Interactive Digital Television in Europe

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1 Introduction

During its short history, television (TV) has gained a very significant role in information sharing and generally in people's daily life. Nowadays, TV is one of the most consumed media forms all around the world. On average, TV is viewed in Europe 3 hours and 33 minutes per person daily (Eurodata TV 2004). There are several reasons for its popularity. TV is a compelling medium due to its *media and information richness*. It requires little from the viewer (*ease of use and follow*) and provides possibilities for *social interaction* among viewers both during and after watching. It can be used both for entertainment purposes and information absorption.

The single most important change process in TV's near history – digitalisation – has started during the 1990s. The process began with the digitalisation of the production and distribution infrastructure. The development has by now reached the viewer level. The transition period will last at least until the end of this decade (see Table 1). This development has a wide-ranging affect on all players in the TV industry from content owners to viewers. These changes are for example better *picture and sound quality*, more *channels*, more *attractive content,* and the possibility to use *interactive services* (e.g. information services, t-commerce etc.).

1.1 The Importance of IDTV

Today, the subject of interactive digital television (IDTV) is a highly relevant and heavily discussed topic because the digitalisation is now in its final phase and has become a reality for almost the whole TV audience and industry. Broadcasters have launched their digital services, set-top-boxes are available, and several countries have decided on a switch-off date for their analogue signal.

This chapter aims to describe the development, current situation, and future trends of IDTV in the European Union (EU). The main objective of the chapter is to give the reader an insight into the IDTV industry's current

market situation, business models and technical developments. We will describe the markets at a general level and highlight some key markets as an illustrative example. The chapter is written from a Northern European perspective and may therefore have limitations in comprehensiveness of other regions in Europe.

1.2 Definition of Terms

In order to make sure both readers and writers have a consistent understanding of the terms used in this document we want to highlight the following three terms: *interactive television* (ITV), *digital television* (DTV), and *interactive digital television* (IDTV).[1]

ITV – Television that allows the viewer to interact with the television set in ways other than simply controlling the channel and the volume and handling videotapes.

DTV – Transmission of television signals using digital rather than conventional analogue methods. Analogue transmission takes place in the form of a constantly variable wave; digital transmission consists of an electrical pulse, which has two possibilities: on and off (or positive and negative), which are represented by a one and a zero.

IDTV – Digital TV signal transmission, which includes interactivity enabling elements. Interactivity can be achieved either by using a service locally (remote control – set-top-box) or by connecting to a return channel (internet or mobile). In this way the *passive viewer* increasingly becomes an *active user*.

2 History of IDTV

The history of IDTV has its roots in the 1950s when the first interactive children's programme called *Winky Dink* was introduced. In this programme, children could draw on a special transparent sheet placed over the TV screen using ordinary crayons (Dodson 2001).

The 1970s were a decade of emerging teletext and first commercial interactive TV services in Ohio offering 30 channels divided into broadcast TV, pay-per-view, and interactive programming. In the 1980s, the BBC introduced the first TV programme (*What´s your Story?*), which viewers could direct via telephone.

[1] Definitions from http://www.whatis.com

The 1990s were a decade of major changes for the TV industry. In the early 1990s both production facilities and distribution networks began their digitalisation process. The end of the 1990ss were a time for launches of IDTV broadcasters and services. The development took mainly place in UK while the rest of Europe was following suit. Sky Digital[2] was first to launch its services in October 1998. NTL[3], Cable & Wireless[4] and ONdigital[5] launched their services in 1999 and 2000.

In 2000, first short message service (SMS) based games for TV were introduced in Finland. Now there are dozens of different TV games and shows played by using SMS as a return channel. These services also include SMS chat and voting. The user sends programme or activity specific SMS messages to the broadcaster. The game or show acts are based on the message, and for example in a chat the message is displayed on the TV screen.

Currently, IDTV enables a wide variety of interactivity for users. For example, in the "Who wants to be a millionaire"–show, the user is able to play the game as a standalone version in his or her home and send the results to the broadcaster if he or she likes. By doing this, he or she is able to win prizes and compare his or her own results to others.

Sports programmes may offer online betting services during games and races where the end user is able to make instant bets as the events evolve.

