Where Television and Internet meet…

New experiences for rich media

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Paper published in eView
December 2001

Introduction

The still accelerating digitalisation of content is without doubt having its effect on the way we look at and (re)use content. This digitalisation brings about new reservoirs of content that can be easily manipulated, distributed and reused. The ever-evolving web of the Internet boosts the accessibility of these large quantities of digital content on a scale never seen before. While the increasing bandwidth ensures that there is virtually no limit on what is accessible through the Internet, such as streaming audio and video. Content itself is becoming more and more an integration of media like text, audio and video, that is rich media, still further 'enriched' with metadata. This addition of metadata facilitates content management and the development of new services in the complete lifecycle of eContent: from adaptation to disclosure and consumption (van Vliet, 2001a). It is this sheer amount of digital content and rich media which is becoming more globally available by the minute that is going to have a major impact (van Vliet et al., 2000). Especially since such an 'old' medium as television is jumping on the bandwagon with different countries (US, UK) for instance phasing out analogue distribution channels and replacing them with digital distribution channels (satellite, cable and terrestrial).

Digitalisation though is a technological innovation and it would be a mistake to view and offer it as a service, as some Dutch cable companies keep insisting on doing. In fact the abundance of digital content is not necessarily a benefit. Two arguments can be given. First of all, time is scarce for consumers to 'process' increasing amounts of (digital) content. This is for instance due to an acceleration in the overall 'speed of living' (Gleick, 2000). Trends and hypes are tumbling over one another. The market does not seem to keep up with consumers needs and wishes, and yet consumers are overwhelmed with everything that is thrown at them as being 'the latest', 'newest' or whatever. The time to 'make it' seems to shorten every generation, no longer a long-time career with a single company but job-hopping to score before turning thirty-five. The social appreciation of having a rich life, 'forces' one to not only have a job and be a family man but also to work-out, participate in all kinds of committees and so on. Precious time must be divided among so many different social roles. Secondly, more content does not automatically mean more interesting content, which is what consumers want. After all, people are more and more articulating their individual needs and wishes in all areas of society: regarding work (individually tailored labour contracts), in financial matters (pension arrangements, insurance contracts), living environment (need for diversity of homes), the consuming of goods (microsegmentation of markets), et cetera. Mass-customisation is the word that captures the commercial strategy to this (Pine & Gilmore, 1988). So, the consumer is faced with a significant challenge: the increasing amount of digital content that has the potential of being of interest for him, and the decreasing amount of time to spend together with the wish to have individually tailored content.

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Individually tailored content usage means that consumers can choose not only which content he wants, but also from whom he obtains it and on what terms. This tailoring can involve different aspects like the role of the consumer, the location, time, terminal and quality of service. For instance an electronic newspaper of a business person could be tailored to the location (local news), time (morning edition, evening edition), terminal (latest stock exchange news on a mobile phone, background story on e-Book), role (business news versus leisure and entertainment news) and quality of service (low quality pictures on Personal Digital Assistants versus streamed videoclips to home storage device). But tailoring of content might be just one need or wish of the consumer, maybe in the end he is searching for memorable experiences or even lifetime transformations (Pine & Gilmore, 1999). This addresses the question of the value of (digital) content (section 1). When we have some idea what consumers appreciate, we can look into the different ways new products and services are trying to meet these requirements. This paper focuses on how two 'channels' for rich media, television and Internet, are developing to meet new consumer's needs. This will be done by sketching new developments in television (section 2) and next generation Internet (section 3). Currently both channels are lacking something, it will be argued that Internet has the spirit but not yet the means and television has the means but not yet the spirit to offer new services. This will lead us to the meeting place: the place where crossover devices and concepts breed. I will describe some of these devices and concepts (section 4). As a kind of wrap up on the survival changes of certain 'mutations' the question of convergence is addressed in section 5. I will end with a short discussion.

I. The drive towards experiences

In first instance digital TV was just that, the same television programs but with better picture and sound quality. It didn't work, because what is the added value of watching Sesame Street with better sound quality? Digital TV took off when new services, like Electronic Program Guides (EPG) and Video-on-Demand (VoD), were offered. This raises the question of the value of content or more specific digital content. One way of answering this question is referring to the work of Pine & Gilmore (1999) on the experience economy. Within going into too much detail, Pine & Gilmore answer the question of how to meet the needs of consumers. They state that a new economy is forming, one in which a customer wants more than 'just' a product, instead they want an experience, that which makes a lasting impression. Moreover, the consumer is willing to pay for this. As such it builds upon commodities, goods and services. The simple but powerful statement by Pine & Gilmore is as follows: If you charge for stuff, then you are in the commodity business; if you charge for tangible things, then you are in the goods business, if you charge for the activities you performs, then you are in the service business, if you charge for the time customers spend with you, than and only then are you in the experience business. Each one is more relevant for the consumer and therefor he is willing to pay more for it. As a business the competitive edge follows the same line: the best opportunity for providing consumers with what they truly want is an experience (see Figure 1).

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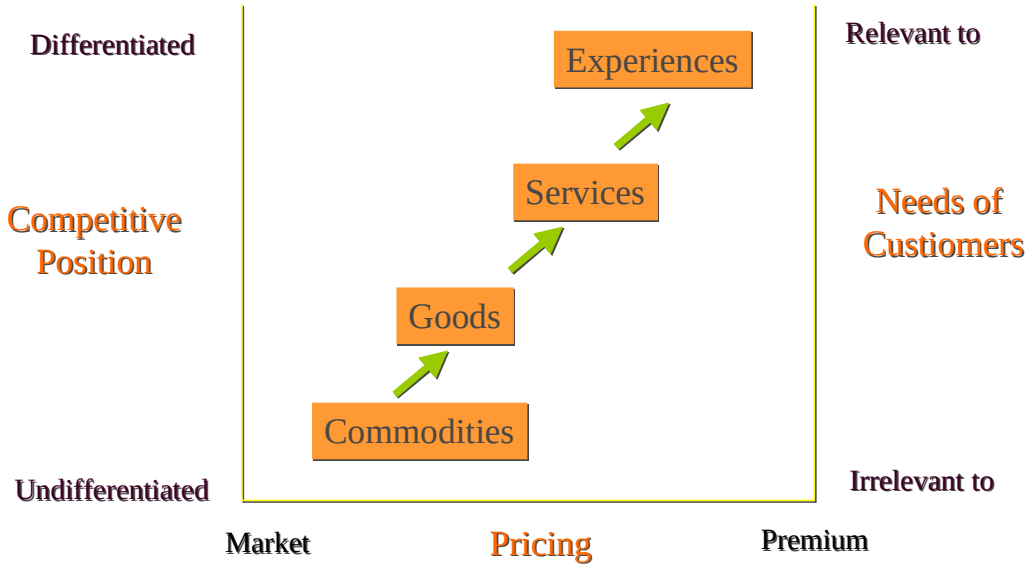
Figure 1: Experiences as value of eContent



Pine & Gilmore draw from a rich and varied mix of examples that showcase businesses that are creating experiences, from Disney world to America Online. An analysis on how their ideas hold up in the context of for instance Internet is beyond the scope of this article.[1] But two examples can be easily given. For video streaming one can think of raw footage (commodity) – edited video (good) – search service (service) and a choice of camera position (experience). Or in case of the web: HTML (commodity) – a web page (good) – a search service (service) and a story (experience).[2] In general aspects such as interactivity, communication, omnipresence, the five senses and story-telling are among the ingredients to invoke experience on the Internet and television (van Vliet, 2001a/b). It is these kinds of ingredients next generation television and Internet are exploiting in their quest for keeping the eyeballs firmly fixed to the screen. In the following two sections I will explore these developments in television and Internet.

II. Television: this time it's personal

In the 60 year or so period that television has been with us as a mass medium, there have been a range of refinements of the television system. Most importantly the switch from mechanical television systems in the 1920s and early 1930s (such as TV systems introduced by Nipkov, Baird and Jenkins) to electronic television in the late 1930s, which made use of a cathode ray tube or CRT (such as TV systems introduced by Zworykin and Farnsworth). A most 'visible' transition was the one from black-and-white to colour, which required the purchase of a new TV set and required broadcasters to acquire new production and

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transmission equipment. Furthermore there was the addition of peripherals such as videocassette recorders (VCR), remote controls (first still attached to the TV, later completely wireless)[3], and further enhancements of the television and its services, such as teletext in the 1970s and stereo sound in the 1980s.

Today we see another transition: the migration from traditional (analogue) TV to digital TV, requiring switching to advanced digital platforms. Basically this transition is a transition of technology: from analogue to digital. But the consequences are far-reaching and go beyond the merely technical. The changes digital television brings about are, among others: high speed data transfer rates, making the delivery of rich multimedia content a reality; the broadening of the scope of 'broadcasters' towards Internet service providers, stimulating the convergence of Internet content and TV broadcasting, multiplication of the number of programmes, better quality, conditional access, and possibilities for broadcasting to small devices and television receivers in vehicles. This transformation will be more important than the previous global upheavals in television, such as the switch for black-and-white to colour, because it will affect the content, economics and politics of the television business, or rather the content business, all over the world. With regard to this latter, new services are (again!) surfacing such as enhanced television, interactive television and personal television. I will discuss these new services after a short expose on digital television and set-top boxes.

Analogue television is heading towards the museum. The last decade has seen major changes in the manner in which the electrical equivalent of the television picture is generated, recorded, transmitted and processed.[4] Digital video as such can be defined as a means of describing the continuous analogue video waveform as a stream of digital numbers: in zeros and ones. Although the term digital television or Digital Video Broadcasting (DVB) is not typically used to refer to just the digitisation that is the production process, but also to the distribution process (satellite, terrestrial, cable and wireless cable[5]) and the presentation and interfacing on terminal devices.

