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Executive Summary

The topic: Unravelling Networked Electronic Media and the Web 2.0

If we cast our minds back to the beginning of the new millennium, European policy makers at that time were worried that Europe was lagging seriously behind other regions of the world in terms of Internet access and application and that this would continue to be the case. According to EUROSTAT, in 2007, seven years after the announcement of the Lisbon Agenda, well over half of European households (54%) had Internet access, the majority over broadband (42% of households). In the leading countries, over 80 percent of households have access, well over three quarters of them via broadband. There are predictions that 3 million new jobs will be created by SMEs operating in the sector by 2015.

Due not least to the rapid development and diffusion of new information and communication technologies, new uses of the Internet have become possible, providing new business opportunities for a broad range of people, leading to new patterns of consumption and production of digital goods. While the changes have seldom been sudden, the result is a new quality of the Internet which has been labelled "Web 2.0". This is linked with terms like networked electronic media, user generated content, social networking and many others which can easily confuse the observer watching developments at a distance.

The aim of this report is to help unravel the concepts underlying the development of the Internet and to point out critical aspects which might require the attention of policy makers in the foreseeable future.

Where is what? The contents of this report

In its *Introduction,* the report clarifies the basic concepts of "networked electronic media", "Web 2.0" and "User Generated Content". *Chapter 2* deals with Technological Developments and Technology Visions and provides facts and figures about innovations of hardware, software and networks important for media industries and Web 2.0 media formats. It considers at some length semantic technologies and the vision of the "semantic Web", and closes by looking at long term media technology visions. *Chapter 3* positions European Media Industries in the global context, analysing the audio-visual sector, the gaming sector, and the mobile Internet in more depth. *Chapter 4* is devoted to networked electronic media associated with Web 2.0 and User Generated Content. The basics of Web 2.0 media are explained in terms of the users' media experience and in terms of Web 2.0 business models, before addressing UGC-Platforms as a specific type of media. The final *Chapter 5* "About Exploitation, Remuneration and Copyright Policies in Web 2.0 environments" describes the new media business and outlines policy relevant insights. Implications and side effects of these new media focus on the possibility of hidden exploitation of the "prosumers" - consumers who also produce content -, potential impacts on the labour market in the media sector, with respect to privacy and with respect to more general transformations of the media industries due to automated or semi-automatic media production. There is then an extensive discussion of the appropriate (micro)payment infrastructure for the Web 2.0 environment. Last not least the issue of Digital Rights Management technologies is raised in the context of copyright policies in Web 2.0 environments.

Where are we now? The state of industry

1. The new environment: Web 2.0

Web 2.0 is shorthand for recent trends in Web-technologies, a changing networked media landscape with new business models and visible changes in the way people communicate via Internet. Beyond a series of new forms of networked electronic media such as blogs, wikis, social networking sites, video sharing platforms and photo sharing sites, Web 2.0 can be regarded as an environment based on a homogeneous underlying infrastructure. This can bring together the local and the global, the stationary and the mobile, the private and the public, the commercial and the amateur, work and play in countless ways. This Web 2.0 environment provides innovative business opportunities for media companies, telecommunications and IT industries.

The open architecture of the Internet and Internet standards enable large scale interoperability and globalisation of services and applications. Developments in hardware influence the creative content industries by improving the connectivity and performance of distribution channels. The newly emerging Web 2.0 technologies embrace advances in client-server communication and facilitate the use of services on the Web as extensions to the personal computer. Advances in programming tools, social software, and easy-to-use and inexpensive tools for content creation have enabled new media forms (like blogs and wikis) and new communication and co-operation forms like *virtual communities*. Thanks to Web 2.0 technologies users can better control their media consumption: The Desktop and the Browser have turned into the user's powerful *media content control centre* allowing the personalisation of networked media experience.

2. User Generated Content and-Platforms for its display

One class of new media to emerge from Web 2.0 environments are so called User Generated Content (UGC)-platforms. A typical example is Flickr, a platform to share personal photographs. These new media are far from being non-profit. Although UGC is intuitively associated with a certain amount of creative effort of users, the term covers a whole range of input from users, even including the involuntary production of commercially exploited data traces.

User Generated Content in principle caters for a niche market, in which each separate niche covers customers or audiences with specialised demands. UGC-Platforms serve numerous niches. By providing an infrastructure for the aggregation and presentation of content serving niches these platforms become a new form of networked media. The role of the user is not only to upload original content, but also to act as broker between supply and demand by tagging, recommending etc. Content on UGC-Platforms often stems from users *and* the media industries. UGC platforms currently serve as an exchange where amateur content can qualify for commercial exploitation in mass media, and commercial content is offered for free to regain attention. They can also be understood as "free access markets" created by companies, where neither "buyer" nor "seller" pay for market entry.

Some markets have been heavily impacted by the rise of user generated content services. The most notable examples are encyclopaedias, the online adult industry and the market for music videos. In other markets UGC complements the existing supply. All major media companies are in the process of setting up UGC services or taking over successful grass roots initiatives, witness the example of the acquisition of the YouTube video platform by Google.

3. The digitisation of the audio-visual business

There are clear indicators that the Internet as Internet of media is turning into the growth motor of the media and entertainment industries. Traditional media migrating to the Internet are able to compensate for lower growth rates or losses in the physical world, but digital born content like video games is showing the highest growth rates. Forecasts see EU27 members from Southern and Eastern Europe as most dynamic in the region. International comparison of media companies shows the importance of US-based global players (Google, MSN, Yahoo), but also the strength of national actors often belonging to incumbent media industries in Europe.

The audio-visual sector is being faced with upheavals due to digitisation. On-demand viewing is likely to be driven by TV-based platforms including services delivered over the Internet rather than public Internet platforms. Radio broadcasting traditionally has a very strong regional element. Due to uncertainty on future standards, existing broadcasters are currently showing little interest in the transition to digital. The adoption of on-line radio is slow due to lack of adequate affordable broadband access in parts of Europe and the slow diffusion of suitable listening devices.

4. Out of the shadows into the mainstream – The Gaming industry

Previously viewed as a slightly disreputable segment of the toy industry, *online video games* are a rapidly growing segment of the mainstream media and entertainment sector with huge business opportunities. Web-based and mobile online video games are turning the games sector into a distinctive type of networked electronic media. Online video games have thus the potential to become mass media for everyone – not only the typical young male computer nerds, but also for women and older people. Online games are competing with other mass entertainment media such as TV and movies, and also with device dependent games (e.g. consoles).

The Internet enables efficient distribution platforms for online games using the typical approaches to profitable business on the Internet, such as subscription models, micropayment/advertising, and indirect revenue streams. The most important segment of online games in economic terms are still Massive Multi-Player Online Games (MMOs) and within this category Massive Multi-Player Online Role-Playing Games (MMORPGs).

The fastest growing segment within the online game segment is probably *casual games* with over 200 million people playing online casual games every month – both downloadable and browser games. Most mobile phone games can be regarded as a sub-section of the casual games section.

A future vision for the gaming sector are "*pervasive games*" which will extend the gaming experience out into the physical world. The gaming experience of tomorrow may use your home city street as a playground with everyday life co-existing side by side with virtual elements.

5. The Internet on the move

While there are figures indicating that the importance of data services in Europe is growing. the content industries argue that the pace of change is too slow due to lack of support for Internet standards on the part of European operators. The process could be accelerated by a shift from expensive SMS to cheap E-mails with links to sites on the Internet. This could be supported by policy measures boosting increased competition based on lessons already learned in Japan, which is the world leader on the mobile Internet.