ITV advertising provides various ways for interaction between user and advertiser. These are for example ordering additional information and product samples via the return channel, participation in competitions or giving feedback to the advertiser. For more examples of interactive services see Table 1.

From the early days of TV onwards, the role of the viewer has changed quite considerably. This evolution can be seen as a development from a leaning backwards (passive) viewer to a more leaning forward (active) user.

[2] See http://www.sky.com
[3] See http://www.ntl.co.uk
[4] See http://www.cw.com
[5] See https://www.ondigital.co.uk

Table 1. History of IDTV (1953–2004)

Decade	ITV	DTV
1950	Winky Dink (1953) Telephone call-ins (1959)	
1960		
1970	Launch of teletext (1974) 1st commercial ITV service Qube (1977) Link Between TV and telephone – Prestel (1979)	
1980	Viewer directed TV programme via telephone (1988)	
1990	Chat messages on TV, interactive ad (1994)	Digitalisation of production process & distribution networks (1990s)
1990	Sky Digital launched (satellite) (1998) Ondigital launched (terrestrial) (1998) Several ITV service launches in the UK (1999)	
2000	SMS based TV games & chats (2000)	

3 IDTV Transmission Channels

TV signals can be transmitted to the viewers via three different channels. These are terrestrial digital video broadcasting (DVB-T), satellite (DVB-S), and cable (DVB-C). The terrestrial signal is transmitted via air and it requires an aerial for receiving the signal. The satellite signal is also transmitted via air, and it requires a satellite receiver (meaning a dish). The cable signal is distributed via a fixed cable, and receiving the cable signal requires a specific cable receiver box.

In order to use interactive services, the user needs also a return channel. The need for a return channel and the type of channel depends on the service used. Examples of the return channels are the mobile phone (SMS/MMS) and an Internet connection via modem or asymmetric digital subscriber line (ADSL). The cable connection is a two-way connection already by its nature, and therefore it is able to provide a built-in return channel for the user.

Internet protocol TV (IPTV) is also an emerging distribution model for TV content. IPTV utilises an Internet connection for both distributing the content and for return channel purposes.

4 IDTV Platforms

Some broadcasters own the whole vertical value chain and provide IDTV services on their proprietary platform. These broadcasters have control throughout the whole value chain from content production to customer relationship. Digitalisation started from these proprietary platforms. These broadcasters were able to develop their platform and services earlier than others, which enabled a faster digitalisation pace compared to government led digitalisation. The most successful proprietary platform standards and providers currently are Sky Digital with OpenTV[6], and Canal Plus[7] with Mediahighway[8].

Besides proprietary platforms there is a development going on with the publicly led free-to-air (FTA) model, which is mainly focused on digital terrestrial television (DTT). This standardisation has started in the early 1990s and is managed by the Digital Video Broadcasting Project (DVB Project[9]). The standard for enabling interactive services is called Multimedia Home Platform (MHP) and is now widely adopted among European countries. Many countries have already set their schedules and plans for both digital TV and radio broadcasting. Despite the Europe-wide uniform standard of broadcasting the deployment of digital broadcasting is highly country dependent as can be seen in Table 2.

The transition period from analogue to digital broadcasting is quite long for many countries starting from three years in Italy up to 12 years in Spain. Finland and Italy are the first countries to shut down their analogue transmission but even their switch-off date is far in the future (2007). Many other countries have doubts about their schedule and no exact dates for switch-off have been published.

[6] See http://www.opentv.com
[7] See http://www.canalplus.fr
[8] See http://mediahighway.nds.com
[9] See http://www.dvb.org

Table 2. Development of digital television in Europe (DVB) (Source: based on www.dvb.org)

Country	Legislation in place	Digital television launch	Analog switch-off
Austria	2001	2006	2012
Belgium	2002	2004	2010 (latest)
Cyprus		No data available	
Czech Republic	2004	2004	2010–2012 (estimated)
Denmark	2002	2005	Not decided
Estonia	No data available	2004	No date given
Finland	1996	2002	2007
France	2000	2005	2008+
Germany	2002	2003	Started – 2010
Greece		Planning started 2003	
Hungary	2004	2004	2010–2012
Italy	2001	2004	2007
Ireland	2001	2004	2015
Latvia	2000	2003	2006
Lithuania	No data available	2004	No date given
Malta		No data available	
Netherlands	1999	2003	Starts 2004
Poland	2003	2001	No date released
Portugal	2000	2004	2010
Slovakia	2001–2004	2005	2015
Slovenia	2004 planned	Depends on legislation	2015
Spain	1998	2000	2012
Sweden	1997	1999	2008
UK	1996	1998	2010