Although digital 'devices' (television, audio, and camera's) are somewhat new, digital sampling techniques are not. One problem though was that the digitised stream required more bandwidth than the analogue signal, which made the technique uneconomical until, in the last quarter of the 20th century, effective techniques for compressing digital signals evolved (Winston, 1998). But from early days, it was already clear digital signals had several advantages over their analogue counterparts. For instance, compared to an analogue system there are several advantages in using digital video equipment (Robin & Poulin, 2000):

- A digitised video signal is immune to analogue signal beyond the inherent distortions generated by the analogue-to-digital (A/D) and digital-to-analogue (D/A) conversion process.

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- Digital video equipment can perform efficiently and economically tasks that are difficult or impossible to perform using analogue video technology.
- Digitised video signals are amenable to the application of techniques for retention of essential information such as compression.

Digital television is the successor of analogue television and although a new technology its roots in many ways are in analogue television: the broadcasting infrastructure, the commercial exploitation, the market penetration of television, and the viewing behaviour of people sitting in front of a television.

Together with digital television the set-top box has sneaked into the home environment. A set-top box is an interface or gateway device that sits between available content that is 'out there' and a home device like the television. Set-top boxes can serve as a gateway for content available through satellite, terrestrial transmission, cable and/or (broadband) networks. Its main feature is to decode the incoming (digital) signal and translate it into a format that can be viewed on a television screen. Most current set top boxes have analogue signals as input. Set-top boxes are not new in that regard, they have already been with us for many years. The first generation of set-top boxes were capable of only receiving and unscrambling analogue transmissions and displaying the results on the TV set. Modern versions of these still analogue-based set-top boxes contain more advanced features and allow TV viewers access to a limited number of interactive services (order a film, voting, play along with games).
The second generation of set-top boxes was directed at receiving digital TV signals and thereby giving access to a range of digital TV services. Although most of them are also capable of receiving and processing analogue signals. A typical second-generation set-top box will perform basic MPEG decoding, have a low-cost CPU (Central Processing Unit), a minimum amount of memory (say 1 Megabyte), a low bandwidth return channel such as a telephone modem and limited support for connecting the set-top box to peripherals and remote devices (O'Driscoll, 2000). At the end of the 20th century a third generation of set-top boxes emerged. These set-top boxes push the interactivity further by adopting a number of PC-like features, such as high-speed data interfaces, large amount of memory (8 to 64 Megabytes), a powerful CPU, high-speed return channel and the ability to process multimedia-based content. With these devices the TV viewer has access to a range of TV- and Internet applications: TV mail, video on demand, home shopping, multi-user games, electronic program guides (EPG's) and interactive advertisements to name a few (O'Driscoll, 2000).[6]

Set-top boxes are quickly evolving from simple gateways for de-scrambling television signals towards powerful devices for interactive services. A recent step toward this has been the introduction of the Personal Digital Recorder or PDR, a consumer device that includes high capacity disk storage. Commercial examples include TiVo, ReplayTV and UltimateTV[7]. PDRs give consumers the opportunity to 'time-shift'; i.e. to watch what they want, when they want.

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More importantly, such PDRs come with specific services for personalisation: like an Electronic Program Guide (EPG) that shows (filtered) information and gives suggestions on possibly interesting content. The addition of a back channel provides a mechanism to allow for commercial services including storage, targeted advertisements and profile management.

At first glance a PDR is nothing more than a super-videorecorder with essentially the same 'timeshifting' functionality. Of course the digital format and the instant access of the hard-disk gives the PDR some profound extensions to basic VCR functionality such as:

- If joining a (live) program halfway, the system is able to capture the content from the beginning.
- Continue recording a program even when it may jump channels.
- Record a program/advertisement on a basis of now, when it is on for next 'x' shows, all episodes, just the highlights, record the next trailer, etcetera. Repeats or the same transmission on other channels are resolved.
- Pause a live event and return to it later. Related to this, be able to fast forward back to real time or to skip forward through index points.
- Instant fast-forward and rewind (the latter also in live programs).
- Simultaneous record and playback.

However, this "super-VCR" functionality can hardly be the driving force for consumers to buy a new device. What can distinguish the PDR from the VCR, though, is its usability. How many VCR-displays don't display 'set clock', because the consumer has given up on programming the device? The PDR instead offers an easy interface by means of an EPG. Consumers can browse through the EPG and record shows by interacting with the EPG grid. It is easy ('clicking') and reminds us of using a regular printed TV guide. Moreover, if personalisation is incorporated, all kinds of user support services can be envisioned, for instance:

- Build your own TV guide– so there are fewer things to look at. This can be based on genre, time, channel, date, sub-genre specific, or any combination thereof, or on already pre-filtered content that the user profile has created.
- Make use of channels of pre-filtered content, third parties offering 'best-of' from all content providers they cover, or pre-formatted EPGs based on viewer preferences.
- Highlight (e.g. use of colours) of favourite programs in the program overview.

The proliferation of digital technologies has sparked off numerous software and hardware technologies that position the set top box and the PDR as a gateway for digital broadcasting and broadband Internet. Moreover, it drives a demand for new services like storage management, interactivity, personalisation, et cetera, which will push its role even further (see section IV). For now we will look at three concepts that have emerged and are capturing this sense of new services and a new usage of television.[8]

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Enhanced TV

Enhanced television is a service in which a regular television program is enriched with additional information and extra options that can be activated by the viewer. Enhanced TV builds upon services like teletext by providing additional information on the television screen. This is done by using the so-called vertical blanking interval in the TV.[9] This is the interval during a television signal where the picture is blank, although not visible for the human eye, and data can be transmitted. This 'Trojan horse' can carry enough information to enhance the TV experience. It can lead to a new experience of television watching because there is seemingly interaction with the television. But this interaction is limited to choosing from a small number of choices that are already there, that is in the broadcasted signal that every viewer receives.

These enhancement appear as graphical and sometime purely informational elements on the screen overlaying the actual program: "To understand what these graphical elements looks like, visualise the way semi-transparent banners with statistics printed on them during basketball games, car racing, or golf tournaments appear on TV now. During a recent broadcast of the Milwaukee 250 car race, for instance, semi-tranparent graphical boxes appeared from time to time featuring information about which drivers were in the lead, their background, racing factoids, speed statistics, the commentator speaking, and other informational tidbits." (Swedlow, 2000) A similar example can be taken from the pilots done in Australia. In December 2000 ICE Interactive and free-to-air broadcaster WIN Television made television history when the first enhanced television programme in Australia was broadcast. An episode of travel programme "Destinations" was researched, filmed and jointly produced by WIN TV and ICE. This programme featured the city of Hong Kong and the ' interactive' element of the broadcast provided additional information about the city for pilot participants to explore. The topics included history, shopping and geography to name a few (see Figure 2). Another example is by the BBC who offers viewers with digital satellite (Sky) TV access to a new BBC Wimbledon 'interactive' service: it allows viewers to select the match they want to watch from a choice of up to five live contests at any time via a multiscreen devised by BBC New Media (Figure 2). Accessing the service is straightforward: while watching coverage on digital BBC 1 or 2, viewers are prompted to press the red button on their handset. This takes them through to the BBC Wimbledon Interactive multiscreen. In addition to the live match broadcast on the main channel, viewers will have access to a further four live matches. Live commentary accompanies each match, and each screen has its own dynamically updated scoreboard. Digital Terrestrial (ONdigital) viewers can access the BBC Wimbledon Interactive enhanced text service. It features statistic, features, comments and player profiles to keep viewers abreast of the latest news from the Championships. Viewers have access to this information while still watching the live action unfold in quarter-screen. As the only UK broadcaster with digital TV services on all three major platforms, the BBC is also offering a new BBC Wimbledon Interactive service for Digital Cable viewers. A Wimbledon 2001 section

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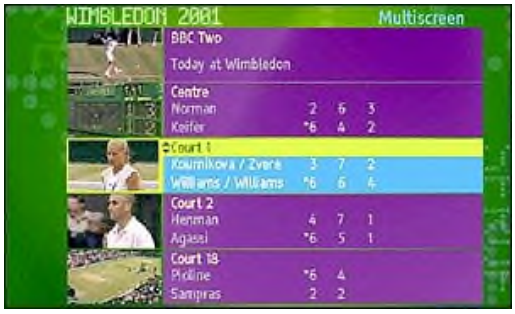
has been created specially for the championships offering Telewest and NTL Cable customers, among others, scores and results, headlines, statistics and message boards.

Figure 2: Examples of enhanced TV



Interactive TV

With no necessity for a return path in enhanced TV, 'true' interaction is absent. A return path, that is a physical channel that facilitates two-way interaction between consumer and service or content provider, is a necessity in order to speak of interactive TV. Interactive television is a service that supports exploratory and constructive interaction with a television program based upon a return path enabling the communication between consumer and service provider. Cable broadcasters can use their upgraded digital cable, but satellite and terrestrial providers must find another return path. Telephone lines – the most popular candidate to date – are cumbersome and have limited capacity. Besides, viewers may not want to tie up their phone lines for interactive TV (Brown-Kenyon, Miles & Rose, 2000).

Interactivity and television is not a vision of recent years, since it was already part of the first visions on television at the end of the 19th century: "The television receiver was first imagined by a Punch cartoonist as a two-way interactive device whereby those at home could talk to those on the screen by the telephone" (Winston, 1998, p. 91). Today this interactivity can come in the form of on-screen flickering icons that points you to related websites to get more information/details or to a more fully integration in the videostream, in which you can select objects on the screen to interact with them (see section 4 for examples on T-commerce). The diversity of interactivity points to an important issue: just what to consider interactivity (see also section 3): zapping can be seen as a, somewhat primitive, interaction. At the other end of the spectrum there is the interaction of affecting a storyline or the contribution of a viewer to the content. For the moment I want to include both options, although it is clear that the 'new' service of interactive television is more targeted at options such as for instance voting, betting and ordering.