Major proposals in this area include a Europe-wide provision of wireless Internet services allowing for internet telephony (Voice over IP) without roaming fees as well as a European spectrum regulation beneficial for the content industries. Radio spectrum policy could provide support by the means of long-range unlicensed spectrum, the provision of pan-European licenses, the provision of licenses to new competitors, and the enforcement of technology neutrality with regard to radio technologies. Such spectrum policy could in particular focus on re-using "beachfront" TV-spectrum (spectrum in the range of 700 megahertz).

A working group composed not only of the incumbent spectrum owners, but also those parties who would benefit from the new approaches, could be set up to elaborate these options as a first step.

Where do we go from here? Trends and visions

1. Learning from games – educational software

Up to now, educational uses of games have included rather massive simulation-type games, but also single-player "mini games" of the casual type available online from java and flash game portals.

Based on the evidence of time spent by users, online games seem to be over all more attractive and compelling than educational software which tends to be put aside after a few hours. This could be due to less appealing graphics and content which fails to sustain interest.

On the one hand educational software can learn from online games, on the other hand it might be in the public interest if game developers were willing to integrate educational elements in games primarily intended for entertainment.

The deliberate incorporation of features of "edutainment" in mainstream teaching of all subjects, and not only computer skills, requires dissemination of “best practice” to avoid costly mistakes with applications which do not capture pupils’ interest and engagement or are unsuccessful in achieving their educational goals. The utilization of edutainment features in teaching requires an adequate infrastructure for schools throughout Europe to provide equal access to the benefits of computer-based teaching methods, including on-line access and sufficiently fast and powerful computers. There might be greater potential for the use of educational software outside compulsory education, such as further education and adult education.

To make optimum use of the potential benefits provided by educational programmes with educational elements, it would be useful to develop Europe-wide recommendations on uses and applications for various levels and types of school. As a measure to diffuse and optimise the utilisation of networked electronic media for educational purposes, a start could be made by inventorising such media and by creating platforms for the exchange of experience at the European level.

2. Electronic small change – the persistent need for micropayments on the Web of the Future

Much of the past discussion on payment schemes for the Internet has focused on systems for the payment of sums too small for other systems like credit cards. While it is true that there is still a lack of interoperability, of cross-border standards, and of a common infrastructure for dedicated micropayment schemes, the demand for such systems has decreased. Current demand is not sufficient to push micropayment systems any further, so there is no need for policy to intervene.

Even so, existing schemes do not support a wide enough variety of content, payments to small content creators or person to person payments sufficiently. In the medium term, current interpersonal payment systems may develop towards more cash-like P2P payments. There is a need for policy to monitor these developments, to analyse the low value payment issue from a societal perspective and to reconsider the regulation of prepaid low value payment schemes.

3. Better to trace than to track down – Digital Rights Management on the open Web

Digital-Rights-Management technologies can be understood as computer technologies supporting copyright policies. There is currently a shift from DRM-technology as "containment" of content to forensic DRM, meaning technologies identifying, tracking and tracing content (and maybe persons associated). Digital watermarks and acoustic fingerprints are maybe the most prominent technologies. Content on Web 2.0 is increasingly being sold free of restrictive DRM technology, but use forensic technology to control circulation of copies and curb infringement of copyright and also as a means to avoid uploading of unauthorized copies, since access providers are expected to apply this type of forensic DRM technology for "filtering".

The ability to track files through forensic DRM obviously raises privacy concerns. Additionally, the technology is not sufficiently reliable to identify all infringements or to distinguish true from suspected infringements. Forensic DRM does also not solve the problem that certain uses under copyright law are perfectly legal and human moderation and judgement will stay essential to make a distinction between illegal and legal use and identify exceptions in copyright law. Regulation might be required to control the fair use of such technologies.

The time, effort and money necessary to enforce copyright policies for large amounts of content of interest to even the smallest minority have led to proposals to leave content with only a small audience uncontrolled and to define a threshold for when it is worth controlling.

As Web 2.0 facilities and practices enable and encourage everyone connected to the Internet to engage in content production and dissemination and to re-combine and re-configure existing media content, "transformative uses" are on the rise bringing with them the question of how to handle related copyright issues. Proposals to go for a wider spectrum of legitimate "transformative uses" could be supported in practice by Creative Commons Licences as an open way of protecting copyrights while granting more possibilities for free use, reuse and transformative uses of copyright protected materials.

4. Exploiting prosumers to displace media professionals – the threat of Web 2.0

Many web services today base their business models on revenues from advertising. The service provider furnishes the platform and facilities for its use, the users produce content, content generates traffic, and traffic attracts advertising revenue for the service.

The user's social capital in Web 2.0 environments consists of three value sources: personal profile and contacts, content contributions and data traces. This implies a risk of "*triple exploitation*". The involvement of prosumers in the value chain of Internet media requires further reflection on adequate compensation, fair revenue sharing, and protection of the users' privacy.

Although the information flowing across Web 2.0 can be used to personalize advertising, and content on UGC-Platforms and to help search engine providers know more about user needs with the aim of delivering more relevant and meaningful results, large scale monitoring and aggregation of users' online personal and intellectual activities brings with it threats to privacy.

The increasing importance of advertising may also have effects on professional journalism. On the Internet ads can be fine-tuned in correspondence with the content of e.g. an article. Articles which are closer to products and services are more likely to be supported by advertising, while well done articles about nasty realities are less likely to attract advertising and generate less advertising revenues. This link between content and ads may in the long run decrease the demand for critical journalism and diminish its overall quality.

Despite the "disappearance" of space and time due to information and communication technologies, stimulating environments and infrastructures favour the local concentration of activities of the "creative class", recently discussed as an important factor for regional development. Although it is maintained that environments still play a major role, the role of the local infrastructures is diminishing through Web 2.0 tools for production, diffusion and distribution and in the end there might be a decrease in the importance of location as an environment. This is an issue well worth examining when devising policies seeking to boost local development.

The ability of Web 2.0 technologies to generate new media products automatically or semi-automatically is likely to have impact on the labour market. Software programmes can build on the expanding universe of original content, to which User Generated Content and other content made freely available (e.g. public domain, public sector information) significantly contribute. Such programmes can bundle and personalize content from the net. Search engines and all other machines which harvest and re-purpose content from the Internet are instances of this development. Secondary media, as those media which do not build on proprietary content are known, have no need for authors. What they do need are programmers. In principle personalized radio or TV stations like peer-to-peer filesharing networks or UGC Platforms can operate worldwide offering personalized services with very few employees really producing, editing and enriching content.

5. The Web of the Future is semantic, but not entirely

a) Semantic technologies already here to stay

Semantic technology makes it possible to add meaning to mere data and content. Technologies enabling the realisation of the vision of the "semantic web" have achieved sufficient maturity for regular use in parts of the media industries and in other communities. Important standards and specifications are already in place. There is a broad range of research in this field funded by national governments and the European Commission. Continued effort is needed to keep Europe competitive in the field and in the lead in selected areas. Improvements here can be very useful for media companies.

Semantic technologies are finding use in the automatic production of secondary media. The potential for Internet radio stations or movie channels to better customize their services with a minimum of personnel has already been pointed out. The next step would be the autonomous generation of new knowledge from what is already there.