The long transition period alongside an incoherent European wide schedule will have various effects on stakeholder groups around IDTV. These are:

- Development of EU wide markets for IDTV related products and services will take years;
- Immature markets create challenges for the companies who have already invested into the industry;
- Broadcasters need to maintain two transmission networks and therefore investments into new services may be only of secondary importance;
- The slow transition period will not create interest towards IDTV among end users and set-top-box penetration may lag behind;

- End users will receive new services slowly and they are in an unequal position to each other compared on a EU level.

5 The Business Model

The evolution of IDTV is changing the business and working models of traditional TV content creation quite heavily. IDTV gives the industry much *more choices and flexibility* compared to traditional content creation, *enables it to utilise a wider range of technologies*, *involves new stakeholder groups* (e.g. interactive agencies, software vendors), and *enables innovative business models*.

IDTV related content can be divided into two main components – TV programmes & formats and value added services (VAS). There are several types of VAS and two ways to use those: either as a programme related or a standalone VAS (see Table 3.). The most common types of VAS are information (incl. electronic programme guide (EPG)), communication, entertainment, transaction services and in general interactive TV programmes. The table below provides examples of various value added services.

Table 3. Value added service types and usage in IDTV

Service type	Programme related VAS	Standalone VAS
Electronic programme guides (EPG)		▪ National / channel / set-top-box based
Information	▪ Enhanced news, traffic & weather information ▪ Sports events related up to date information	▪ Travel destination presentations in digital teletext
Interactive TV programmes	▪ See Communication, Entertainment & Transaction	
Communication	▪ Chat (via set-top-box, mobile, internet)	▪ Email ▪ Instant messaging
Entertainment	▪ "Who wants to be a millionaire"-show (interactive: participation in game show from home) ▪ Voting, ring tones, logos etc.	▪ Games, quizzes etc.
Transaction	▪ TV-shopping ▪ Betting	▪ Concert & travel tickets ▪ Banking services

The traditional TV content production and distribution model is illustrated in Table 4 (column 1). Interactive value added services are more complex by nature and therefore require a wider range of competences to be produced (columns 1–6.). Key actors for delivering these competences are *IDTV software vendors, VAS hosting providers, return channel providers, advertising and interactive agencies, consulting agencies*. These actors together with traditional TV content production actors are able to develop and distribute fully-fledged IDTV programmes and services. The rest of the actors in the IDTV value chain provide other important but not critical services for the industry.

Table 4. TV content production and distribution model (Source: Pelkonen et al. 2002)

Core activities	Support activities	Infrastructure related components	R&D projects	Infrastructure supporting activities	Industry rules
Content creation	Advertising services	DTV set-top-box manufacturing	Inhouse	Negotiations of:	Regulation of competition
Content aggregation	Consulting services	DTV distribution equipment manufacturing	Co-operation projects	Finance	Legislative work
Content sales and marketing	Training & education	DTV software creation		R&D co-operation	Creation of standards
Content distribution	Return channel services	Development & maintenance of distribution network		Subcontracting	
Content usage	CRM	VAS hosting		Co-operation projects	
	Research activities				

Business models of service developers and the added value of IDTV are described briefly in the following.

IDTV software vendors

- Develops software components which enable interactive value added services (e.g. platforms, middlewares, content creation tools, specific applications);
- Revenue from software licenses, revenue sharing, and services.

VAS hosting

- Provides hosting environments and services for broadcasters, content providers, and aggregators;
- Revenue from service fees.

Return channel services (internet service provider (ISP), mobile operator)

- Provides connections from the end user's set-top-box to the broadcaster and service provider;
- Revenue from setup fees and premium priced service usage.

