1

digital convergence

Life is becoming digital for some time now, [Digital]. We are surrounding ourselves with gadgets and we are consuming immense amounts of information, that is increasingly being delivered to us via the Internet. We play games, and we still watch (too much) television. Some of us watch televion on our PCs, and may be even looking forward to watch television on their mobile phone. For others, the PC is still a programmable machine. Being able to program it might earn you a living. Understanding multimedia, however, might even provide you with a better living. In this chapter, we study what trends may currently be observed in the delivery of multimedia information, and we explore what impact the digital revolution may have from a commercial perspective.

1.1 entertainment

In november 2000, a theme issue of the Scientific American appeared, featuring a number of articles discussing (digital) entertainment in the era of digital convergence. Let's start with a quote:

Scientific American (november 2000)

> *The barriers between TV, movies, music, videogames and the Internet are crumbling. Audiences are fetting new creative options. Here is what entertainment could become if the technological and legal hurdles can be cleared ...*

Moreover, it was observed that:

- digitizing everything audio and video will disrupt the entertainment industry's social order.
- the whole concept of holding a CD or movie in your hand will disappear once d-entertainment is widely available.

Underlying the importance of entertainment in the era of digital convergence is the premisse governing an entertainment economy, which may be stated as

there is no business without show business

Additionally, the authors of the introduction to the theme issue speculate that

democracy

> *Creation of content will be democratized. Low cost digital movie cameras and PC video editors allow anyone with an eye to record and edit a movie for just a few thousend euro ...*

However, given the aesthetic ignorance of the average individual making video movies, it seems doubtful that this will hold true for entertainment in general.

In that same issue of the Scientific American Gloria Davenport, a pioneer in the field of multimedia, presents list of applications characterizing the evolution of digital entertainment, [Entertainment]:

evolution of digital entertainment

- 1953: Winky Dink (CBS) – interactive television, drawing exercise
- 1972: Pong (Atari) – ping-pong on computer screen
- 1977: Adventure – text-based interactive fiction
- 1983: Dragon's Liar – laser-disc technology 3D game
- 1989: SimCity – interactive simulation game
- 1989: Back to the Future – the Ride
- 1993: Doom – 3D action game
- 1995: The Spot – interactive web-based soap opera (Webisodic)
- 1999: IMAX3D – back to Atlantis (Las Vegas)
- 2000: Big Brother – TV + around the clock Web watch + voting
- 2001: FE Sites – fun enhanced web sites

It is interesting to note that *Big Brother*, which was originally created by a Dutch team, has become a huge success in many countries. Although the integration with the web was limited, it may be seen as the start of a number of television programs with web-based interaction facilities.

digital experience

The list compiled by Gloria Davenport suggests, a convergence towards an 'ultimate digital experience', Now, what does *digital experience* mean?

In a special issue of the Communications of the ACM, about the next 1000 years of computing, Ramesh Jam makes the following observations:

> *The desire to share experiences will be the motivating factor in the development of exciting multimedia technology in the foreseeable future.*
>
> *Ramesh Jain, Digital Experience, CACM 44.3, pp.38-40*

Considering the variety of means we have at our disposal to communicate, as reflected in the list below, we may wonder whether our current technology really stands out as something special.

communication technology

- *oral* – communicate symbolic experiences
- *writing* – record symbolic experiences
- *paper* – portability
- *print* – mass distribution
- *telegraph* – remote narrow communication
- *telephone* – remote analog communication
- *radio* – analog broadcasting of sound
- *television* – analog A/V broadcasting
- *recording media* – analog recording
- *digital processing* – machine enhancement
- *internet* – multimedia communication

According to Ramesh Jam, internet-based multimedia communication differs from earlier communication technology in that it somehow frees the message from the medium. Reflecting on Marshall McLuhan phrase – *the medium is the message* – he observes that:

McLuhan (1976) – the medium is the message

> *..., the medium was the message when only one medium could be used to communicate messages.*
>
> *Now, the Internet allows the synthesis and rendering of information and experiences using whatever is the most appropriate media to convey the message*
>
> *(In other words) The message is just the message, and the medium is just the medium.*

Speculating on the future of multimedia communication and presentation technology, he states that:

presentation technology

- compelling experiences rely on carefully staged presentation
- in the coming years we'll see tremendous progress in presentation technology related to all our senses.
- enriched with (other) sensory information, virtual reality might approximate real reality ...