The principle of harvesting and repurposing existing content raises crucial questions of copyright and digital rights management. The knowledge semantic search engines collect about persons, their behaviour and their preferences might turn into a nightmare for privacy if not monitored and regulated appropriately by politics. A further more subtle effect of semantic technologies worth investigation is the delegation of knowledge work to machines (intelligent agents), the trustworthiness of these agents, and a potential loss of citizens' "informational autonomy".

b) What about Google? - Semantic search engines and other powerful visions

Semantic web technologies have already proved useful as a navigation and search interface to databases on certain web sites, but a global semantic search engine is far from reality given the billions of existing documents without semantic annotations. In view of the massive activities of users tagging and rating content on Web 2.0, the "semantic web" vision has been modified and labelled Web 3.0 to imply the convergence of Web 2.0 and semantic technologies.

The semantic web community is of course aware that computerized mechanisms to extract semantic information from text and multimedia documents are required to make further progress towards the semantic web. They may have underestimated the potential of other approaches to improve Internet search by analyzing user behaviour, mining the existing Web and mining the semantic web.

It is likely that there is no one best way to realise the vision, with an optimised synthesis of the different strands of search improvements as the basis of the next generation of Internet search engines and it would be surprising to find that Google had missed out.

The most ambitious vision of the semantic web envisages personalized intelligent software agents, which not only answer natural language questions, but also perform tasks for users. The concept of the "Internet of services" sees the Internet as a huge network of applications able to perform tasks based on requests by users. The idea of having an artificial agent that can reliably search for information is still largely a vision rather than a reality, but the Internet of Services is a rather likely long term trend of Internet development.

c) The Semantic web will ease in gradually

In view of the state of semantic web technologies and considering the far reaching visions, the "semantic web" can not be conceptualized in isolation from other trends and is not a technology as disruptive as some protagonists claimed some years ago. The gradual enrichment of the WordWideWeb with semantics now appears as an evolutionary process linked with other developments. We have seen that bridges between the "syntactic web" (HTML, XML etc.) and the semantic Web are required and that there is no clear break where information about structure ends, and semantics begin. User involvement is crucial for the development of the semantic web, because without user involvement the billions of documents will never be semantically annotated and human intervention is needed as a corrective to automated processing of meaning. Last not least, further improvements of search engines will not only depend on semantic descriptions based on ontologies. There are many more approaches to improving Web searches, based on web mining, "semantic web mining", "observational metadata", or "similarity detection". Improved search engines are likely to unite the best features of all approaches.

Facts, figures and research for the realisation of Visions

As others, like the OECD, have pointed out before, there is a lack of sound statistics and reliable surveys about the new sector of networked electronic media. Available data are often restricted to the United States. There is no such thing as a European Networked Media Observatory. Little is known about how media consumption and behaviour is changing, and there is still no economic measurement of the "networked electronic media sector", in which many industries and many actors are jointly generating economic value. On one side, as technology companies (Telcos, ISP, Internet companies) are tending to move up the value chain towards content, the convergence of providers needs to be taken into account. On the other side, the broader creative content sector consisting of amateur, semi-professional and professional producers, deserves more attention in media statistics and research.

End note

The present report "Looking Forward in the ICT & Media Industries" is the final deliverable of the STOA project "Looking forward in the ICT and media industry – technological and market developments". It is based on research by the project team at ITAS (Institut für Technikfolgenabschätzung und Systemanalyse, Karlsruhe), a member of ETAG, the European Technology Assessment Group. In addition to desk research the report draws on communications with experts, who commented on an earlier version, and insights from the workshop "ICT & Media Industries in the Times of Web 2.0", which took place in the European Parliament on June 26 2008.

The thematic focus of the report is on "networked electronic media" and particularly on Web 2.0 and User Generated Content (UGC) developments. The report combines descriptive stock-taking efforts with more in depth analysis of selected policy relevant issues and an assessment of some future oriented visions of ICT and media development.

1. Introduction

The present report is the final deliverable of the STOA project "Looking forward in the ICT and media industry – technological and market developments". It is based on research by the project team at ITAS. In addition to desk research the present report draws on communications with experts, who commented on an earlier version of this report and insights from the workshop "ICT & Media Industries in the Times of Web 2.0", which took place in the European Parliament on June 26 and was organized by the Scientific Technology Options Assessment Panel of the European Parliament (STOA) and ETAG, the European Technology Assessment Group. The thematic focus is on "networked electronic media". The report combines descriptive stock-taking efforts with more in depth analysis of selected policy relevant issues and an assessment of some future oriented visions of ICT and media development. In this introduction we provide some background information on "Networked Electronic Media", delineate the thematic focus of this report, namely Web 2.0 and User Generated Content, present its structure and add some remarks on the political context of the study, the sources used, and last not least we acknowledge the generous support provided by experts.

1.1 Background: Computer-Based Networked Electronic Media

The shift from analogue to digital technology is the basic disruption on which the advances in media technologies build. Media content is a key driver for ICT uptake and vice versa. ICT enable multiplication and diversification of channels through which creative content can reach the users. The number of new media forms relying on these networks is increasing steadily. Video-on-demand, online video games, virtual worlds, and social networking sites are just some examples of networked electronic media which co-exist with digital forms of publishing, TV, film, and radio. The convergence of networks and distribution platforms further blurs existing boundaries and promises a unified media experience. All of these developments represent new market opportunities for producers and distributors of content, and generate important growth prospects for the media and entertainment sector. The corresponding convergent perspective from the users' point of view is depicted in Figure 1.

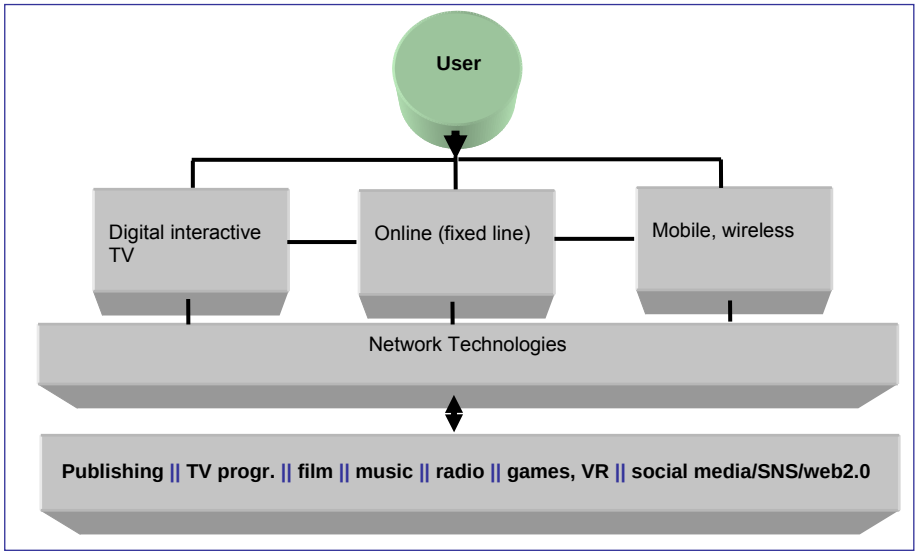


Figure 1: Users' converging media experience

A perspective addressing only the multiplication of channels misses the important point that the emerging media are interactive and programmable media, and that in consequence ICT is more than a neutral technical prerequisite for media experiences. In computer-based networked media ICT is inseparable part of the medium.

The locus of computer-based networked media is where content, computers and communication technology intersect (see Figure 2).