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An example of an interactive TV implementation is the development of *Jeopardy! Interactive* and *Wheel of Fortune Interactive* in the late 1998 by Mixed Signals Technologies.[10] For each show and interactive game engine was written in HTML and JavaScript. As soon as new episodes were taped and edited in post-production, data files for each episode were created. Each file consists of the episode's right answers, wrong answers, puzzle solutions, flipped letters, and so on -- all documented with timecode-level accuracy. In total, these episode files typically contain 250 to 300 game events or "triggers," and most of them are unique. These files are then merged with the closed-captioning data, tested for quality assurance, and then encoded to master tape. As each episode airs, the triggers are broadcast along with the regular video feed and are received by viewers' set-top boxes. The triggers direct the set-top box to display and hide graphics and text in the ITV Game Engine, and they enable and disable buttons, answers, and so on in sync with the "game events" in the show. A database server handles back-end data management for both shows. These high-speed and highly scalable servers can handle millions of simultaneous users. When viewers register for play, post a high score, or click on interactive ads airing during the shows, the database server manages and routes this information appropriately.

Personal TV

Personal television is aimed at supporting a consumer in dealing with the huge amount of content that is available and which the consumer wants to ‘confront’ on his own terms. This on the one hand means that the consumer wants control over time: it is about not being a slave to a schedule but watching television at any given moment. The VCR springs to mind as a device that already supporting this timeshifting aspect. The selling point of current PDRs is therefore not so much the concept of timeshifting as well as its usability: it is easy to use and contains enough intelligence to do some work for the consumer, like record favourite shows when not at home. On the other hand this means that content is presented in the way the consumer wants; for one thing, that non-interesting content is filtered out and content is ordered in a specific way. The EPG is a clear implementation of this. So, Personal TV is a service that supports timeshifting and the adaptation of information on television programs to the consumer’s preferences and interests, in which usability is a key factor.

Personalisation of TV (guides) is done by using profiles.[11] A TV viewer is associated with a user profile that contains information on:

- Users’ preferences for certain TV shows (e.g. game shows, documentary’s, soaps)
- Users’ interests (e.g. classical music, sports, cooking, African elephants)
- Users’ viewing behaviour (like which shows did he watch and for how long: viewing history)
- Rating information (did he like the show: TiVO’s thumbs up / thumbs down feedback)
- User characteristics (e.g. gender, age)

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- Task/goal characteristics (e.g. leisure, information seeking, entertainment).

Based on this user profile an agent or content service provider (if access to profile information is permitted by the user) can support the viewer in the following way, all of which should lead to a more satisfying viewing experience:

- Suggestions for interesting to watch/record TV programs
- Filtering and/or prioritising of programs shown in the EPG
- Filter pushed content like advertisements and trailers
- Tune in automatically to favourite channels, programs, sports commentator, et cetera
- Set interface options as language, 'skin' of EPG, audio option for the visually disabled, et cetera
- Record programs on behalf of the viewer, for instance a complete series of a show the viewer likes (e.g. all episodes of 'Frasier' or 'Buffy, The vampire slayer')' while taking into account for instance reruns.

TVGateway[12] is an example of an Interactive Program Guide (IPG) service that provides cable operators with control over their digital set-top boxes and gives cable customers an personalised TV viewing and navigation experience. The thin-client architecture utilised by TVGateway provides quick and easy access to program listings without consuming valuable set-top box resources. The open platform design of TVGateway means it can operate on a wide variety of set-top boxes, including today's widely deployed digital boxes. Finally, the fully customisable look-and-feel of TVGateway lets the cable operator create an attractive fully branded program guide that is consistent with other interactive services. Features include, among others: different listing categories accessed via a single button press, multiple mini-pages of program information via INFO key, access to all integrated applications on the set-top, such as Internet and Video-on-Demand (VOD), and preferences menu for selecting language, keyboard and date formats (see Figure 3)

Figure 3: Example of interactive program guide

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Another example is Singularis[13], which is a company that offers software to implement personalised services, such as personalised TV portals. The approach used by Singulairs in the personalisation consists of the following phases:

1. Collect: Data from different sources within a Digital TV environment is collected and reconciled, including implicit and explicit profile information.
2. Process: Statistical algorithms are used which categorise and summarise user's tastes and lifestyle for marketing and consumer applications. Further a specific recommendation engine for TV and Entertainment content makes use of personalisation algorithms that interact with every customer on a one-to-one basis, continuously learning, about each customer's individual needs, wishes, and preferences.
3. Personalise: A distinction is made for business and consumer applications. Business Applications includes the generation of revenues for TV operators such as targeted ad banner and video advertising, content promotion and T-commerce profiling. It allows service providers to gain unparalleled understanding of their consumers' entertainment taste, psychographics and lifestyle. Consumer Applications: the consumer experience is enhanced by enabling personalised consumer services. This software toolbox allows TV operators to better satisfy the need of consumers by deploying personal services such as Personalised Electronic Programming Guide, Content navigation tools, smart Personal Video Recorder or entertainment reminders among many others. The multi-platform technology allows numerous personalised applications, from Digital TV to wireless.

See Figure 4 for an implementation of Singularis.

Figure 4: Singularis' Personalised TV Portal running on an STB

So, in conclusion we can say that in the development of television there is a certain logical increase in the functionality that is being supported for ‘enriching’ the television: by way of the

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STB the television experience is enhanced by (conditional) access to more channels, by way of the PDR local storage is added with the enhancement of timeshifting and personalisation services build upon that, by way of the HMS the television is enhanced by being placed within an ubiquitous communications network. Besides this development there is the development of leaving the analogue world behind and moving forward to digital formats for producing, transmitting, storing and presenting content. And judging by the times and the contexts in which adjective such as 'enhanced', 'interactive' and 'personal' are used to sell new devices, we can surely conclude that there is something going on. But is this is the end of television or the beginning of delivering new experiences through television?

For one thing the claim on simultaneous communication over distant spaces as a defining characteristic of 19th and early 20th century television, has now been abandoned. With a few notable exceptions: i.e. world cup finals and media events such as Princess Diana's funeral, which linked over 2 billion live viewers. Two developments seem to back this up: first, the explosive growth of mobile telephones suggests a shift in the engagement of simultaneity from the image to the acoustic or text (SMS). Secondly, the trend towards television's reliance on stored material shifts it away from simultaneity; it brings television closer to a home movie service with a telephone link for orders and billing. You could say "[television] has mutated into the very storage medium that it was defined in opposition to – as if the telephone were to transform into the answering machine" (Uricchio, 1998, p. 11). Simultaneity combined with the power of realistic images transmitted into the living room was the way in which television gained identity, but nowadays this can not be enough. Walter Friedel already foresaw this in 1925, in one of the early treatises on television: 'Only when there are 'world shattering events' like boxing matches and similar sensations would the television theatres have a 'full house'' (Quoted from Zielinski, 1999, p. 134).

This shifting away from simultaneity touches upon another big issue: the control of time. Currently the control is in the hand of the broadcasters, but the time schedule of the broadcasters and the related concept of prime time could be history, and could be controlled with the use of personal TV services. But it seems that people also depend on this time schedule. Also in relation to the social event of television watching: together in front of the television or the delayed situation of talking about it in the pub, around the water-cooler or at birthday parties ('did you see… last night'). This is certainly rooted in the aspect of simultaneity that television carried with it from the beginning (everything was live) but that has diminished rapidly over the years. The question is if people are willing to give up this 'lifeline' of scheduled television viewing in a ever increasing complex and faster going society, and take control themselves.

With regard to inducing experiences, television certainly has the bandwidth and quality of service to provide high quality multimedia experience, but all developments point to adding

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new functionality to this in the way of interactivity, personalisation and connectivity. Essential aspects of inducing experiences (section 1). But then again one can be sceptical whether or not these new services will gain enough momentum and survive: the VCR and its timeshifting capacities didn't change television fundamentally, nor did the remote control or the availability of more channels. Also earlier experiments with interactive television all bled to death. Moreover, economically it must be profitable to introduce these new services of personalisation and interactivity, or else it won't happen. That is why interactive TV will be limited to certain programs (educational, children's programs, big game shows) and also enhanced TV will be only used in certain contexts like sports, music, infotainment, et cetera. The main reason being that it is far too expensive to offer all programs fully interactive. The fact that the industry isn't yet up to it to provide these services in a efficient way, can mean the 'law of suppression' (Winston, 1998) kicks in, and some services will be delayed. Still economically, we as consumers, won't get the best solution but the most profitable for the industry. Something one must also not forget that rules and regulations on television differ widely for different geographical areas and surely between the Europe and US. Regulations can stimulate or frustrate the development of new services considerably. Regulations on distribution, content ownership (i.e. EPG information) and intellectual property rights, availability of information, the 'democracy' of information, et cetera all will have an impact on at least the pace of the developments but quite possibly also on the direction of the developments.

III. Internet: connect to interact

Internet is a global network through which millions of computer users exchange data. The Internet comprises some 7000+ networks, each associated with an organisation such as a firm, a university, a government agency or an Internet service provider (ISP). Only about 10 networks have more than 1% of access traffic[14], of which WorldCom is currently (2001) the largest network with 'only' 6% access traffic. Since Internet is an interconnection of networks, users are not always in the same network, but spread out over networks. If for instance there is a kilometre between a user and a point of origin of certain content, this could mean that the content passes through a number of networks and even more hubs.