Clearly, from a technological perspective there seems to be no limit, except those imposed by our own phantasy.

research directions– *the face of cyberspace*

The notion of *cyberspace* was introduced in William Gibson's novel *Neuromancer*, that appeared in the early 1980's, signifying a vast amount of (digital) data that could be accessed only through a virtual reality interface that was controlled by

neuro-sensors. Accessing data in *cyberspace* was not altogether without danger, since data protection mechanisms (including firewalls, as we call them nowadays) were implemented using neuro-feedback. Although the vision expressed in *Neuromancer* is (in our days) still futuristic, we are confronted with a vast amount of information and we need powerful search engines and visualisation techniques not to get lost. So what is the reality of *cyberspace* today?

> *... cyberspace is a construct in terms of an electronic system.*
>
> Vivian Sobschack, 1996, quoted from [History], p. 321

On reflection, our (electronic) world of today might be more horrendous than the world depicted in *Neuromancer*. In effect,

cyberspace

> *television, video cassettes, video tape-recorder/players, video games, and personal computers all form an encompassing electronic system whose various forms interface to constitute an alternative and absolute world that uniquely incorporates the spectator/user in a spatially decentered, weakly temporalized and quasi-disembodied state.*

All these gadgets make us dizzy, stoned with information and fried by electromagnetic radiation. However, the reality of everyday computer use is (fortunately?) less exciting than the images in *Neuromancer* suggest. User interfaces are usually tiresome and not at all appealing. So except for the fanatic, the average user does easily get bored. Would this change when virtual reality techniques are applied pervasively? What is virtual reality?

virtual reality

> *virtual reality (is) when and where the computer disappears and you become the 'ghost in the machine' ...*

In other words, virtual reality is a technology that provokes immersion, sensuous immersion, supported by rich media and powerful 3D graphics. In our age of information, we may wonder how all that information should be presented. Rephrasing the question, we may ask what are the limits of the digital experience, or more importantly, what should be the norm: 3D virtual environments, plain text, or some form of XP?

1.2 convergence

Let's see if we are able to give a more precise characterization of *digital convergence*. In their introduction to the theme issue of the Scientific American, Forman and SaintJohn locate the beginning of digital convergence, historically, at the 1939 New York World Fair:

history

- 1939 – New York World Fair – formal debut of television broadcast

They observe that

> *the receiver at the RCA Pavillon was way ahead of its time, it was a combination of television - radio - recorder - playback - facsimile - projector ...*

Moreover, they remark

> *that in hindsight suggests that we humans have a fundamental desire to merge all media in one entity*

By way of definition we may state, following Forman and SaintJohn, that digital convergence is:

digital convergence

> the union of audio, video and data communication into a single source, received on a single device, delivered by a single connection

And, as they say, *predicted for decades, convergence is finally emerging, albeit in a haphazard fashion.*
Taking a somewhat closer look, we may discern subsidiary convergences with respect to content, platform and distribution:

subsidiary convergences

- *content* – audio, video, data
- *platform* – PC, TV, internet, game machine
- *distribution* – how it gets to your platform

Here, Forman and SaintJohn remark that

> *if compatibility standards and data protection schemas can be worked out, all d-entertainment will converge into a single source that can shine into your life on any screen, whereever you are ...*

However, observe that the number of competing standards and architectures is enormous!

television

It is fair to say that no device has changed the way we live so dramatically as television. Television, for one, has altered the way we furnish our living rooms, not to speak about the time we waste watching the thing.

Now, we may wonder what interactive television and enhanced televison have to offer us. Looking back, we may observe that it takes some time for the new possibilities to catch on.

observations

- interactive television (1970) – people did not want to communicate back to the broadcaster
- enhanced television –

  - Disney – Who wants to be a millionaire?
  - Big Brother – ...

For example, although many people watched Big Brother when it first appeared on television, the willingness of the audience to react other than by phone was (apparently) somewhat disappointing. Perhaps, in the Netherlands this was due to the fact that only a fraction of the PC owners was, at that time, permanently online.