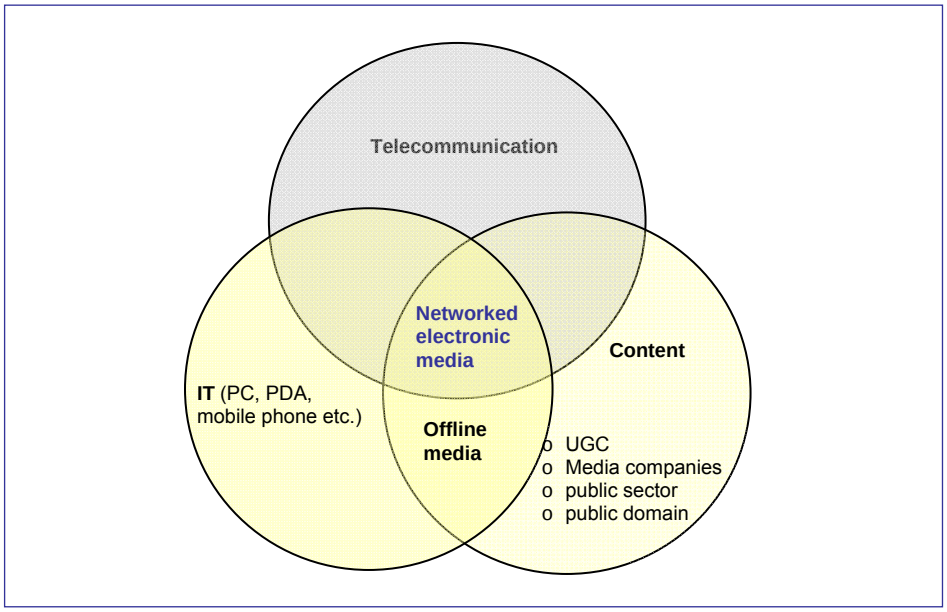


Figure 2: Convergence of Telecommunications, IT and Content

1.2 Thematic Focus: Web 2.0 and User Generated Content

The number of different media forms is almost unlimited. Communication needs – not content as such - are drivers of new media formats, and the creativity of computer-literate media designers turns the needs into innovative media forms. The open Internet provides a level playing field for users and creators of all kinds (including public institutions) shaping new media forms. In addition to media content from traditional media companies migrated to the Internet, we witness an ever growing share of digital born content like online games, virtual worlds, simulations, without any equivalent in the physical world, and a growing share of media building on user created content, e.g. Blogs, Wikis, IRC, video sharing platforms etc.

Web 2.0 and User Generated Content address particular characteristics of networked electronic media. In general the expression "user generated content" is very broad and used for many activities in which users might be involved. Linking to a site, giving feedback on content, annotating content with keywords, filesharing on P2P networks, uploading a snippet of a recorded TV programme, changing a given piece of content by adding some text or sound, creating a personal profile on a social networking site, and of course making publicly available original creative work is what the term covers. Although we tend to think that the use of the term is too unspecific and could be replaced by "prosumer" (coined by Alvin Toffler) or "user involvement" depending on context, we have to accept that the term is currently inevitable as it is heavily used in current publications and debates. On the one hand "user generated content" may be regarded as a "significant disruptive force … for traditional content suppliers" (OECD 2007a, p.5), and on the other hand services providing and integrating "user generated content" may be regarded an intelligent new media strategy.

Web 2.0 is just a common expression to address the current state of the Media Internet from a user's point of view. It indicates a shift in Internet-based media and comprises new forms of media production and distribution involving the participation of "users". Often these new media forms combine content of media companies, user generated content and communication about it. In chapter four we will go into detail regarding Web 2.0.

When looking at Web 2.0 as a participative Web with users heavily involved in the production and distribution of media content we should not loose sight of another strand of Internet media development. As computer based networked media are programmable media, i.e. amenable to automated information processing, there is a huge potential to generate new content and new media forms from already existing media and content. These new media services are often tailored to specific needs: Search engines are the most prominent type of secondary media. They exploit content produced by others "on the fly" and provide personalized media services to their users (in the simplest case: search results). Secondary media often leverage the fact that activities on the Web can be monitored, measured and analysed automatically. "Web mining" is sometimes used as an umbrella term for this type of activity. Another means to make secondary media more powerful are semantic technologies. Future networked electronic media are likely to draw on user involvement *and* web mining *and* semantic technologies.

As borders between spheres tend to be blurred - between work and leisure, office and home, in-house and public, private and public, personal communication and media, consumption and use of media, at home and abroad, communication and co-operation - the use cases for new media which can be adapted and contextualized will increase.

1.3 Structure of the Report

Following this introduction *Chapter 2* deals with Technological Developments and Technology Visions. The first of the three sections of this chapter provides facts and figures about Internet access, broadband, hardware and software developments important for media industries, adds a closer look at those technologies enabling Web 2.0 media formats and closes with a look at the NEM vision, prepared by one of the European Technology Platforms (NEM = Networked and Electronic Media), which gives an idea where future European research on networked electronic media is heading.

The next section is about semantic technologies and the vision of the "semantic Web". After an introduction to the state of the art, we shed some light on the "semantic web", which comes as a vision in two fashions: as a "better search engine" and as an "intelligent software agent" performing everyday tasks for human beings. In the discussion part issues such as challenges to copyright and rights management, and the consequences of semantic technologies for media production, and the nexus between Web 1.0 ("syntactic Web"), Web 2.0 (participative Web) and the semantic web are addressed.

The third section undertakes a kind of horizon scanning, identifying technology visions of more "immersive" media and virtual environments, and further long term visions expected for time horizons extending from 2010 to 2150 such as Web 4.0 or WebOS imagining a state where machine intelligence has reached a point that the Internet becomes the planetary computer or Ray Kurzweil's vision of "singularity" expecting that by 2029 computers will be able to out-perform humans at virtually everything.

Chapter 3, European Media Industries in Context, starts by positioning European media and entertainment industries – focussing on digital products and services - within the global context, before the audio-visual sector, the gaming sector, and the mobile Internet are analysed in more depth.

The advent of digital recording and transmission technologies has had even greater disruptive potential for the audio-visual sector than any technological change it has experienced before. The changes the music industry, audio broadcasting, film industry and TV are undergoing are sketched as well as the emerging new digital media formats, which are not all being adopted as quickly as one might have assumed. Examples of competing Web 2.0 approaches to radio and TV are Last.fm and Joost TV.

It is shown that electronic games are an often overlooked but economically important sector. While there is some danger of addiction and loss of touch with reality, games provide lessons for business and education applications. In particular the compelling nature of virtual worlds holds great potential for business and learning.

The section on the *Mobile Internet* starts with global facts and figures for mobile data services comparing the performance of countries and the European situation with other world regions. The general assumption is that mobile data services are becoming increasingly relevant as a source of revenues for operators and content producers. The comparison is followed by an analysis of the European situation asking why there is so little use of the mobile Internet from mobile phones, and identifying some obstacles. A short analysis of the Japanese situation is meant to identify possible lessons for Europe. In the discussion section more competition is proposed in order to achieve cheap mobile Internet services sooner – to the benefit of consumers and content providers. To bring about more competition pan-European licensed IP-services and spectrum commons are presented as worth considering.

Chapter 4 is devoted to Web 2.0, user generated content and new media. In the first section we explain the basics of Web 2.0, i.e. the media experience of users associated with Web 2.0, typical instances of Web 2.0 media formats, and elements of Web 2.0 business models such as the open source paradigm, "the long tail", the role of brand popularity and search engines, the role of advertising, "glocal webbing" for media shaped for local and global audiences. In a second section user generated content platforms are analysed in more depth. Following an enumeration of the activities often associated with UGC, a distinction is drawn between "creativity" of users and involvement of users in value creation of media services. Empirical findings on user activities on the Internet are presented and UGC platforms are discussed as new media with different strategies of value creation depending on players involved.