Most data on the Internet at the moment is text and graphics, but this is rapidly shifting towards rich media such as animations, streaming audio and streaming video. This puts a strain on the Internet regarding performance and quality of service. Partly this can be overcome by greater compression of the data[15] and for instance reducing the size of the playback window. But this does not solve the problem of varying bandwidth. Data on the Internet is sent in packets and some take longer to reach their destination than others. The moment a data package arrives at the client, if it arrives, can not exactly be predicted. The data packages can follow different routes and arrive in a different order as originally send. In the case of the Hypertext Transfer Protocol (HTTP) they must be assembled based on an

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order number. For text and still images you just have to wait a few seconds, but audio and video interruptions in the data stream are more serious because your movie grinds to a halt. You could download the whole file and then play it, but you might be in for a long wait and this is not an answer for live broadcasts.[16]

So, delivering video on the Web is not without its problems. When you consider that compressed digital video generates 25Mbits/sec of data and an average modem can receive 56 Kbits/sec and ADSL maximum download speed is 2 Mbits/sec, the problem is clear. Basically the limited bandwidth on the Internet up until now has put a hold on qualitatively good video on the Internet: small sized (post-stamps: 176x132 pixels for example), jerky images (five frames a second) and of low quality is all current mainstream Internet connections via a modem (a maximum of 56 kilobit/s) or ISDN (64 to 128 kilobit/s) has to offer. Bringing back the early days of television with a screen a few inches wide, fuzzy pictures and with only a couple of hundred lines.

When talking about the problems of streaming audio and video on the Internet it mostly concentrates on the so-called 'last mile', the connection to the home. But in fact four main problems can be identified regarding video on the Internet, of which the last mile is just one.

1. The 'last mile' is the connection of the consumer to the Internet, normally a modem with limited download speed. This surely is a bottleneck but one has to realise that many people can use office lines or university lines to connect to the Internet, and these are usually better, megabit or even gigabit, connections.
2. Besides the last mile there is the 'first mile', the connection of the content provider to the Internet. There are several problems related to this:
    - Performance: the content must transfer long distances and several networks.
    - Reliability: content may be blocked by congestion or peering problems.
    - Scalability: due to a limited bandwidth at the site of origin it is difficult to scale, leading to problems when there are many concurrent requests.
3. Not all backbones are fibre optic, meaning backbones can suffer from limited capacity. Moreover the content provider cannot control the caching options of backbone servers, leaving him in the dark about the 'freshness' of his content.
4. A last problem is the connection points between the backbones, or peering points. The technology for this is limited and quality differs widely, which makes it hard to guarantee the quality of the content delivery.

A possible solution to these problems is the implementation of so called content delivery networks (CDN). A content delivery network is in fact an overlay network, and consists of placing a lot of servers in a lot of networks, using caching and dynamic routing technology. The latter must ensure that real-time decisions can be made which route is the best in terms of performance. This decision is based on monitoring Internet so you have information

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available on latency, overloaded datacenters, lines, backbones et cetera.[17] An example of this solution is Akamai[18], who have some 9700 servers in 650 different networks in 65 countries. Strong points of this solution are: 1) It is efficient, content is served from servers near the end user (edge servers) and traffic congestion is avoided; 2) It is reliable, traffic peaks do not crash sites and sites are protected against variable net performance; 3) There is no single point of failure, server or network outages are automatically avoided in real-time. This solution needs large investments and is basically a global solution. A more local or national solution is to create a specific exchange point for exchanging broadband content and connect the most important content and service providers to this. Problems of the first mile, backbone performance and the peering point could be avoided in this case. This solution is pursued by for instance the NOB in the Netherlands with their 'Media gateway'.

Help though is on his way with the development of Next Generation Internet (NGI) as a structural solution. The technology enablers of NGI remove limitations of the current Internet to meet more sophisticated customer demand.[19] These enablers can be summarised in three main areas of improvement:

1. Broadband: with the customer demand for a multimedia-rich online experience the current issue of capacity and speed will be taken care off. Broadband is defined as 2 Mbps symmetric (duplex) bandwidth, which is required for next-generation, multimedia enriched applications.
2. Quality of Service: with the customer demand for guaranteed 24x7 operations of services Internet must address the current (un)reliability. Different aspects of Quality of Service will be improved to make the Internet more reliable, secure and easier to use: like improved network protocols (rapid fault detection, short response time), improved middleware and improved end-user applications, for instance easier search and retrieval by means of semantic web solutions.[20]
3. Multi-Access: customer demand ubiquitous communications thereby pointing at the current limited means of access of Internet which must improve in next generation Internet. Mobile access to the Internet is essential to support transactions and deliver real-time information in the field.

With the advent of broadband and true datarates of over a 2 megabit/s and further enhancements in compression techniques there is the prospect of real video on demand on the Internet. But even with or without these better tools and solutions, video is already a vital part of the Internet today: Madonna's Brixton Academy appearance attracted 9 million hits (not viewers!), and 30 million people saw the trailer for the Star Wars movie 'The Phantom Menace'. Also, on a smaller scale, we see streaming audio, for instance listening to 30 seconds music clips on Amazon to get an impression of a CD. So what is the specific attraction for consumers to use a technical 'inadequate' channel to disclose rich media?

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If we switch our perspective from a technological point of view to a more conceptual view, certain ‘characteristics’ of Internet are proposed. Raessens (2000) argues that the Internet remediates multimediality from film and television, based on one common code: digital data. But as argued above, Internet has a long way to go before providing the immersive multimedia experience of film or television (even in a narrowcast situation), while television and film are rapidly switching to digital formats. Moreover, different media, who are rooted in this digital era, have the potential to become a multimedium. The Internet, or a Personal Digital Assistant (PDA) for that matter, has the possibility to combine moving and non-moving pictures, three sorts of sound elements (spoken words, music and sounds) and written texts, by using a single, digital, code. Still the majority of websites on the World Wide Web are based on text and images, with the growing addition of animations (especially Flash intros). Other services of the Internet such as e-mail or chatting are still text based with little multimedia or none at all.

Raessens argues further that personal computers are increasingly connected to the worldwide computer network of the Internet. One of the most important differences with traditional mass media like television is the replacement of a broadcast model with a network model. When speaking of the Internet narrowcasting is often mentioned as opposed to broadcasting (radio and television). Narrowcasting as the communication of one-to-one or one-to-few as opposed to broadcasting with its one-to-many mass-communication.[21] Michael Real (in Drannikova & De Kuijper, 1999) remarks that the term mass communication in traditional media theories is used when indicating media with communication from *one-to-many* on a large scale; an unpersonal message is sent to a relatively heterogeneous and anonymous audience with limited possibilities to give feedback. The transmitter and receiver do not know each other. 'Specialised’ communication rather has a *one-to-one* form of communication (e.g. telephone or fax). Internet possesses properties of both forms: *one-to-one* a-synchronous communication (e.g. e-mail), *many-to-many* a-synchronous communication (mailing lists, newsgroups), synchronous communication with *one-to-one* or *one-to-few* character (chatting, games) and a-synchronous communication with *many-to-one*, *one-to-one* or *one-to-many* character (visiting a website).[22] Different forms of communication are but one aspect of the aspect of connectivity. Another is the fact that users, through the network they connect to, have access to a huge amount of digital content. Moreover users can actively search for content themselves at any time they want. As opposed to radio and television which both have a set time schedule and a limited choice.[23]

Virtuality, as a potentially another characteristic of Internet, directs, according to De Mul (1997), to that which is merely apparent, on the other side it indicates a capacity that can become real or active. A virtual world or virtual reality (VR) is, according to Michael Heim (Raessens, 2000), a simulation of a world which does not exist in physical sense, but the user or spectator considers the VR’s effects as real. An example of a VR is the system that

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submerges users totally in a seemingly world and gives them the possibility to transport to that world and to interact with it. Virtuality as a characteristic of Internet though is doubtful. Although I can imagine that a person is so 'close' with Internet that he forgets what is happening around him, I can hardly give good examples of virtuality on the Internet. Maybe due to its limited multimediality. One exception are games which build on narrative in a strong sense, such that even text-based Role Playing Games (RPG) can become immersive. But besides that it is easier to imagine that television, with its power to create its own world, drifts people off to 'virtual' (unreal) worlds. But even in these situations identification is rare, empathy as a more moderate feeling is more common (van Vliet, 1991).

On the subject of interactivity, theorists are usually the first to acknowledge that this concept often is used incorrectly.[24] De Mul (1997) says that manufacturers of multimedia products tend to stick the term 'interactive' on anything that is sold in digital form. What often is meant, however, is that the user can decide the order of the offered information. The concept of 'hypertext' can explain the word interactivity. A hypertext is a non-linear network of fragments, through which users can make up their own path by clicking with a mouse. This is the publishing technique used by the World Wide Web: documents are broken down into web pages that are connected to each other by hyperlinks. A hyperlink can be a word, a graphic or animations, and when a user clicks on it the web page it refers to, is displayed on the screen. This allows users to 'surf' documents that are stored on different computers all over the world. The user is no longer a passive consumer, but participates in an active manner in realisation of the final text. More refined hypertexts and hypermedia (hypertexts with pictures and sound) determine the choices users get offered by the path that they already made, so a similar text fragment has other connections at a following confrontation. Michael Joyce (in De Mul, 1997) argues that true interaction is only the case when the medium responds as often on the user as vice versa, as both the medium and the user are influenced by the behaviour of the other. This is an example of a *constructive hypertext*; the user can change content and structure of a hypertext. Joyce puts this besides an *exploratory hypertext*, a hypertext that lets users explore different organisation structures but does not allow them to change anything. A good example of the latter is when Douglas Varchol argues that the presence of interactivity makes multimediality of the Internet unique: "By means of interactivity the possibility exists to 'jump' from one medium to the other: from video to art to the written word back to video or what else" (in Drannikova & De Kuijper, 1999, p. 52). Interactivity in the sense of hypertext/hypermedia is certainly a characteristic of Internet, not in the least because of the popularity of the World Wide Web. But let us not forget interactivity in the sense of communication: chatting and instant messaging are two examples of very popular means of people interacting via the Internet.