Advertising & interactive agencies

- Creative design services for content related actors (e.g. content providers, DTV software vendors, advertisers etc.);
- Revenue from service fees.

Consulting services

- Provides business and technological solutions for broadcasters;
- Revenue from service fees.

However, the most important factor in this value chain lies in the hands of the end user and his/her acceptance towards new programmes and value added services. Depending on the end user's choices only the best and most interesting services will become successful and bring revenue to the whole IDTV value chain. Revenue from the end user can be collected either directly (time/quantity based fee, one time fee or subscription fee) or indirectly (sponsored usage).

6 The Market

The development of an IDTV market in the EU countries has started in the late 1990s. Digitalisation started first with cable and satellite platforms. By now, the attention has turned towards the success of digital terrestrial television (DTT) development. Nearly 44 million households out of 144 million households in the EU countries (pre-May 2004) have IDTV via satellite (30.3 M), cable (7.7 M) or terrestrial (6.0 M) channels.[10] This equals 31% of the total number of TV households. According to Strategy Analytics (2002), the number of IDTV households in Western Europe is expected to grow to over 100 million households by the year 2007. Major IDTV markets in the EU can be found in Germany, UK, France, Italy, and Spain totalling almost two-thirds of the TV households.

6.1 Size of the Business

Revenues from Digital TV in Western Europe (EU's 15 member countries plus Norway and Switzerland) are estimated to be approximately US$ 40 billion in 2004 and expected to grow to over US$ 72 billion by 2006.

Table 5. Digital TV revenues 2000–2006 (US$ billion) (Source: Paul Budde Communication 2004)

Year	Europe	USA
2000	6.15	5.76
2001	10.69	9.61
2002	17.68	14.31
2003	27.42	21.19
2004	39.53	28.96
2005	54.60	41.91
2006	72.22	60.76

Revenues from ITV applications and services are estimated by Strategy Analytics to be almost US$ 1.5 billion in 2008. This figure excludes revenues from pay-tv subscriptions, t-commerce[12], and interactive advertising[13].

[10] The number of TV households grew to 170 million in May 2004 when new member countries joined the EU. Data on digital television penetration in those ten new member countries is not available.

[11] See http://www.dvb.org

[12] Electronic product and service trading and ordering via TV.

Table 6. Revenues from interactive TV applications and services in Western Europe 2002 and 2008 (US$ million) (Source: Strategy Analytics 2002)

Consumer Revenues	2002	2008
TV Messaging/Email	10	234
TV Betting/Gambling	10	64
Interactive TV games	36	448
Enhanced TV	35	712
Other ITV revenue	1	26
Total	92	1484

Forrester Research (2003) estimates that in 2007 revenues from t-commerce will be € 8 billion, and from i-advertising € 2 billion. By combining figures from Strategy Analytics and Forrester we can see that IDTV revenues excluding subscription fees would equal over € 11 billion during 2007–2008.

6.2 Market Players

Currently, the whole IDTV industry is in a phase of rapid development. Value chains, business models, and roles of the companies are becoming clearer every day. Besides traditional TV content production actors, the key IDTV industry actors can be divided into two different categories:

1. Companies focusing solely on IDTV
   - Platform & middleware
   - Content creation & management tools
   - Specific applications
     - MTV´s Doubles Week Tennis game during advertising breaks
     - Image capturing with Infocast Systems' ITV Capture[14]

2. Companies offering services for IDTV industry
   - Advertising & interactive services (ad agencies)
   - Consulting services (information and communication technology (ICT) consulting companies)

[13] Marketing communication planned and executed to actively engage viewer in advertising process through interactivity.

[14] See http://www.infocast.fi/CaptureE.html

- Return channel services (ISP, mobile operators)
- VAS hosting services (information technology (IT) hosting companies)

Examples of the companies focusing solely on the IDTV business are listed in a table below.