In the final *Chapter 5* "About Exploitation, Remuneration and Copyright Policies in Web 2.0 environments" we go into more detail on the new media business, trying to come up with policy relevant insights. In the first section we reflect on networked electronic media in the context of "open innovation" and ask if Web 2.0 business models based on user involvement imply hidden exploitation of "prosumers", and what impact they may have on the labour market in the media sector, especially for small content creators, and small and medium sized production firms. We also discuss the privacy risks involved for users. Last not least we start a debate about the consequences for media industries of semantic web technologies and web mining technologies enabling automated or semi-automatic media production.

In the next section we reconsider the quest for micro-payment systems and the need for a micropayment infrastructure in Web 2.0 environments in some detail. This issue is important, because although "free content" and advertising based business models are dominant, new payment schemes may be required if current schemes fall short of supporting a wide enough variety of content, to support payments to small content creators and person to person payments.

In the third and final section of this chapter and this report the issue of Digital Rights Management technologies is raised in the context of copyright policies in Web 2.0 environments. The chapter starts with an explanation of forensic DRM technologies, which are gaining importance on Web 2.0 as they enable to identify, track and trace content (and maybe persons associated). They are used as supportive technical mechanisms within business models which sell "DRM-free" content (but seek to curb infringement of copyright); and as a means intended to avoid uploading of unauthorized copies to User Generated Content Platforms. The issue of forensic DRM leads to a broader review of the liability of service providers (including mere access providers) and increased expectations that these intermediaries will apply forensic DRM technologies for "filtering".

We also address limitations of the forensic DRM approach in this regard. As Web 2.0 facilities are enabling and encouraging everyone connected to the Internet to engage in content production and dissemination and to re-combine and re-configure existing media content, some current copyright provisions are under pressure. As copyright policies should stimulate creativity and innovation instead of stifling it, we take a look at proposals to widen the spectrum of legitimate "transformative uses".

There are three Annexes to this report: ANNEX 1 with a list of the experts who supported us, ANNEX providing a Timeline of policy relevant events taking place in 2008, and ANNEX 3 highlighting some of the actors whose publications are framing the European debate on the future of ICT and media industries**.**

1.4 Some Further Remarks

1.4.1 A short remark on the context of this study

Although the report is not targeted to support a specific policy action, it might be read having in mind the European Commission's activities related to "Creative Content Online" and "User Created Content". In **ANNEX 2** we provide a Timeline of policy relevant events taking place in 2008. Here we pick out just three activities.

- "Web 2.0" and "user created content" are issues studied by the European Commission especially within the i2010 initiative. The Council of the European Union when commenting the "i2010 - Annual Information Society Report 2007" (Council 2007a) invited the Commission to develop policies regarding future trends including web 2.0 and web-based services, and it also highlights "the explosion of user generated content" related to web 2.0 as a development to be taken into account (Council 2007a, p. 5).

  In the same vein, the i2010 High Level Group suggested in its issue paper on content and convergence "… to assess the future economic and cultural implications of user-created content and the rise of 'semi-professional content…" (i2010 High Level Group 2007).

- A *Recommendation on Creative Content Online by the Council and the European Parliament* is expected – by mid 2008 (cf. EC 2008a). The recommendation was announced on the third of January 2008, the day the Communication on Creative Content Online (EC 2008b) was published. A public consultation on "Creative Content Online in the Single Market – 2008" started the same day and ended February this year (see EC 2008d for the contributions received).

- More recently (17.04.2008) the *i2010 Mid-Term Review* (EC 2008h) and accompanying documents by Commission staff (EC 2008i-j) stress the need to develop a long-term policy agenda for users in the digital environment. User created content is one topic on the agenda. A study commissioned by the European Commission on "user-created content: supporting a participative information society" is currently underway, aimed to support policy making in this respect.

1.4.2 Thanks to the contributing experts

We would like to thank the experts who commented on an earlier version of this report or contributed as invited speakers to the STOA Workshop at the European Parliament. A list of these experts can be found in **ANNEX 1**. Some of the comments we received in written form are quoted in this report directly, the impact of other comments is less visible but nevertheless encouraged us to improve our arguments or even to rewrite sections of the report.

1.4.3 Short remarks on sources, statistics and currency

The report draws on many sources from scientific literature, newspapers, online sources like blogs, wikipedia, newsletters, subscriptions to company information, press releases, Internet statistics, market research, white papers, existing foresight reports, roadmaps etc. There are, however, a few sources serving as most important reference points framing the European debate, which we document in **ANNEX 3.**

Most if not all statistics and data we provide have to be regarded as rough indicators of the order of magnitude of a given item. This is inevitable in a literature review which can not check the original data and the reliability of methods applied in the surveys quoted. Where useful and possible we have transformed foreign currency values to Euro on the basis of the reference exchange rates for each year provided by the European Central Bank (ECB 2008).

2 Technology Developments and Technology Visions

There are clear indicators that the Internet as Internet of media (including mobile and convergent platforms) is expanding its audience, generating traffic growth of 50 to 60% a year, and is becoming more attractive with growing bandwidth available to consumers. Developments in hardware influence the creative content industries by improving the connectivity and performance of distribution channels. In parallel Web 2.0 technologies developed, which embrace advances in client-server communication, programming (web services, AJAX, API etc.) as well as easy to use and inexpensive tools for content creation and social software. Web 2.0 technologies have stimulated the spread of new media formats. Blueprints of future European research in the field of networked electronic media are available e.g. from the European Technology Platform NEM (Networked and Electronic Media. Semantic technologies, accompanied by visions of the semantic Web, are highly relevant for the future development of media industries and assessed in greater detail. Beyond this development towards greater automation of media production, greater "immersion" of users into virtual environments is expected in the future. On the horizon some researchers already see developments like computer enhanced dreaming and holographic television.

2.1 Technology Developments

2.1.1 Internet access

The open architecture of the Internet, based on standardised technologies has facilitated large scale interoperability and early globalisation of services and applications. In April 2008 Internet World Stats (2008) reported more than 1.3 billion Internet-users worldwide, equivalent to 20% of the world's population. The user figure for Europe came close to 350 million (348,125,847) which corresponds to a penetration rate of 43.3% and a share of 26.4% of Internet users worldwide. At 231.2%, the use growth rate between 2000 and 2007 for Europe was somewhat lower than the worldwide rate of 265.6%. With respect to EU 27 the same source reported 273,234,619 Internet-users as of November 2007, indicating a penetration rate of 55.7%. At the end of 2007, North America was the leading world region with a penetration rate of 71.1%. In Asia the penetration rate was just 13.7% as of December 2007, but countries like South Korea (71.2%), Japan (68.7%), Taiwan (67.4%), and Malaysia (60.0%) have a higher share of population on-line than the EU27. Another way to look at the development of the Internet is to focus on traffic (see Table 1).

Table 1: Internet traffic growth

Current (year-end 2007) annual Internet traffic growth rates worldwide	**50-60%**
Year-end 2007 monthly Internet traffic estimate worldwide	**3000-5000 PB (PetaByte = 10^{15} bytes)**
Year-end 2007 estimates for monthly Internet traffic (GB per capita) for selected regions and countries	
Australia	**1.0**
Western Europe	**2.3**
Japan	**2.6**
U.S.	**3.0**
Hong Kong	**17.0**
South Korea	**17.0**

Legend: Estimates for Australia and Hong Kong are based on official government statistics, while that of Japan is derived from cooperative ISP data collection in that country. In all cases, extrapolations were made to provide estimates for year-end 2007. Figures for other countries are based on snippets of information of varying degrees of reliability, as well as confidential reports by some service providers. *Source:* MINTS 2007.