So, Internet's strong points are its connectivity (availability of content anytime anywhere, and communication) and interactivity (hypermedia and communication), but it fails to deliver the

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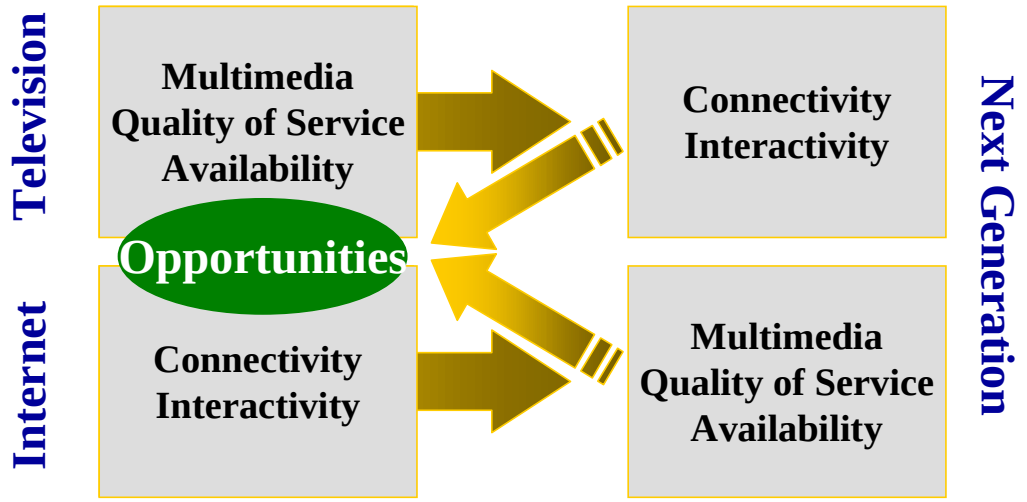
goods, that is rich media such as streaming audio and video, due to lack of bandwidth, quality of service and multi-access. Internet thus has a problem with raw throughput, that is the bandwidth is limited (as opposed to the relatively 'unlimited' bandwidth of television, especially satellite television). On top of this the penetration of Internet in the home is severely less than television. Of course the bandwidth brought to homes will increase over the years but it is questionable whether Internet can ever compete with television on matters of bandwidth and in-home availability (see Lilley 1999). There are instances of rich media experiences on the Web but no major live Web streaming media event has even come close to serving a million users, much less an audience similar in size to a major TV event (i.e. the Super Bowl with 120 million US viewers).

IV. The meeting place

With our analysis of next generation television (section 1) and next generation Internet (section 2) we can see clearly that there is something strange going on: Television as a medium with enough bandwidth delivers engrossing multimedia content, with a strong quality of service[25] and is widely available, strives towards more connectivity and interactivity; whereas Internet is connectivity in essence being a network that connects people, and proving tools (hypermedia) and services (email, chat) and that strongly relies on interactivity strives towards more bandwidth to deliver real multimedia experiences, a better quality of service and wider availability (see Figure 5). Someday they will meet, moreover this process is already in progress creating all kinds of opportunities for new devices, concepts, services and experiences. Some will make it, some will be too weak and perish. If we can foresee such a meeting place then where can we find these new services and what do they offer?

Figure 5 : Developments in Next Generation Television and Internet



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The current set-top boxes and PDRs, although a step forwards, still have a limited 'range'. We must envision an "open" environment, in which (digital) content is widely available from different sources, communication is ubiquitous and devices exchange information and content transparently: "Technology is erasing the boundaries of televisions, telephones and computers. The cable box on your TV will not only let you order all the PPV movies you want, but it will be a virtual communications centre".[26] Enter the Home Media Server (HMS). Such a device has communications as its main characteristic. In a world where media convergence creates a unified environment where content is available from a variety of sources, and where technology is erasing the boundaries between televisions, telephones and computers, the HMS is a central device for the consumer to control his communications, whether it be telephone, Internet narrowcasting or television broadcasting. The concept of interconnecting electronic devices within a residential home seems therefore the next logical step. It allows consumers to share files between family members, share the use of expensive peripheral devices such as colour printers and DVD players, and play multi-user games.[27]

An example of such a HMS is Nokia's Media Terminal[28], which will be introduced in 2001/2002. It is an infotainment centre which will decode standard definition digital programming, cruise the Web, access interactive TV functions and record programming on to at least a 20GB hard drive in its original digital form. It will also act as a PDR, allowing to record programs with the option of live-freezing images and store locally information and content when desired. The terminal can connect to several external devices such as printers, digital cameras, hard disks, personal computers and game-pads. By using the remote control, with the in-built keyboard, family members can easily access content and services. With what Nokia calls 'Navibars' consumers are able to create their own profile, by selecting which value-added applications and services they want to have direct and fast access to.

Figure 6: Example of a Home Media Server

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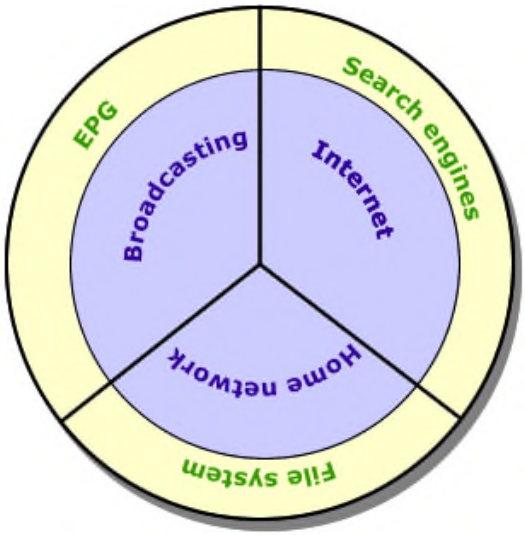
In such a HMS environment, new questions arise and new service opportunities become possible. I will briefly look at four of them.[29]

Unified search

Media convergence enables a unified environment in which content is available from a variety of sources. The same content can be delivered from several suppliers, by many methods onto many devices at many places. The unified content environment encountered in the media home environment is made up of three basic sources: broadcast content, the Internet and the home network (see Figure 7).

Figure 7: Unified search environment (taken from van Setten, Tokmakoff, van Vliet, 2001)



The home network consists of locally stored digital content (music libraries, family photos, documents, stored videos, et cetera). Currently each one has its own way of letting the consumer search for specific content and its own way of presenting the results. For broadcasting this is evolving towards the Electronic Program Guide (EPG) or Interactive Content Guide (ICG), for the Internet these are search engines and directory services, and for locally stored digital content this is essentially a file system interface. If we truly want a unified portal, and integration of these should be pursued, then this will mean integrated search facilities for content and an integrated presentation of the results. Specific examples are searching for video over IP[30], then ordering it in high-quality via the cable, or unified search results presented in a browser with the opportunity to choose video-footage on the subject, a website, join an online forum, get a document on it from a peer, etcetera (see Figure 8).[31]

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Figure 8: Examples of unified search

Peer to Peer (P2P)

Functionality regarding peer-to-peer or P2P networking will also become important in a rich media environment. At present, there is an immediate association between P2P and content piracy, given the Napster-case and all other implementations that followed in its footsteps. Although such activities can also be expected to occur with rich media on the HMS, and as it is already occurring on the Internet with DivX, the application of P2P technologies can be extended beyond simple file swapping into group-oriented functionality. A first example of this is to apply the "tell-a-friend" approach often found on web-sites to the TV environment, that is the user is able to inform a friend of a piece of content that they may find interesting and make it available to that person. This could work as follows:

> A user is watching a cooking program and during the broadcast, decides that a friend would also perhaps be interested in the program. Using the HMS, the user selects the "tell a friend" function and selects their friend from the buddy list (or address book). The HMS then sends a message (analogous to email) to the friend which indicates the program of possible interest. At the same time, the program is recorded on the HMS and marked as being temporary storage. The friend then has a number of options. They may respond to the message stating that they are not interested, in which case the stored programme becomes available for deletion. Similarly, after a specific time period without a response, it is assumed that the stored programme is not "wanted" by the friend and it becomes available for deletion. However, if the friend is interested to view the programme, they respond to the initial message and the programme can be transferred between the two HMS's or streamed directly from the source HMS. As with any form of content sharing, transaction costs may apply in which case the Payment component is invoked.

A second example is to allow HMS users to view the presence of other HMS users. There are many ways to implement a user presence function, as with the AOL Instant Messenger[32]

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Buddy List. This facility allows users to see who else is “online” and to chat with them using a purely text-based interface. This can be taken one step further by making use of avatars in a 3D environment that is embedded within the HMS’s TV display (see Figure 9). This could work as follows:

> A user decides to watch a specific program such as, for example, a program on Tigers aired on the Discovery channel. When the user selects the channel, their avatar is “transported” to the corresponding “room” in the 3D environment. This room is decorated to reflect the themes of the show – perhaps it looks like a forest and there are tigers walking through it. In this room are other avatars that represent people also watching the same show. The user may interact with these avatars by selecting them and sending an instant message. When the user changes channel, they are transported to the corresponding room, which reflects the new program and its viewers.

In this case the well-known and increasingly popular instant messaging application is taken and applied to a TV environment, where users can have shared experiences with friends who are watching the same show.

Figure 9: 3D environment for interacting with other TV viewers

T-Commerce

Besides ‘regular’ commercial opportunities such as providing premium content - special channels, pay-per-view (programmes, movies), pay-per-play (games) - and pushing content (ads, trailers) to the PDR in for instance off-peak hours, the two most innovative Television commerce, or T-commerce, options that become available are targeted commercials and impulse buying.