Table 7. Solely IDTV focused software companies

Platforms, middleware, tools (e.g.)	Specific applications (e.g.)
Alticast	Endemol
Cardinal Systems	Fresh Interactive Technologies
CoreMedia	Gist Communication
ditg	Icareus
Emuse Technologies	Infocast Systems
Espial	MassMarketMedia
IRT	Pixtel
Ortikon Interactive	Softel
Sofia Digital	Technidata
SysMedia	TeleIDEA
Tamblin	TSS

6.3 Market examples

The development of the IDTV market is highly country dependent. Therefore we have taken three different EU markets for closer examination. The United Kingdom (UK) has the most advanced IDTV market in Europe. Finland has been a pioneer in adopting the MHP standard. Italy is adopting IDTV rapidly and has several interesting special characteristics as described below.

a) United Kingdom

The UK is currently the most developed IDTV market in Europe. The launch of the first IDTV services occurred already in October 1998. Since then, IDTV has reached over 55% of UK households totalling some 13.8 million homes (Ofcom 2004). As penetration is now halfway completed the annual growth rates start to diminish. The government's target date of 2010 for the analogue switch-off looks challenging, especially because 20% of the homes remain firmly uninterested in what IDTV has to offer (ITC 2003). The market has witnessed fast growth but also already some failures (collapse of ITV Digital).

Table 8. IDTV subscribers in UK/platform (Source: Ofcom 2004)

Platform	Pay TV	Free-to-air
Cable	2,502,451	
Satellite	7,085,000	345,000
Terrestrial		5,016,200
Total		13,858,901[15]

During the last six years the UK's TV industry has had time to develop and launch lots of IDTV related content and value added services. This has served also as a learning and reference point for other European countries. The services broadcasted in the UK cover the whole range of IDTV VAS as described in Table 3.

The IDTV industry in the UK is also well developed. There are several companies offering value added products and services for the broadcasters. Examples of the companies in IDTV content business are ditg, Emuse Technologies, Flextech Television, MassMarketMedia and Mindhouse. Major IDTV broadcasters are Freeview, NTL Home, Sky Digital and Telewest.

The IDTV penetration and industry continue to grow steadily. People get used to IDTV, and also advertisers start seeing IDTV as a potential medium. Time will show whether UK will switch-off analog network in 2010. Competition between platforms will continue as the free-to-air DTT model is the fastest growing platform currently. Also VAS companies will face increased competition as more players enter the market also from outside the UK.

b) Finland

Finland has been among the first countries to launch IDTV services in Europe. The "national launch date" for IDTV was August 27th, 2001. So far, penetration of IDTV has reached approximately 400,000 households which equals 18.7% of all Finnish households. The penetration growth rate is strong, and an optimistic estimate for selling IDTV set-top-boxes is 50,000 units per month in the near future. The penetration growth rate should stay very firm during coming years, as the Finnish government has set its analogue switch-off date to August 31st, 2007.

[15] Adjustment to remove double counting for households equipped to receive digital on more than one set (–1,101,280).

Table 9. IDTV households in Finland (05/2004) (Source: Various industry sources)

Platform	Households
Terrestrial	370,000
Satellite	30,000
Cable	Few thousands

Most of the terrestrial TV services are free-to-air, which is a traditional model for TV broadcasting in Finland. On the contrary, satellite services are usually operated in pay-TV mode.

Finnish broadcasters have started to introduce value-added services for Finnish viewers in the forms of interactive services and pay-TV. There are several companies developing and offering IDTV solutions and services. These include Cardinal Systems, Icareus, Infocast Systems, Ortikon Interactive, and Sofia Digital, to name few. Major IDTV broadcasters are YLE (Finnish public broadcaster), MTV3, Nelonen, VIISI, and Canal+.

Penetration continues to grow rapidly and in general IDTV is getting more and more popular among the Finnish people. Broadcasters are also launching new services actively developed by DTV software vendors. The interest of the advertisers for IDTV is still a question mark. The analogue switch-off date is very challenging, and it remains to be seen how well Finland has adapted to IDTV before that date.

c) Italy

Italy officially launched its terrestrial IDTV services on the 1st of January 2004. Services reach initially some 50% of the population. The coverage will be extended to 70% of the provincial capitals during 2005[16]. All major broadcasters (RAI, Mediaset, and Telecom Italia) have started their IDTV services by launching and piloting interactive programmes and value added services. The initial market response has been encouraging, and currently set-top-boxes are sold at the rate of 2,000 a day. If the positive trend should continue up to one million set-top-boxes will be sold by the end of 2004 (DTG 2004).