The Minnesota Internet Traffic Studies (MINTS 2007) calculate an annual Internet traffic growth rate of 50-60%. Measured in GigaBytes per capita and month an average traffic volume of c. 2.5 GigaBytes is assumed, but places like South Korea or Hong Kong produce much more traffic per capita.

High traffic rates are supposedly due to broadband access and P2P networks and rich audio-visual and multimedia content on offer. The role of P2P-traffic is confirmed by data from ipoque (2007). They hold that P2P-Filesharing overall generates most of the traffic on Internet. In Eastern Europe even 80% of traffic was due to P2P filesharing (measured in August/September 2007). The P2P traffic share is however not growing more rapidly than overall Internet traffic. Following ipoque this is due in part to new download alternatives, for instance Direct Download Links (DDL) offered by One-Click-Hosters such as RapidShare.com or MegaUpload.com.

These developments show that while the architecture of TCP/IP has been relatively stable, the Content Delivery Layer is evolving steadily. Advances at this level have made possible P2P filesharing services as well as Web 2.0 services like YouTube or Facebook (see Figure 3).

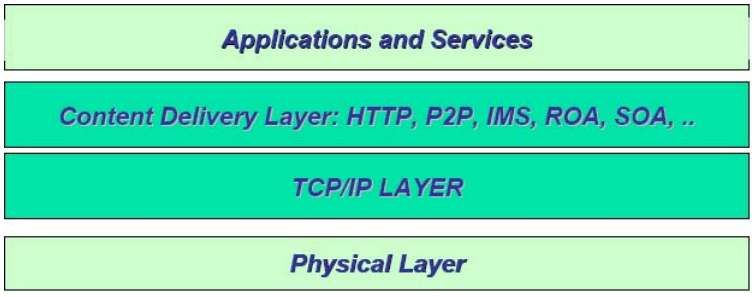


Figure 3: Protocols at the Content Delivery Layer
Source: Quemada 2008

2.1.2 Broadband

EUROSTAT (2007) published figures on EU27 broadband connections: Whereas 54% of households had access to the Internet during the first quarter of 2007, 42% had a broadband connection. Table 2 shows the general growth, but also the enormous differences between countries. While with respect to Internet access a factor 4 applies between least developed and most advanced countries, the factor for broadband access is about 10.

Table 2: Internet in percent of households in EU27

	Internet access		**Broadband access**	
	2006	2007	2006	2007
EU27	49	54	30	42
Top 3 Countries				
Iceland	83	84	72	76
Netherlands	80	83	66	74
Denmark	79	78	63	70
Last 3 Countries				
Bulgaria	17	19	10	15
Romania	14	22	5	8
Greece	23	25	4	7

Source: EUROSTAT 2007, p.7

The European Commission recently published, in its Progress report on the single European electronic communications Market 2007 (EC 2008g, p.7f), numbers on fixed broadband access lines. EU average penetration rose from 16.3% in January 2007 to 20.0% in January 2008. The differences between countries have however increased. On the other hand, there are now eight EU countries with stronger broadband penetration rates than the US, and in July 2007 Denmark and the Netherlands had the highest penetration rates in the world (ibid, p. 8).

DSL is still by far the predominant broadband access technology in the EU, accounting for around 80% of all lines. Alternative technologies, mainly cable but also fibre to the home (FTTH), wireless access and mobile, are beginning to provide the potential for significant platform competition (IDATE 2007). Average DSL coverage reached 89.3% at the end of 2006. At national levels, DSL coverage is now over 80% in 22 countries. However, those national figures reveal big discrepancies between urban/suburban and rural areas. On average, DSL coverage in rural areas was only 71.7% at the end of 2006, which is 18 points below total coverage and 23 points lower than in urban areas.

On download speed IDATE observed that close to 80% of DSL users subscribe to offers with rates up to 2 Mbps. Connections with speeds over 2 Mbps account for 40% or more in 6 countries (Belgium, France, Iceland, Malta, Netherlands and Portugal). On average, disparities between the connection rates subscribed nationally and in rural areas are shrinking. As many audio-visual applications on the Internet require more than 2 Mbps to be consumed conveniently it would be worth to closely monitor the deployment and use of connections with higher rates.

Another interesting finding presented in the report already quoted (EC 2008g, p. 7) is that along with platform convergence there is a continued trend towards bundled services, where operators offer a mix of fixed voice, broadband, TV and mobile at a flat rate (triple play): 29% of households have subscribed to at least one bundled service, up from 18% the previous year.

In the mobile segment, 3G coverage reached 71.3% at the end of 2006, with 3 countries (Luxembourg, Sweden, Austria) at or close to 100%. The number of subscribers was 46.6 millions, or just over 10% of the total cellular subscriber base, with 2 countries (Italy and UK) accounting for more than half. However, some smaller countries were able to record high penetration rates: Luxembourg is over 30% and Portugal and Ireland over 20%.

2.1.3 Hardware

Developments in hardware influence the creative content industries by improving the connectivity and performance of distribution channels by which creative content reaches users. Telecommunication capacity and processing power together lead to increased quality of interactive media. They also provide the basis necessary for digitising and manipulating audio-visual information content. Display technology further increases the quality of content reproduction, while increased storage capacity makes portable devices more attractive and P2P networks (using the distributed storage of connected devices) more powerful. Sensors and RFID-chips enable location based services and new input and output devices. Table 3 provides further indications of the impact of hardware developments on the media sector.

Table 3: Hardware developments and their impact

Technology	Description	Example of impact on Media Sector
Telecommunication capacity	Faster and more reliable transmission of data via ICT networks;	Increased attractiveness of digital distribution models, and online creative content goods (e.g. MMORPGS)
Integrated circuit and processing power	Increased performance of ICT devices.	New, more powerful devices for content production tools and reproduction devices (e.g. next generation video game consoles).
Telecommunication + processing power	Increases in the quality of interactive experiences.	Real-time interaction: More immersive video games and virtual worlds, creation of feedback loops between content creators and audiences in real-time
Display	Cheaper, higher quality display screens.	Lower cost of devices, increased quality of content reproduction (e.g. mobile phone screens, touchpads, e-ink)
Storage	Increased storage capacity in devices and networks.	Increased attractiveness of portable devices, and the power of peer to peer networks (by making it possible to leverage a larger installed storage base).
Sensor	New input/output devices.	Increased interactivity potential and innovative user interface paradigms
RFID	Radio frequency identification of devices and goods.	Improvements in the efficiency of e-Commerce logistic systems, further possibilities for localised content delivery (e.g. localised mobile gaming).

Source: Mateos-Garcia et al. 2007b, p. 20 (own selection and adaptation)

2.1.4 Software and applications

In general, the role of technology in the creative content sector is facilitative, providing new opportunities for content creation, distribution and use. Furthermore these ICT-developments are often complementary and mutually reinforcing, and act as a catalyst bringing about structural changes. Eventually the creative combination of these technologies leads to the emergence of new networked media.