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In the case of targeted commercials, when viewing a program, default advertisements are replaced with advertisements from the local storage, which are selected based upon the consumer's profile, either previously entered in preferences, or as dynamically modified by local intelligent agent action.[33] It may also be selected based upon other parameters, such as time of day or viewing room. This all depends on the feedback of the consumer. If a return path is enabled, it is possible to transmit information back to the advertiser describing the results of the consumers' actions. Depending on the capabilities of the return path, this response can be immediate or delayed. The response could include parameters such as time, program, consumer profile, et cetera. The consumer may have options for reacting to a commercial, including passive viewing, acknowledgement, response, request for further information, or an actual purchase request. This feedback information does not have to come 'cheap'; a consumer can 'sell' this valuable information.

The combination of the Internet and the broadcasting/entertainment network gives another opportunity for content to become a potential gateway for transactions. I refer here to impulse buying (or more generally impulse feedback) which can be triggered in at least three ways:

- Pointers (e.g. a URL), within the screen to give an indication to the viewer that he/she can get additional information or start a transaction;
- Enhancing content by placing additional information next to it, as for example implemented in enhanced television (van Vliet & van Stelten, 2001);
- Clickable onscreen hotspots or objects, 'cloaked' during normal viewing but available whenever a consumer wants more information.[34] This interactivity could result in a simple pop-up text or menu, links that take the viewer to a specially created mini-site, a website or a related program, dial-back services from co-operating agents, etcetera (see Figure 10).

Figure 10: Ordering Bathing suites from Baywatch

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The benefits and opportunities for advertisers are obvious: appropriate ad placement, reaching target audience (also localisation for national advertising) leading to more eyeballs to compelling content and the enhancement of loyalty. Furthermore, it reduces costs (less 'waste' in reaching viewers that don't want the ad, multiply replay of ads for one download, off-peak delivery to the HMS), and gives feedback on viewers (identify demographics, possibility of 'impulse buying', favourite ads capture information).

Personalisation

One of the most promising aspects of the HMS is its capability to provide a personalised user experience. In a personalised information system, information is adapted by the system to the user in a given situation and context. The overall effect is to give the user an optimal individual experience, which targets the specific goals of the user. Examples of such systems are personalised newspapers, personalised online store catalogues, publication recommendation systems, personalised TV guides, and personalised lectures (van Setten, 2001).

In order to personalise such services, there is a need to collect user information and build a user-specific profile. There are several possibilities for the initialisation of a user profile. With explicit creation, the user creates the profile explicitly (e.g. by adding keywords to the profile). It is also possible that the user is questioned by the system and based on the answers, the user's interests are deduced. Another option is to let the user select one or more pre-defined profiles to start with, which function like a template for the user profile. Some systems allow implicit profile creation where the user is able to start using the system and the system builds a user profile purely by analysis of the users actions. This profile forms the basis for personalised services, which utilise the user-specific profile to adjust the system behaviour. It is important for personalised information systems to keep user information up-to-date. Keeping information about the user up-to-date can be done in two ways: using feedback from the user or by allowing the user to manually update the user profile. Concerning the former, there are two main ways that feedback can be used to maintain a user profile: by analysing the usage behaviour, which is called implicit feedback, and by using explicit relevance feedback. An example of the latter is the 'thumbs up' and 'thumbs down' button on the TiVo remote control.

A possible implementation of personalisation in a HMS is to use it as a centralised personalisation component, which is responsible for providing personalisation services to other functional components in the system. For example, the presentation aspect of the user Interface can make use of the personalisation component to alter the way it presents information to the user. This can be thought of as an adaptive user interface, much in the same style as the adaptive "Start menu" introduced into the Windows 2000 user interface. The HMS' search component uses the personalisation component to rank search results and to modify the search strings sent to search engines based upon the user's profile. It is also

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used to help the system make decisions on what up-coming content in the EPG the user may find interesting based upon previous viewing. Based upon the advice of the personalisation component, the system can make a decision whether to record the program item or not. One can even envision a scenario in which personalisation supports a group of friends that are having a gathering and who decide to watch some content together. In order to come to a simple and fast decision on what to watch, each group member's personal profile (conveniently located on their PDA or mobile) is transmitted to the host HMS system, at which point the system recommends TV programs for them to watch together.

Figure 11: TiVo's remote control with the thumbs up (green) button and thumbs down (red) button

V. Convergence: a critical note

In the preceding sections a couple of crossover devices have already been mentioned. The PDR was introduced as a separate box but it is not hard to imagine that its main hardware asset (local storage) can become part of a STB. The first implementations of HMS will add communications options for digital cameras, musical instruments (via MIDI) and telephony. But also other crossovers can be mentioned: game consoles and Home Media Server functionality (Sony's Playstation 2), DVD-players and PDRs and game consoles (e.g. NUON-players), and even timeshifting devices for the PC (Pinnacle's Bungee). Even though the devices are there and make a statement, there is not guarantee they will make it. A lot of the discussion on this can be, for argument sake, be divided in believers, who think TV and PC/Internet will convergence, and non-believers, who are sceptical about this ever happening. The arguments used in this discussion can be categorised along three perspectives: technological, economical and social-cultural as the following table shows.[35]

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Believers	Non-Believers
Technological perspective	
• Television is switching to the digital format, sharing the same code as Internet, as well as same standards. And digital image handling does away with the problems faced by analogue TV sets • World-wide efforts to standardise technology • TV signals and Internet can be carried on the same 'pipelines', such as fibre-optic • Next Generation Internet ensures more bandwidth and QoS.	• TV screen is not technically suited for displaying PC/Web content • TV has high quality of service, like fridge's and microwaves, as opposed to the crash-sensitive PCs • Set-top boxes are not versatile enough to keep up with technology changes of the Internet • No standardisation (yet) in set-top box middleware and software • Different interface handling: remote control (TV) versus keyboard and mouse (PC).
Economical perspective	
• The average number of hours online will increase when people can surf via their TV • A TV viewer is more relaxed than a PC user and is therefore more prone to 'impulse buying' • A lot of big companies (read: money) is involved: AOL/Time Warner, Microsoft, ABC/Disney/ESPN • The combination of the emotional power of video with the transactional power of the Internet is advertising nirvana. • The boxes are not expensive and the value adding services are there.	• Pace of innovation in TV-environment is different from PC-environment • Internet access does not meet the interest of broadcasters • Implementations could be delayed by the governmental regulation regarding broadcasting • Implementation of new services are complex, time-consuming and therefore expensive • Advertisers are not sure which development to put their money on.
Social-cultural perspective	
• Increasing need for control over time • Screenagers, grown-up in a world of ubiquitous content, are future customers • TV and PC are more and more present in the same room, blurring their traditional background.	• Different feel to it: leisure, 'lean backward' (TV) versus work, 'lean forward' (PC) • TV is a social medium: watch together and have discussion on programs everybody watches • TV viewer is passive, so (inter)activity doesn't address the 'state of mind'.

Not only taking these perspectives in turn makes a single 'yes' or 'no' to the convergence question seem naïve, also the necessary differentiation between what convergence we are talking about clouds the issue. We must at least distinguish between convergence of content (audio, video, data), devices (PC, TV, game console, mobile), distribution channels (Internet, cable, satellite, terrestrial), technologies (compression techniques, transmission, addressing), companies (globalisation, vertical versus horizontal market developments), services (search & retrieval, personalisation, communication) and usage (escapism, informational).[36] If we evaluate these on a scale of 'likelihood' of convergence happening, we can state that the convergence most likely to happen are those of:

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a) Content: content will become more multimedial because of digitisation and more and more information disclosure is done electronically (e.g. Internet). This doesn't mean written texts will disappear but it does mean that for instance a newspaper will contain video footage, audio commentaries et cetera, when disclosed via a terminal, for instance a web tablet.
b) Technology: the fact that many initiatives for standardisation are taken up, of which MPEG[37] (multimedia) and TV-Anytime[38] (television) are just but two examples, is a sign for the recognition of leaving proprietary systems behind and working towards 'open' systems. Open mostly in the sense of 'open' to communicate and integrate with other systems, but sometimes even in the sense of open sources (i.e. Linux).
c) Companies: given the rate of take-overs and the scale of the large companies that are forming (e.g. AOL and Time Warner) means companies recognise the added value and necessity of teaming up.
d) Services: personalisation, communication, search & retrieval services are all going to be of great importance in a world with an abundance of digital content, whether stored/accessible via the Internet or broadcasted or locally stored.

The convergence of distribution channels and the convergence of usages are the least likely to happen. Different distribution channels all have strong points and weak points[39], leaving no clear winner, at least for now. Moreover they have different historical roots, and different economical players and forces are at work. It is therefore not likely we will see a convergence of distribution channels. Similarly we won't see a convergence of usage. On the contrary one of the forces against convergence is that there are different needs leading to different usages. The 'lean forward' versus 'lean backward' attitudes can be related to different needs of information seeking versus relaxation. These don't merge into something new.

The convergence of devices is indecisive. Several examples were given of 'cross-over' devices, combining different functions into one device. These 'mutations' are there and some will succeed in surviving while others will be left behind in history. Surely there will be fax/copier/scanner devices, just like mobile/PDA/MP3 devices, but they exist as the integration of several functions in one device, nothing less nothing more.

If we turn to television, maybe we should say that no medium has ever replaced another, existing medium, only its importance has changed. In the past the viewing experience was influenced by colour TV (more realistic images), the remote control (switching channels without getting out of your seat), satellite or cable TV (more channels), teletext (more information), the VCR (possibility of timeshifting and 'video on demand'), flat screen and DVD (better picture and sound quality). Alternatively we can say that everything that new services offer is already possible, although sometimes to a limited extent: more information (teletext), more channels (satellite/cable), timeshifting (videorecorder) and interactivity (remote control).

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So, television already contains many services and has always been in a state of transformation from its beginning, mutating and redefining its capacities and relations to viewers and other media, while inhabiting a dynamic media landscape.