Nevertheless, Forman and SaintJohn state, somewhat optimistically, that

> *The convergence of digital content, broadcast distribution and display platforms create the* big *convergence of d-entertainment and information with feedback supporting human interactivity.*

Before looking at *digital television* more closely, let's summarize what digital convergence involves:

convergence

- *content* – 2D/3D graphics, data, video, audio
- *distribution* – broadcast, wireless, DVD, internet, satelite, cable
- *platform* – PC, television, game machine, wireless data pad, mobile phone

As concerns digital television, we may come up with some immediate advantages:

digital television

- enhanced resolution
- multiplication of channels
- interactive television

Currently, there are some (competing) standards in development, that will enable the mass-scale adoption of digital television, notably:

standards

- US – 8-VSB (vestigial side-band) – not for antennas
- EU – COFOM (coded orthogonal frequency) – antennas, cable, satelite

When speaking about (digital) television, we must make a further distinction between:

- HDTV – high definition television
- SDTV – standard definition television
- ITV – interactive television

In addition, we may mention the introduction of set-top boxes, such as

set top boxes

- BlueSky (UK), PrimeCon (D) – HTML, XML (X3D)

that, making use of what we may regard as standard web technology enable us to access the web through television.

As further discussed in chapter 3, we have (standard) codecs for d-TV, in particular

(standard) *codecs for d-TV*

- MPEG-2 – from Motion Picture Expert Group
- MPEG-4 – high quality streaming d-video on Internet

that enable the effective delivery of digital video, possibly in combination with other content.

Unfortunately, experts disagree on what might become the most suitable appliance or platform to consume all those digital goodies.

a *killer* d-TV appliance ...

- DVD player/recorder – 400.000 sold in 2 years, 2h of MPEG-2 video
- personal television – TiVo, Replay-TV (MPEG-2 cache)
- game machine – Sony PS 2, X-Box

Will we prefer to watch stored video, instead of live televison broadcasts? Will the Internet be able to compete with traditional television broadcasting. Will DelayTV or Replay-TV, which allows you to watch previous broadcasts at a time that suits you become popular? Will an extended game machine or PC replace your television? Currently,we must observe that

streaming media (still) have rather poor resolution.

Leaving game machines aside, will it then be the TV or PC that will become our platform of choice? Forman and SaintJohn observe:

TV or PC

> *The roadblock to the Entertainment PC could be the PC itself. Even a cheap TV doesn't crash or freeze. The best computers still do.*

However, they conclude that

The Entertainment TV

> *it might make sense to adopt a programmable PC that can support competing TV standards, rather than construct a stack of TV peripherals.*

Nevertheless, there are a number of problems that occur when we (collectively) choose for the PC as our platform for d-entertainment:

problems

- thin clients (Sun/Java) vs fat clients (MS/Intel:Dell,Compaq)
- Internet (IP) is not robust – QoS
- proprietary architectures and codecs – RealVideo, QuickTime, Windows media

Do we opt for thin clients or fat clients? Will we be able to develop a more robust version of the Internet, that includes so-called *Quality of Service*, which gives you guaranteed bandwidth and delivery? And, will we be able to unify proprietary architectures and codecs into a common standard, such as MPEG-4?

Evidently, the situation becomes even more complex when we just consider the range of alternatives for connectivity, that is for possible ways of distributing contents:

distribution

- *telephone network* – from 0.5 - 2 Mbps to 60 Mpbs (2.5km)
- *broadcast TV* – 6 MHz / 19 Mbps (4 channels MPEG HDTV)
- *cable TV* – hybrid fiber-optic coaxial cable 6 Mbps
- *fixed wireless* – 2 Mbps (radiotowers + rooftop antenna), phones/handhelds
- *satellite* – downloads to 100kbps, modem for uploads ...

Most probably, convergence with respect to distribution will not result in one single way of being connected, but rather a range of options from which one will be selected transparently, dependent on content and availability.

Let's stay optimistic, and ask ourselves the following question:

what will we do with convergence once we have it?

One possible scenario, not too unlikely after all, is to deploy it for installing computing devices everywhere, to allow for

ubiquitous computing

- smart houses,
- smart clothes, and even
- a smart world.