For the creative content industries, software is a means of supporting the creation, distribution, and access to content. Remarkable organisational innovations and the success of the open source innovation model are the background for the development of software today. Rapid prototyping, continuous iterations, involvement of the user are elements of so called agile or extreme programming Open source development has led to modular object libraries with self-contained, highly re-usable modules of code that can be readily integrated to form larger systems. Object libraries allow users for instance to construct their own desktop by selecting elements for this purpose from larger libraries, e.g. plug-ins, add-ons, desktop gadgets, filters. Table 4 points to major building blocks of Web 2.0 with respect to software.

Table 4: Software developments and their impact on the media sector

Technology	Description	Example of impact on Media Sector
Open Source	Accumulation of software tools and applications available under open source licenses. Ruby on Rails is an open source web application framework that is frequently used in Web 2.0 website development.	Lower barriers to innovation through the recombination of open source software (e.g. JOOST), availability of cheap and high quality systems for content creation (e.g. video game engines).
Agile/Extreme Programming	Organisational innovation to increase the efficiency of software development.	Creation of higher quality content (e.g. video games), development of better software infrastructures for the creation and delivery of content.
Object Orientation	Creation of object libraries that can be rearranged to create new applications and systems.	High customisability of software products and integration of collection of contents (e.g. modular Content Management Systems, content libraries in Second Life).
Embedded Software	Widespread diffusion of intelligent artefacts.	Further integration between different components of the value chain (e.g. access to information about 'intelligent' content products via mobile phones).
Databases	More advanced data classification and retrieval structures.	More sophisticated search engine technologies.

Source: Mateos-Garcia et al. 2007b, p. 24 (own selection and adaptation)

Advances in databases and knowledge management systems are essential for multi-channel media distribution, maintenance of content and rights, and for retrieval and search. First generation World Wide Web pages were static, revealing the entire content at a glance.

Today more and more web sites and web-offerings rely on databases rendering the content in a conditional way (dependent on the providers and the users). Advances in database technology combined with convenient client-server interaction (machine to machine) are also important. AJAX (Asynchronous Javascript and XML), a combination of technologies that enable highly interactive web applications which make the use of the WWW comes closer to continuous sessions and desktop applications. It helps to increase usability. "Social software" builds on this and is the basis for networked electronic media allowing users to communicate and to interact - contributing content, sharing it, modifying it etc. (e.g. Wikis, Blogs, SNS). Finally we should highlight those facilities based on data exchange between applications, which enable content offerings of a cross-media nature by embedding, syndicating or mashing-up. These applications allow the combination and mixture of content in new ways and contribute to the look and feel of Web 2.0. Table 5 (next page) explains some of the related concepts.

Table 5: Some basic technology concepts enabling Web 2.0

API: Application Programming Interface. A defined interface to a computer application or database that allows access by other applications
Embedding Integrating content or an application into a web page, while the original format is maintained
Mashups: Combination of different types of content or data, usually from different sources, to create something new. It's a lightweight integration of multi-sourced applications or content into a single offering requiring minimal programming.
RSS: Really Simple Syndication. A group of formats to publish (syndicate) content on the internet so that users or applications automatically receive any updates.
Web Service: A Web Service is a software system designed to support clients and servers to communicate using XML messages that follow the SOAP standard.
Widget Small, portable web application that can be embedded into any web page.
XML (eXtensible Markup Language) An open standard for describing data, which enables easy exchange of information between applications and organizations.

Legend: Definitions based on Future Exploration Network 2007

We can sum up that underlying the new media environment and the wealth of networked electronic media are technical innovations. The fundamental framing is provided by the open architecture of the Internet and Internet standards enabling large scale interoperability and early globalisation of services and applications. Furthermore, and more specifically:

- The Content Delivery Layer has evolved steadily, while the architecture of TCP/IP has remained relatively stable, Advances at this level have made possible P2P filesharing services as well as Web 2.0 services like YouTube or Facebook.
- Web 2.0 is enabled by many technical advances in client-server communication and programming tools (web services, AJAX, API etc.).
- There are free and low cost tools available to create content and to build new media services. The entry barriers for content creators and media creators are therefore low. Open source is important here.
- The considerable spread of media formats and the steady growth of these new forms of communication are stimulated by increasing numbers of broadband connections, decreasing costs for connectivity and storage space.

2.1.5 Next steps in innovation and research of Networked Electronic Media

A look at the vision of NEM, one of these European Technology Platforms (NEM = Networked and Electronic Media) will give us an idea where future European research on networked electronic media is heading. It is a policy-oriented vision for networked media aiming to mobilise research and innovation effort and to facilitate the emergence of "lead markets" in Europe. Members of the initiative include content producers, broadcasters, equipment and device manufacturers, telecom operators, service providers, standardisation bodies, industry associations, universities and technological centres, with a strong focus on SMEs.

In 2006/2007, the platform published its vision for 2015, which includes a number of social aspects (NEM 2007b, p. 19f):

1. **Job creation**: up to 3 million new jobs in the sector;
2. **Cohesion:** availability of NEM services and applications to the great majority of European citizens and businesses, independent of geographical location. The ageing and less agile should benefit from home applications to provide a secure and caring environment.
3. **Equal opportunity:** instant, seamless, device and network-independent availability of multimedia content in any location in a non-discriminatory manner with special attention to different languages.
4. **More User-Generated Content** through sophisticated, simple-to-use content creation products, content capturing and storage devices, database tools for organisation of and access to personal content, lightweight DRM tools.
5. **Persistence of crime and terrorism**: reinforced need for powerful interoperable DRM systems.
6. Broadcasters with a public service mission to "entertain, inform and educate" will be challenged by demand for personalisation and "on-demand" entertainment.
7. **Special attention to small and medium size enterprises**: "think small first".

As means to achieve these social goals, the NEM platform identifies four "technology pillars" for the future (NEM 2007b, p. 13ff):

1. **Broadband**, the critical enabling technology as a catalyst for multimedia content delivery.
2. **Convergence** with the elements heterogeneity and interoperability: low-cost and mass-market devices or upward compatible and re-configurable equipment. Users will create both personal content and services: need for easy-to-use interactive networked multimedia creation tools.
3. **The "extended home"** equipped to enable the creation and delivery of multimedia services for entertainment, education, communications, security, healthcare, remote control etc. Home appliances will be connected to at least one very high capacity local network and increasingly to a global broadband network. The focus will change from selling products to selling experiences.
4. **Social computing** will become part of the mainstream through the mass adoption of digital technology. Context is the essential element in the new networked electronic media world.

The research topics regarded as strategically most important by the NEM are subdivided into four groups:

1. **Content creation** including the representation of content, tools for content creation and manipulation, and automated semantic annotation;
2. **Networking and delivery infrastructure:** intelligent delivery, quality of service and networking types;
3. **Media presentation and content access**: authentic, true-to-original media reproduction, virtual reality, dynamic federation of distributed interface devices and user-system integration;
4. **Enabling technologies:** security and privacy, rights management and federated services, middleware and human language technologies.

2.2 Semantic Technologies and the Semantic Web

First we introduce semantic web technologies, sketch the state of the art and present perspectives of research. Then we shed some light on the semantic web as a vision, which comes in one fashion as "better search engine" and in another fashion as "intelligent software agent" performing everyday tasks of knowledge workers. Semantic technologies prove to be of great importance for networked electronic media already today, and have the potential to further push secondary media (media exploiting existing content). A full blown semantic web is likely to pose challenges to copyright and rights management as well as to privacy. Eventually we find that the vision of the semantic web is not self-sustained, but affords bridges to the "syntactic Web" (Web 1.0), involvement of users (Web 2.0), and the integration of web-mining technologies in a broad sense.