The latter also makes clear that convergence need not be a matter of all or nothing.[40] Television can easily pick up aspects of the Internet, like its interactivity and its connectivity, and place it in a context where it makes sense. Interactivity could be part of specific programs as quizzes, game shows and educational programs. Enhancements can find a place in information-driven programs like news (enhancements with regional items) and sports (statistics). Connectivity could be part of discussion forums (voting) and music (interview artist). In the same way, Internet can benefit from the television by providing additional (streamed) information, like backstage images of a pop-concert that is broadcasted or interviews with sportsmen not shown in the regular broadcast. This also seems to be a good economic strategy, because in this way, broadcasting and narrowcasting are nicely mutually tuned and there is an optimum chance of targeting the right audience.

VI. Discussion

Imagine the impact of rich media if we consider just the huge popularity of such 'inferior' products/services as MP3 and SMS. Digital technologies will transform virtually all media segments. More and more 'traditional' products are transforming into digital format: music being one of the first (CD) but is still migrating further (MP3 and Super-Audio format), and other media are following: books (ebooks), radio (DAB), film (DVD and digital cinema), newspapers and magazines (online versions) and television (DTV and HDTV). But also the distribution of these products is using increasingly digital channels, like the Internet, mobile networks or digital broadcasting. This digitalisation has two, seemingly contradictory, benefits: durability (CDs, DVDs, HDs and other storage media) and the fact the content is easy updateable and adaptable, making it a natural format for volatile and tailored content.

The worlds of Information and Communications Technology (ICT), Internet and broadcast television have recognised this possible impact and, stimulated by the digital revolution, have set out on a mission to conquer the home environment. Currently the most prominent weapons in this campaign are the set-top box and the Personal Digital Recorder (PDR). Positioned as a 'link' between the home network and the networks (both the broadcast network and Internet) that are 'out there', it represents the dream of the broadcast, entertainment and telecom industry: the 'connected' home. The simple set-top box is evolving from being a device for receiving and unscrambling analogue transmissions towards a Home Media Server (HMS) as an 'interactive' portal for not only broadcast content, but also all kinds of content and services. The HMS lies at the heart of convergence of the triad: communications/networks - content/media - computing/software. Besides massive storage capacity and being a communications 'gateway', the home media server is characterised by

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the ability to handle metadata and software that provides an easy to use on-screen interface and intelligent search/content handling facilities.

There is no doubt that the home media environment is already attracting interest from a many different parties: Telco's, computer manufacturers, network providers, consumer electronic companies, broadcasters and software companies. The new technologies will open up all kinds of opportunities for entering the lucrative world of home entertainment with enhanced and interactive television applications; new markets for people involved in creating content, etcetera. The coming together of the broadcast industry (TV programmes), the entertainment industry (movies, games) and the Internet (world wide web, email, chatting and T-commerce) creates an enormous momentum for the development of new content and new services. The consumer is seduced to get 'connected' by the promise of the sheer amount of content that will become available, the influence he can have on that content, that is 'interactivity', and the tailoring of that content to him as a person: 'personalisation'. We are to believe that we are no longer a mass audience but individuals: actively selecting content and using/viewing it whenever we want. The marketing terms used to sell these ideas are currently 'enhanced TV', 'interactive TV' and 'personal TV'. They all stress a more profound experience of an already known device: the television. The picture that is painted is that television can offer more (hence 'enhanced'), can offer interactivity (hence 'interactive') and that viewing behaviour is no longer dictated by the broadcasting schedule since users can choose to watch everything anytime they like (hence 'personalisation').

Television and Internet are both too strong media and economical factors to be wiped away by one another. Television does not have to be reinvented, it just 'borrows' concepts from Internet and makes Internet into a fourth medium for TV broadcasting after terrestrial, cable, and satellite delivery. Especially with the expected increase of rich media (Markus et al., 2000), this could become a substantial addition. Set-top boxes are only the beginning of a development, PDRs and HMS are next. But they also won't replace television but simply make it better, or at least different. How fast these developments will go and how much television will lean on Internet services and concepts, and vice versa, is not only based on technological possibilities and economical factors but also dependent on acceptance by society at large and the individual consumer in particular, that is whether or not it will offer experiences he cannot refuse.

References

Adelaar, Th. & van Vliet, H. 2000. *Emerging Rich-Content E-Commerce Business Models*. Paper presented at the Seventh Research Symposium On Emerging Electronic Markets "Electronic Markets – From Business Strategies to Implementation" St.Gallen, Switzerland, September 17th to 19th, 2000.

Berners-Lee, T., Hendler, J. & Lassila, O. 2001. The Semantic Web. *Scientific American*, May 2001.

Samsung
Ex. 1020 - Page 30

Brown-Kenyon, P.I., Miles, A. & Rose, J.S. 2000. Unscrambling digital TV. *The McKinsey Quarterly*, 2, 2000, p. 71-81. http://www.mckinsey.com/media/undi00.asp

Brussee, R., Eertink, H., Huijsen, W., Hulsebosch, B., Rougoor, M., Teeuw, W., Wibbels, M. & Zandbelt, H. 2001. *Content Distribution Networks*. Telematica Instituut, Enschede.

Center for Digital Democracy. 2001*. TV that watches you: the prying eyes of interactive television*. A report by the Center for Digital Democracy, June 2001. http://www.democraticmedia.org/privacyreport.pdf

De Mul, J. 1997. 'De digitalisering van de cultuur'. *Lustrumbundel Faculteit der Letteren*. Katholieke Universiteit Brabant, Tilburg. p. 26-49.

Drannikova, S. & Kuijper, A. de. 1999. *www.intervisie.nl, een onderzoek naar de mogelijkheden van het internet voor de Nederlandse publieke omroepen*. Utrecht, Universiteit Utrecht (doctoraalscriptie).

Dunn, J. 2001. The Big Set-up. *Tornado Insider*, May 2001, p. 76-79.

Gleick, J. 2000. *Faster: The Acceleration of Just About Everything*. Vintage Books, London.

Hill, A. 2001. *Will the home LAN save us?* ZDNET, 27 juni 2001. http://www.zdnet.com/zdnn/stories/news/0,4586,2780521,00.html

Jensen, J. F. The concept of 'interactivity'. In: J.F. Jensen & C. Toscan (eds.) – *Interactive Television. TV of the future or the future of TV?* Aalborg University Press, Aalborg. p. 25 - 66.

Jensen, R. 1999. *The Dream Society: how the coming shift from information to imagination will transform your business*. McGraw-Hill, New York.

Lee, R. & Lee, B. 1995. How and why people watch tv: implications for the future of interactive television. *Journal of Advertising Research*, november/december 1995, p. 9-18.

Lilley, A. 1999. *Interactive TV: A Briefing*. Document produced by Lumiere and New Media Knowledge to accompany the special briefing on interactive TV given at the Quest for value 99 event held on the 15th and 16th September 1999.

Loviscach, J. 2000. Privé-tv. Video-overdracht via Internet. *C't*, 2000, 7/8, p.124-136.

Markus, L.F., Marcus, A.W., Bowen, M.G., Post, A.J. & Shaughnessy, K.L. 2000. *Broadband E-Battle. Enhanced TV Challenges the PC for Interactive Services and E-media supremacy*. Deutsche Bank Alex. Brown, 28 January 2000.

O'Driscoll, G. 2000. The Essential Guide to Digital Set-top Boxes and Interactive TV. Prentice Hall.

Owen, B.U. 1999. *The Internet Challenge to Television*. Harvard University Press, Cambridge.

Pine, B.J. & J.H. Gilmore. (eds.) 1988*. Markets of one. Creating customer-unique value through mass customization*. Harvard Business Review Press, Boston Massachusetts.

Pine, B.J. & J.H. Gilmore. 1999*. The Experience Economy. Work is theatre & every business a stage*. Harvard Business School Press, Boston Massachusetts.

Samsung
Ex. 1020 - Page 31

Raessens, J. 2000. 'Cinema and beyond. Film en het proces van digitalisering'. *E-View*, nr. 1, 2000. http://comcom.kub.nl/e-view/01-1/raes.htm (consulted 6 March 2001).

Robin, M. & Poulin, M. 2000. *Digital Television Fundamentals. Design and Installation of Video and Audio Systems*. (second edition) McGraw-Hill.

Saint Girons, R. 2000. Wise up to web TV. *Cable & Satellite Europe* (March 2000, p. 40-41).

Shepard, S. 2000. *Telecommunications convergence. How to profit from the convergence of technologies, services, and companies*. McGraw-Hill, New York.

Stout, A. 2001. Beyond the web. *Computer Arts* 56, April 2001, p. 26-32.

Swann, Ph. 2000. *TV dot COM. The future of interactive television.* TV Books, New York.

Swedlow, T. 2000. *Interactive Enhanced Television. A Historical and Critical Perspective. Interactive TV Today*. http://www.itvi.com/etvwhitepaper.html (consulted on 22 January 2001).

Tokmakoff, A. & Van Vliet, H. 2001. *Home Media Server Content Management*. Paper presented at the ITCom2001 - Internet Multimedia Mangement Systems. Denver USA, August 2001.

Uricchio, W. 1998. The Trouble with Television. *Screening the past: an international electronic journal of visual media and history*, september 1998. http://www.latrobe.edu.au/www/screeningthe past/firstrelease/fir1998/Wufr4b.htm

Van Bemmel, N. 2000. Toekomst-tv. *De Volkskrant*, 21 April 2000, p. 17.

Van der Heijden, T. 2001. Bezitters van digitale televisie blijven gewoon tv kijken. *Insight*, 2001, 5, p. 45.

Van Dijk, J. A. G. M. & Vos, L. de. 2000. *Op zoek naar de heilige graal, beelden van interactieve televisie* (paper op congres communicatiewetenschap: de groeistulpen voorbij? Universiteit Twente, Enschede.