An interesting feature of the market is that Italy's government allocated funds for subsidising set-top-boxes. € 120–150 million are available to ensure the demand of 900,000 MHP enabled set-top-boxes. On the other hand a fast start is needed as the government has set the analogue switch-off date to the year 2007.

[16] See http://www.dvb.org

Table 10. IDTV households in Italy (Source: www.dvb.org)

Platform	Households
Terrestrial	70,000
Satellite	5,000,000
Cable	300,000

The Italian market will start to wake up for interactive content as well as value added services. Currently, there are not that many IDTV software vendors developing interactive applications for the Italian market but this will change soon due to the increasing penetration.

The market and its development are at the very beginning. It remains to be seen how effective subsidies are, how quickly IDTV will cover the whole country, and how well the market develops in general.

7 Major Technological Developments

Europe has several technical standards that enable interactivity in IDTV. First, the developments occurred in form of proprietary platforms among actors who own the whole vertical value chain (see section on the history of IDTV). The best known companies and platforms are Sky Digital with OpenTV and Canal+ with Mediahighway. Besides the proprietary platforms the Digital Video Broadcasting Project (DVB Project) started to define specification for DTV in the early 1990s, and later in that decade an open and distribution channel independent specification for interactivity enabling middleware, nowadays known as MHP[17]. Many European countries' governments have adopted this standard for their primary platform in free-to-air model. However, proprietary platforms still lead the competition in IDTV (see Table 11). It is important to keep in mind that these platforms and standards define also the functionality of the set-top-box. Currently, end users are able to buy either a very basic set-top-box (that receives digital signals and has no interactivity) or more sophisticated ones with interactivity and conditional access.

[17] For more information of MHP standard see section on IDTV platforms.

Table 11. Middleware standards in Europe (2003)
(Source: www.broadbandbananas.com)

Middleware standard	Households (thousands)
Betanova	1,800
Liberate	2,527
Mediahighway	5,198
MHEG5	2,100
MHP	1,020
OpenTV	12,135

The technical development around IDTV is continuous. Standards evolve, new technical innovations are created, and new end user solutions are coming to the markets constantly. These developments create many new opportunities for industry actors but also as many challenges – for example standardisation, time shifted viewing, new delivery channels, and device convergence. In the sections below we will elaborate these challenges.

7.1 Standardisation

Currently there are several standards for IDTV in Europe. OpenTV keeps its leading position with over 12 million users, Mediahighway follows with over five million users while other standards have one to two million users each. MHP has only a little bit over one million users and has clearly the role of an industry challenger. Compared to other industries (e.g. GSM in mobile telephony) there are too many standards and the IDTV industry will face most definitely *a battle of the standards and a consolidation.* One of the first examples of this development process is Mediahighway´s MHP compliancy.

7.2 Time-Shifted Viewing

Technical development occurs also in the way how people can use TV. A natural evolution of VCRs goes towards personal video recorders (PVR). With these hard drive based systems end users are able to record their favourite programmes, watch it when they want, and very easily skip the advertisements. Also video on demand (VOD) services start developing gradually along new delivery channels (e.g. Internet protocol television –

IPTV[18]). This model enables even *more flexible TV usage* and the possibility to skip advertisements totally. This type of technological development will have wide ranging effects among the industry.

7.3 New Delivery Channels

Technical development in other digital media industries has created possibilities to offer TV content also on other devices than traditional TV sets. Especially handheld devices like mobile phones and PDAs provide *new delivery channels* for TV content and introduce new ways to use TV. These new delivery channels are based on handheld digital video broadcasting (DVB-H)[19] and internet protocol datacasting (IPDC[20]) technologies. With handheld devices end users can choose time, place, and way to access TV. IPTV on the other hand brings TV via Internet to both PCs and set-top-boxes that are connected to the Internet while using the traditional TV as a monitor. This again gives the end user more choice in terms of additional content, communication, and VAS.

7.4 Device Convergence

Just like new delivery channels provided by other digital industries there are also new end user devices that bring new ways to utilise media content in the living room. At some point this development will lead to *media convergence,* i.e. one or a few devices handle all needs related to using media content. The devices competing over this role are set-top-boxes (e.g. ADB, Nokia), media centres (e.g. Microsoft, Sony), and game consoles (e.g. Sony, Microsoft, Nintendo). However, it will take some time before these integrated networked multimedia home terminals are available for mass markets.

