internetleverantörer.

Så det är inte så att Connected TV är helt döfött som så.

Sen tror jag också det kan bero på vad som händer med standardiseringen.

Du har ju openIPTV forum som håller på att standardisera såna här saker. Kommer det bli så att alla kommer överens, operatörer och tv-tillverkare?

Som det har varit nu de sista åren så har tv-tillverkarna haft lite överhand. Det var någon kohandel, där det finns en managed och en unmanaged lösning och unmanaged var helt internet och managed var ims och alla operatörer kanske inte vill ha ims.

Om man då är en annan operatör som inte vill ha någon av de, vad gör man då? Och hur kommer det här kombinera ihop, kommer det bara bli någonting som tv-tillverkarna kör eller kommer de få acceptans bland operatörer. Gör du det så kommer dom som använder det här konkurrera och få internettjänster båda två, då kan det bli någonting.
10.2.7 Elgiganten, Per Nordqvist, salesman, 2010-05-31

På vilket sätt kan Connected TV vara ett hot mot etablerade Kabel/Satellit-TV/IPTV-leverantörer?

Om inte leverantörerna exempelvis Comhem har något att säga till om med innehåll osv. då är det direkt konkurrerande mot dem.
Om de vill lansera egna tjänster och små appar så fungerar inte det om det redan finns i TVn.

Hur kan mångfalden av plattformslösningar för Connected TV påverka användarna?

Det är som med allt annat, det är jätteknepigt för slutanvändaren att det inte finns någon standard. Som med bilar, är man en Saab-användare så kör man Saab och då köper man gärna Saab igen.
Om man är en Samsung-användare så kan man det systemet, med deras fjärrkontroll.
Mångfalden som så gör att det blir svårare att byta märke på något sätt. Man tycker att det är säkert att hänga på det egna.
Det skulle vara jättebra med en standard
Säljer man på dessa internettjänster som merförsäljning till TV?

Du kommer in på ett segment av TV apparater och såg att du kommer in i ett segment där du har 7-9000 och 10-12000 och så finns det topp tv.
Rent försäljningsmässigt så blir allt sånt bra argument för att propsa för en viss produkt.
Så att vill jag sälja en TV med internet@TV så kan man pusha för det att det är jättebra för dig och det kommer förenkla din vardag och du kommer slippa sitta framför datorn lika mycket, du kommer enklare hitta filmer och slippa reklam och allt det där.

Hur kan en öppen eller kontrollerad plattform för Connected TV vara att föredra och varför?

Jag tror starkt på öppenhet, crowdsourcing.
Om man ska lyckas med någonting idag så ska det vara så lättgängligt som möjligt och en tjänst blir bättre ju större utbud som finns.
Det ska självklart hålla en viss kvalitet, men har man sex appar som är riktigt bra, eller har man tusen appar så blir det mer intresse, det skapar ett hås kring det, som att har du det här intresset så kan du göra det här.

Vad ser du främst för möjligheter med Connected TV?

Främsta möjligheten är att mer integrera TV-beteende och hur man kan förenkla det.
Du kan kolla mail och sånt och det är ju jättebra och vara connected all the time.
Att den analyserar hur man tittar och du får ett litet tips om att nu vill du säkert kolla på trailern för den här filmen och så stämmer det att jag faktiskt vill göra det.
Då är det jättebra.
Eller om det har kommit ett nytt South Park, klicka har om du vill köpa det.
TVn är fortfarande en TV tror jag och de borde fokusera på TV-tjänsterna och göra tv-tittandet så kul som möjligt.
Men en webbläsare på TVn, vet jag inte hur bra det fungerar bland folk.
Jag tycker inte att det är så schysst att sitta och surfa på en TV, det känns inte som ett behov utan det gör man ju på en dator. Medans kolla på film och såna grejer, det är det man gör med en TV.

**Vad kommer vara den största utmaningen för Connected TV?**


**Vad är största problemet med att se film över internet idag?**

Kvaliteten och tillförlitligheten, det är garanterat det två största. Man vill ju se det i bra kvalitet och gör man det även om man har en 100Mbit lina så kan man inte vara säker på att det inte kommer hacka och det förstör ju hela filmen.

**Vilken roll tror du att Connected TV kommer att ha i framtiden?**

Jag tror att det bara kommer vara en koppling till det nätverk som man redan har. Om tio år så kommer man inte att ha TV-sändningar som man har idag utan man kommer att köra det genom det fibernät som man hela tiden bygger ut. Det kommer finnas kapacitet att göra det och då finns det ingen anledning att ha en sämre analog överföring till exempel, eller något sånt.
10.3 Expert survey questions

Connected TV

This survey involves the expectations of Connected TV.

Connected TV are TV-devices directly connected to the Internet.

What are your profession?

Are you a man or a woman?
- Man
- Woman

How old are you?
- Age up to 19
- 20-29
- 30-49
- 50-65
- 66+

Have you heard of Connected TV before?
- Yes
- No

What service would especially make you choose a Connected TV as your next TV?
- Video On Demand, movies that starts whenever you want them to
- Access to pictures from foto applications (Flickr, Picasa etc.)
- Social applications for Facebook, Twitter, YouTube etc.
- News (over the top) directly on the TV screen
- Surf the web
- Games

Have you used VOD on your TV-set before and in what way?
VOD = Video On Demand, movies that starts whenever you want them to
- Yes, through a computer connected to the TV-set (Online videostore)
Yes, through IPTV
Yes, through Connected TV
Yes, through some other device (gaming consol etc.)
No, never used VOD

What do you think is the BIGGEST obstacle in whatching VOD on a TV-set today?
VOD = Video On Demand, movies that starts whenever you want them to
○ To much trouble so I never bother doing it
○ Not enough movies to choose from
○ Bad quality
○ To expensive
○ Do not know

What are your expectations on VOD via Connected TV?
VOD = Video On Demand, movies that starts whenever you want them to

Image quality?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
</table>
| Very bad |   |   |   |   | Very good

Sound quality

<table>
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<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
</table>
| Very bad |   |   |   |   | Very good

Supply of movies?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
</table>
| Very little |   |   |   |   | Very big

Supply of online videostores?

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<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
</table>
| Very little |   |   |   |   | Very big
Navigation with the remote control

1 2 3 4 5

Very hard □ □ □ □ □ Very easy

Would you consider cancelling your current TV subscription if you could access the same amount of content On Demand with a Connected TV?
- Yes
- No
- Do not know

Do you believe Connected TV will replace the existing linear distribution forms of TV? or simply complement them?
- Yes replace
- No, only complement
- Do not know

Will your next TV be a Connected TV?
- Yes
- No
- Do not know

Skicka

Från Google Dokument

Rapportera missbruk - Användarvillkor - Ytterligare villkor
<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>ID</th>
<th>Gender</th>
<th>Age Range</th>
<th>Have You Used VOD Before?</th>
<th>How You Watched VOD on Your TV?</th>
<th>What Was Your VOD Experience Like?</th>
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<td>5/5/2010</td>
<td>8.43.15</td>
<td></td>
<td></td>
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<td>Yes, through a computer connected to the TV-set (Online video store)</td>
<td>Bad quality</td>
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<td>Good quality</td>
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<td>Yes, through a computer connected to the TV-set (Online video store)</td>
<td>Too much trouble so I never bother</td>
<td>5</td>
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