Van Setten, M. 2001. *Personalised Information Systems*. GigaPort Research Report TI/RS/2001/036, Telematica Instituut, Enschede. (https://extranet.telin.nl/docuserver/dscgi/ds.py/ViewProps/File-16467)

Van Setten, M., Tokmakoff, A. & Van Vliet, H. 2001. *Designing Personalized Information Systems - A Personal Media Center*. Position paper for Workshop "Personalization in Future TV" at User Modeling 2001 conference on 13-14 July, Sonthofen, Germany, 2001.

Van Vliet, H. 1991. *De Schone Schijn. Een analyse van psychologische processen in de beleving van fictionaliteit en werkelijkheid bij theatrale produkten.* Thesis, Amsterdam.

Van Vliet, H. (ed.). 2000. *Directions for Long-term Content Engineering Research. A view from above*. GigaPort Research Report TI/RS/2000/048, Telematica Insituut, Enschede. (https://extranet.telin.nl/docuserver/dscgi/ds.py/ViewProps/File-9796)

Van Vliet, H. 2001a. *De levenscyclus van eContent. Een keten van kansen*. Presentation at the 3rd GigaPort Kennisseminar, 17th of May 2001. MediaPlaza, Utrecht.

Van Vliet, H. 2001b. *Volgende Generatie Televisie en Internet.* Presentation at the University Utrecht as part of 'Het actuele debat' on the 4th of December 2001. Utrecht.

Samsung
Ex. 1020 - Page 32

Van Vliet, H. & van Stelten, N. 2001. *Next Generation Television. State of the Art report on new developments in Television from a technological, economical and social-cultural perspective*. GigaPort Research Report TI/RS/2001/038, Telematica Instituut, Enschede. https://extranet.telin.nl/docuserver/dscgi/ds.py/ViewProps/File-14793

Winston, B. 1998. *Media Technology and Society. A History: From the Telegraph to the Internet*. Routledge.

Zielinski, S. 1999. *Audiovisions. Cinema and television as entr'actes in history*. Amsterdam, Amsterdam University Press.

Acknowledgements

I like to thank the GigaCE project members 2001 for contributions and discussions, especially Naomi van Stelten, Andrew Tokmakoff, Thomas Adelaar and Mark van Setten.

Notes

[1] See van Vliet, de Heer & Adelaar – Downloading emotions: experiences on the Internet (forthcoming).
[2] Regarding 'stories' as experiences see Jensen (1999).
[3] Introduced by Zenith in 1950 nicknamed Lazy Bones followed by the first completely wireless remote, the Flashmatic, in 1955: http://www.abcnews.go.com/ABC2000/abc2000living/GMAtimecapsule991214_remote.html.
[4] See Robin & Poulin (2000) for a technical overview.
[5] Wireless cable is a relatively new service that is used to broadcast TV signals at microwave frequencies from a central point or head-end to small antennas located on the roof of customers. Signals are broadcasted from base stations within a 35-mile diameter of the customer's home. Signals are received with home rooftop antennas, and a set-top box is needed for decrypting the signal and pass it to the television.
[6] In reality the picture is not always as clear-cut as presented above. At least three reasons can be given:
1) It takes time for a new technology/device to penetrate the mass market, claim its throne and make its predecessor obsolete. Such transition periods can take from 5 to 10 years for successful new introductions, or even longer for less successful ones. In this period older and newer technology exists alongside each other, leading to for instance digital set-top boxes that can also process analogue signals or game consoles that can also play earlier generations games by being backwards compatible.
2) Technology, and especially new technology, costs money. In the case of advanced set-top boxes, consumers are still unwilling to purchase these devices because of the high prices. This leads to increasing pressure on set-top manufacturers to cut costs and challenges them to design low-cost set-top boxes that still support (some) interactive services and basic navigation, that is a scaled-down or 'light' version that can be 'upgraded' to support advanced services. As a consequence the difference between an advanced analogue set-top box and a 'simple' digital set-top box is sometimes difficult to tell.
3) Due to the promising future for set-top boxes different industries (broadcasting, consumer electronics, entertainment industry) are trying to introduce different flavours in order to get a market share. For instance Sony's Playstation 2 (PS2) cannot only play games but also DVD's, and with introduction of a hard disk and high-speed modem this becomes a highly competitive home entertainment platform. Add another module containing a TV tuner and for decompression the video stream and the PS2 enters the realm of advanced multimedia set-top boxes. The interest of different industries led to all kinds of 'hybrid' devices, which seems to be a far cry from the 'traditional' set-top box.
[7] www.tivo.com, www.replaytv.com, www.ultimatetv.com
[8] See van Vliet & van Stelten (2001) for more examples, for instance WebTV and Synchronised TV.
[9] Another option is to scale down he high quality of a digital channel in order to make 'room' for additional information.
[10] www.mixedsignals.com

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[11] Online personalised TV guides, work on a principle similar to search engines. TV viewers enter a profile that defines what kind of shows they like to watch and when, for example: www.tvgids.nl.
[12] http://www.tvgateway.tv/
[13] www.singularis.com
[14] As opposed to transic traffic for which the network provider does not get paid.
[15] For instance DivX;-) and OpendivX (www.divx.com), On2 (www.on2.com), 3ivx (www.3ivx.com) and the media 8 codec by Microsoft.
[16] Streaming, which enables you to start watching a video before it has completed downloading, has two forms: progressive and real time. With progressive streaming you can view the part of the file that has downloaded, but the video files do not adjust to match the bandwidth of the viewer's connection. Progressive streaming is also called HTTP streaming because the video files can be stored on an HTTP server. Real time streaming continually matches the quality of the video to the bandwidth of the connection, so the video is always seen in real time. This makes it suitable for live broadcasts and it also supports random access so you can skip forward to the end of a movie without having to wait for the whole thing to download. In theory, real-time streamed video should never pause, but in practice it is not unusual to see the message 'net congestion' below the frozen video image while the audio continues to play.
[17] See Brussee et al. (2001) for a further discussion on CDN.
[18] www.akamai.com
[19] The Dutch project GigaPort (www.gigaport.nl) aims to unlock the potential of Next Generation Internet by demonstrating the value of its applications across various industries.
[20] See Berners-Lee, Hendler & Lassila (2001).
[21] There is no principle reason why Internet cannot be a broadcast medium, it is a matter of cost, that is the most cost-effective way to deliver for instance video. At the moment traditional broadcasting, cable, satellite and terrestrial are far more cost-effective in delivering quality video to the home than the Internet and this will not change in the near future. And even if Internet becomes a broadcasting medium it is more like newspaper broadcasting: the message is public but not the medium (everyone receives his/her own copy) in contrast to television broadcasting in which the message and the medium is public (Owen, 1999).
[22] Although the 'many' in Internet (thousands and in some cases tens of thousands at the same time) do not match the many in television broadcasting (millions for regular TV shows to billions in some cases like worldwide sport events).
[23] Even in the case of satellite television and local radio stations, the choice is in the order of hundreds or thousands of different channels. This doesn't come near the millions of websites currently accessible.
[24] For a further discussion see Jensen (1999), van Dijk & de Vos (2000) and van Vliet & van Stelten (2001).
[25] This refers to the service of delivering content and not the quality of that content that is whether it is or is not a 'good' program.
[26] C. Michael Armstrong, chairman of AT&T, at the 1999 Internet World Conference, quoted from Swann, 2000, p. 103.
[27] There are several initiatives for finding the holy grail of home networks: the Home Phoneline Networking Alliance (HomePNA) develops specifications for interoperable, home networked devices using existing phone wiring; the HomeRF working group (HRFWG) was formed in 1999 to develop an open interoperable specification for the next generation of wireless home networks and announced an open industry specification called Shared Wireless Access Protocol (SWAP).
[28] www.nokia.com/multimedia/mediaterminal.html. Other examples are for instance Sony's Playstation 2 and Tiny's Takami entertainment centre (www.tinytakami.com).
[29] See also Tokmakoff & van Vliet (2001) and Hill (2001).
[30] As in the Video-over-IP project: vip.telin.nl
[31] Work on this is carried out within the GigaPort project: www.gigaport.nl.
[32] http://www.aol.com/aim
[33] An example is Spoton (spoton.actv.com), a service by ACTV and VNU/Claritas (van der Heijden, 2001). It offers a service that is basically an end-to-end solution for delivery of and accounting for targeted, interactive TV advertising through digital transmission systems. Spoton offers pinpoint accuracy by choosing the most effective ad to send to each household during the same commercial break. This choice can be based on the general demographic profile of a region, the specific profile of an individual household, or remote control keyed viewer entries. Additionally, Spoton offers also for instance allowing customers to receive additional information or purchase products, or automatically

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change an ad once it has been shown the optimal number of times in each household. See the report by the Center for Digital Democracy (2001) for a critical analysis regarding privacy issues.

[34] See Wink (www.wink.com) and Media100 (www.media100.com) for implementations.

[35] Largely based on Owen (1999), Loviscach (2000), Lee & Lee (1995), Markus et al. (2000), Saint Giros (2000), van Bemmel (2000), Swann (2000), van der Heijden (2001), Stout (2001) and Dunn (2001).

[36] See also Shepard (2000).

[37] www.mpeg.com

[38] www.tv-anytime.org

[39] See van Vliet & van Setten (2001) for an overview.

[40] Also the pace of the convergence can differ. This pace is dependent on technological implementation and standardisation, and is set by economical motives, which could also mean a slow down. There are all kinds of reasons why (large) companies may choose to slow down the developments (or 'suppress' them; see Winston, 1998): perhaps rights issues may delay introduction of services (e.g. the delay in the introduction of DVD players due to security issues); maybe the big players are not ready as organisations to fully exploit the new developments and delay them to gain time; or maybe the business models are not significantly clear leading to risks in implementing services.

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