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[18] A system to deliver television programming using the Internet protocol (language) over computer networks. See also http://assetmanagement.broadcastengineering.com/ar/broadcasting_iptv

[19] A terrestrial digital TV standard that uses less power in the receiving client than DVB-T, and allows the receiving device to move freely while receiving the transmission, thus making it ideal for mobile phones and handheld computers to receive digital TV broadcasting over the digital TV network (without using mobile phone networks at all). See http://www.afterdawn.com/glossary/terms/dvb-h.cfm

[20] A service where digital content formats, software applications, programming interfaces and multimedia services are combined through IP (Internet Protocol) with digital broadcasting. See http://www.ipdc-forum.org/about/index.html

8 Outlook

The IDTV industry is in a very challenging phase currently. Penetration levels are still rather low, and this has diverse effects for the industry. The industry is in a *treadmill* that is very common for many new emerging technologies. If there are no set-top-boxes and services there are no users and vice versa. Slowly progressing penetration has a negative industry-wide effect in the form of hard market conditions for interactive content and application developers, advertising sales and increased broadcaster operating expenses in form of two simultaneous broadcasting networks.

However, if there are no delays in penetration and growth rates develop as expected this will lead the industry to *high market growth figures* in the coming years. Demand for interactive content, application and advertising production would create activity and healthy competition among industry players, broadcasters could plan new investments after the analog network shutdown and end users could enjoy high quality content services.

The size of the whole IDTV business is anyhow limited, yet the market has many local actors and only a few international ones. This is especially the case with content and IDTV software developers. The software business is also by its very nature an international business so the market environment is immediately all of Europe. There is a danger that many companies will not gain market share, and that they will face either consolidation or market exit.

On the other hand *some trends support small and innovative companies* in their internationalisation activities. These trends include content formats, media convergence, and universality of software development. Creative and innovative companies may well break through on a European level.

Standardisation is still in an early phase. OpenTV has got a head start in platform business and they have got time to further develop the platform based on real customer experiences. MHP and other minor standards are in a challenger's position and it remains to be seen who will win the *battle of the standards*. However, it is quite obvious that there will be only one or a few future standards in Europe as it has been demonstrated already in home computer (Windows vs. Mac) and mobile markets (Symbian vs. Microsoft).

Standards have wide ranging effects for the markets. Only the biggest companies are able to support multiple standards and smaller companies are constrained to one platform. Depending on the decisions on standards companies may be either *winners or losers* unless various standards become compatible.

New delivery channels create again pros and cons for the IDTV industry. First, these channels (i.e. DVB-H for handheld and IPTV) provide *new ways to deliver content* for end users. Content may be richer (IPTV), the end user has enhanced possibilities to access the content (DVB-H), and it enables new ways to serve and charge the user. Secondly, these channels create potentially *bigger markets* as time and location free usage reaches a wider audience. New channels and bigger audience mean also *increased competition*. The development of distribution models makes the IDTV market tempting for new market entrants from other industry segments. Entry to market opportunities may occur at the broadcaster, content provider (e.g. mobile content) and IDTV software development level (e.g. mobile software companies).

Device convergence creates also challenges for the IDTV industry actors. Media convergence in home terminals is a *widely accepted future vision* among markets. It is not clear yet in what form the competition will emerge and who will be the winner. Set-top-box manufacturers and middleware developers have basically two options: develop set-top-boxes more towards media centres or licence middleware for media centre and game console manufacturers. Media centres enable more innovative content and service creation and therefore provide new business opportunities for IDTV software vendors and content providers.

The philosophy of media convergence raises ever-increasing *competition over the end user's time consumption*. If in the near future most of the home entertainment is served from only one source, which will then be the preferred entertainment type, and how will the end user make his/her choice? Currently, TV viewing takes on average a big share of the end users' time but other media are gaining share rapidly. How IDTV can secure its place in the end users' life and differentiate positively against radio, game consoles, Internet, and other media is still an open question.

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