I wonder what a smart world will look like. In the end we will have to wait and see, but whatever will emerge

We Will Watch

That is to say, it is not likely that we will have a world without television. Television as we are used to it seems to be the dominant paradigm for d-entertainment, for both the near and distant future.

research directions – *technological determinism*

Although there are many technical issues involved in (digital) multimedia, as exemplified in the issues that play a role in digital convergence, a technical perspective alone does not suffice. Each technological innovation has its consequences on our social life. Conversely, each trend in society might result in the adoption or development of new technology. Looking at the history of the media, we may observe that media become *materials* in our social processes. Or, as phrased in [History]:

media as materials

> *each medium of communication tended to create a dangerous monopoly of knowledge*

For example ([History], p. 8) for Christians, images where both a means of conveying information and a means of persuasion, that is part of the rethorics of institutionalized religion.

Looking at our age, and the media that have come into existence in the previous century (radio, television, ...), [History] observe that:

technological determinism

> *technological determinism was not the answer, ... more attempts were to be made to provide answers about the social consequences of television than had ever been asked about radio.*

In effect, underlying all developments in the media (including the computer) we may assume a basic need for information. A rather problematic need, for that matter:

information

> *Information became a major concern anywhere during the late 1960 and 1970s where there was simultaneous talk both of 'lack of information' and 'information saturation'.* [History], p. 555

Nowadays, we regard information as a commodity. Train schedules, movies, roadmaps, touristic information, stock prices, we expect it all to be there, preferably online, at no cost. No information, no life. Information drives the economy. Upwards and downwards!

1.3 commercial impact

There is a large number of gadgets that could be classified as multimedia gadgets, a few of which are listed below, taken from the offerings of eluxury.com.

eluxury.com

> *Choose from today's state-of-the art entertainment, communication, and navigation products from industry leaders including Olympus, Motorola, and Panasonic:*
>
> *digisette*
> *pencam*
> *wristpc*
> *micropda*

More seriously, we are faced with the question what commercial impact multimedia, and in particular digital convergence, may have. Let's look at some news from business and comments from the popular press.

TV meets the Web

Monique van Dusseldorp & Partners operate on the European multimedia market as consultants. They promote, amongst others, the integration of TV and the Web.

http://www.tvmeetstheweb.com

Their mission:

> *helping clients in Europe position themselves for media convergence*

Their interests encompass the following types of content:

content

> *streaming media (audio and video), interactive gaming, virtual reality and 3D animation, interactive TV programming, interactive advertising, video on-demand, webcasting and multimedia*

In 2000 they issued a report sketching the European broadband landscape. Quoting from this report:

European Broadband

> *The advent of broadband Internet access, which has been available in the US for some time but is only now beginning to make inroads into Europe, makes a whole range of new services possible. As download speeds have increased and more bandwidth has become available, the possibility of delivering screen-based content such as films, television programs and music has moved a step closer to mass market usage.*

With respect to the adoption of cable or DSL in Europe, they observe that despite the fact that cable companies have gained firm ground, there is an even larger number of conventional telephone lines.

cable or (X)DSL?

- 1999 – 180 million conventional telephone lines

In contrast, there are only 15 million cable subscribers, giving DSL a large potential audience.

Matthijs Leendertse, co-author of the report, observes:

broadband landscape

> *Gaining competitive advantage and future revenue in Europe's broadband landscape will depend heavily on a company's ability to offer integrated services: access (fixed and wireless) and content. It is virtually impossible at this point for one single company to offer these services on a pan-European level. This means that companies need to find partners to fill the gaps in their offerings.*

Let me assure you, at the moment of writing the battle is still going on!

new media

As may be read in all newspapers (in 2001), large investments are being made (by both cable and telephone companies) to improve the technological infrastructure for the new media. Not to forget, the companies operating on the mobile telephone market. Simultaneously, joint ventures arise between content developers and providers, as with the Dutch Endemol company.

Now, what does the popular press have to say about all these developments. Here is one comment, from a Dutch newspaper:

Peter Greven 23/3/2001 (Volkskrant)

> new media sucks – people like new technology. they don't like new media.

The translation from Dutch is, admittedly, mine. It says, in other words, that people like to receive the old stuff on new gadgets, but that they are not willing to pay for any new sort of services. For example, when considering the *TIVO* smart video recorder, that uses a disk cache for storing MPEG coded versions of broadcasts, just think of other gadgets and services that didn't make it or that are encountering problems in being accepted:

acceptance problems

- experiments (failed): videofoon, videotext, cd-i, DCC
- Canal+: information overload

Perhaps the reason for these failures is the *trial-and-error* (aka spaghetti) method that is being followed in developing new media.

Jan van Dijk (UTwente) The Network Society

- spaghetti method – plate against the wall, and see which will stick

Just throw it on the market and see what sticks. Perhaps that is not the right method to be followed. But can you think of a better one?

In many cases 'the market', that is the people using a service, do not behave as expected.

observations

- download & upload – (Sweden: upload!)
- video-on-demand – see webnoize.com

For example in Sweden, the upload of material far exceeded download, which is contrary to the assumptions underlying ADSL.

mobile multimedia

To conclude this chapter, let's look at another potential hype. In 2000, Webnoize published a report (by Matt Bailey), entitled *Wireless Entertainment: What Is It Worth?*:

wireless entertainment

> *The wireless web is being unleashed. Cellular providers around the globe are spending billions of dollars to bring faster connectivity to cell phones, personal digital assistants (PDAs) and other mobile devices. As new networks roll out, wirelessly streamed music will be a huge hit with commuters, while young media junkies will demand music videos and short animations. Tens of millions of consumers around the world will use wireless devices to gain ubiquitous access to content.*

The intent of the report is to investigate whether investments in the mobile entertainment are justified. Quoting again:

wireless or worthless?

> *Webnoize examines how providers of music and video services can benefit from the wireless delivery of multimedia. Using survey evidence, pricing information from new wireless networks and interviews with industry visionaries, the report analyzes supply and demand to build an economic and business model for mobile multimedia.*

Apart from the need to invent some business model, there are a number of strategic questions to be answered in order to estimate the risk of making investments in this direction. Following Bailey, we may list questions such as:

strategic questions

- how quickly will wireless connectivity speeds improve?
- what is the demand for services that deliver music and video to wireless devices?
- how can suppliers of multimedia services monetize demand for wireless access?
- how much will it cost to stream multimedia content to wireless devices now and in 2006?
- are consumers willing to compromise quality for lower cost?

And more. If you are interested whether anyone is willing to take such risks and invest in mobile multimedia, just look at what players are involved.

the players

> *Alltel, AT&T Wireless, AtomShockwave, Cingular Wireless, Clear Channel, HitHive, Ifilm, Infinity, KDDI, Liquid Audio, LMIV, Mannesmann, MP3.com, MTV, NetCom, Myplay, Nortel Networks, NTT DoCoMo, Omnitel, Sprint, Telefonica, Telstra, Vitaminic, Verizon Wireless, Virgin Megastores, Vodafone, Voicestream.*

Now make up your mind, and ask yourself the question whether multimedia is worth your (intellectual) investment.

research directions– *the information society*

There is no doubt about it, we live in an information society. But do we know what an information society is?

In [History] (p. 187), the functions of the media are summarized as

functions of media

information, education, entertainment

So, perhaps, we could better state that we live in a *media society*. So far, in the latter part of the previous century, television has dominated our lives, and observe that (following Ernie Kovack, cited from [History]):

medium

> television is a medium 'because it is neither rare nor well done'

Back to the main issues, what is an *information society*? According to [History]:

information society

> *the new term 'information society' gave form to a cluster of hitherto more loosely related aspects of communication – knowledge, news, literature, entertainment, all exchanged through different media and different media materials – paper, ink, canvas, paint, celluloid, cinema, radio, television and computers. From the 1960s onwards, all messages, public and private, verbal and visual, began to be considered as 'data', information that could be transmitted, collected, recorded, whatever their point of origin, most effective through electronic technology.*

So, from the varieties of perspectives we have discerned, including technological perspectives, societal perspectives and psychological perspectives, we must investigate the problem of communication:

communication

- *what* – content
- *who* – control
- *whom* – audience (how many)

That is, simply, who says what to whom in what channel with what effect?! The remainder of the book will, however, will treat these issues mainly from a technological perspective. In the chapters that follow, we will enquire after the technological assumptions that make an information society possible.

questions

digital convergence

1. Sketch the developments in *multimedia*. What do you expect to be the commercial impact of multimedia in the (near) future?

concepts

2. Explain what is meant by *digital convergence*.
3. Which kinds of *(digital) convergence* do we have?
4. Discuss the relation between the *medium* and the *message*.

technology

5. Give a brief sketch of the development of *digital entertainment*.
6. Characterize: HDTV, SDTV, ITV.
7. Discuss convergence with respect to *platforms*.
8. Discuss convergence with respect to *delivery*.