2.2.1 Introduction to semantic web technologies

Blueprints of *semantic technologies* go back to the origins of AI and hypertext research (van Ossenbruggen et al. 2002). Initial thoughts on the *semantic web* go back about 10 years. However, the core technologies reached stability only four years ago in 2004. Researchers in the field also tell us that the enabling technologies have now come of age and important standards and specifications are available. "The last 1-2 years have seen a huge improvement not only in the variety of those tools but also in their quality" (W. Hall; expert communication; also Feigenbaum et al. 2007). Wahlster, another prominent expert in the field, predicts that semantic web technologies "will be very visible within three years within the business sector" (Wahlster 2007a). These assertions by researchers do not contradict the assessment by the consultant company Gartner assuming in its 2007 "Hype Cycle for Emerging Technologies" that the semantic web will take more than 10 years to become mainstream (cf. Figure 4).

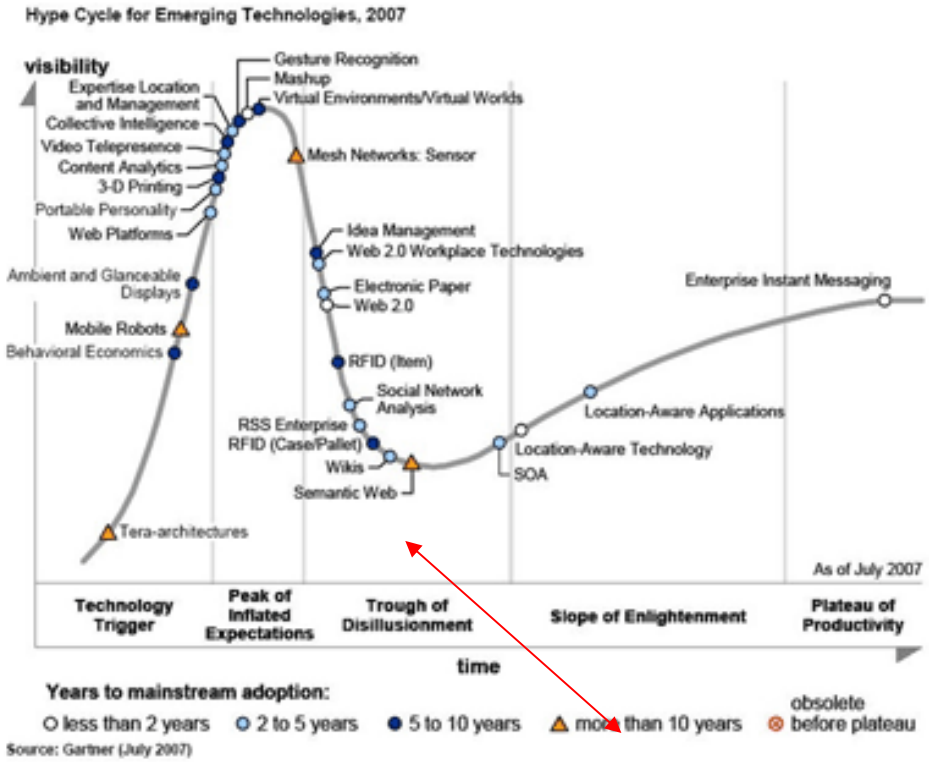


Figure 4: The semantic web in Gartner's Hype Cycle 2007; *Source:* Gartner quoted in Business Growth Network 2007

It is not surprising that semantic technologies like other knowledge management technologies are likely to be adopted earlier in controlled or closed environments like businesses, firms and communities than on the open World Wide Web. Shadbolt et al. (2006) believe that the work of communities, especially eScience communities, developing semantic technologies for their domains will act as drivers or incubators of a global semantic web. His comparison is the take-off of HTML which was first adopted in specific physics communities.

An easy way to understand the semantic web is to start looking at the development of information processing on the World Wide Web. The Web appeared first as a "docuverse" (Ted Nelson), where documents are connected via links produced by human beings. HTML, the hypertext markup language, was used to add metadata to the documents in a standardized way, mainly to inform different browsers how to render information in a unified way. HTML tagging contained mainly information regarding the presentation of documents. XML, the Extensible Markup Language (XML) was the next step. XML is a general-purpose specification for creating customized markup languages allowing user communities to define document elements and document structures for their purposes. XML thus facilitates the sharing of structured data across different information systems, particularly via the Internet, and it makes Web documents suitable for further processing in databases. In the end it supports communication and co-operation in given application fields, e.g. e-business or e-commerce.

What the W3C, promoting both XML and Semantic Web Standards, says about the semantic web already started with XML:

> "The **Semantic Web** provides a common framework that allows **data** to be shared and reused across application, enterprise, and community boundaries. It is a collaborative effort led by W3C with participation from a large number of researchers and industrial partners" (W3C 2008a; emphasis in the original).

Despite the similarities, there is however an important difference between XML and semantic web standards. While XML is about the processing of document elements and document structures, semantic technologies are about machine-readable statements with respect to the meaning of content and data, and the relations between the items identified. Semantic descriptions of this type enable new perspectives for information processing including "semantic reasoning", which means that software programmes can discover relations among data sources and generate new knowledge by inference.

If more semantic information about the content, the context it belongs to, and relations among content items were available in a form computers can process, we could imagine better, more specific search results. If these semantics were in place in a *standardised* form search results could even be better, because a larger pool of resources could be covered. In parallel cross referencing and sharing of data between applications would become easier, and as data would no longer be locked-in in a single application at a single web site also reuse of data would become easier.

Today standards are already available to identify resources and to express semantics, most notably RDF and OWL. RDF (Resource Description Framework) is a metadata model allowing to make statements about resources in the form of subject-predicate-object expressions. OWL (Web Ontology Language) is a language also specified by W3C able to build, publish and share "ontologies". Ontologies can be understood as controlled vocabulary for specific domains. Different from thesauri, however, ontologies are able to express many more relations between items of content and indicate how relations shall be processed. W3C is a major standardization body for semantic web standards (see Table 6 next page).

Table 6: Some Semantic Web standards defined by W3C

Short form	Short explication
RDF	Resource Description Framework: a basic format for content description. A piece of data or content, a resource, is identified by a unique name called a Universal Resource Identifier (URI, e.g. a URL), and a statement about the resource in form of subject -predicate-object (RDF *triples)* expressing a relationship between the subject and the object. These triples can be interchanged and processed automatically.
Ontologies and Ontology Languages	Controlled vocabulary for a domain or an application area. The annotation of resources with controlled vocabulary requires ontology languages, e.g. OWL = Web Ontology Language
SPARQL	SPARQL (SPARQL Protocol and RDF Query Language) is an RDF query language, a query language that allows applications to search for specific information within RDF data.
GRDDL	GRDDL (Gleaning Resource Descriptions from Dialects of Languages) is a markup format enabling translations from HTML or XML to RDF.
RDFa	RDFa (Resource Description Framework attribute) provides a set of HTML attributes to augment HTML source code with machine-readable hints.From the HTML markup annotated with semantics, RDF triples may be extracted.

Sources: W3C (2008a) with many entry points, and Wikipedia (http://en.wikipedia.org/wiki/Semantic_Web) with links to these standards

Note that W3C standards are not the only specifications defining how to add semantics to content on the Web. For example "Microformats" and "Topic Maps" are alternative standards in use, although with a limited scope of applications in mind if compared to semantic web claims. "Topic Maps" are a standard for the representation and interchange of knowledge developed by ISO (ISO/IEC 13250:2003).

Microformats define semantic markup making use of XML and HTML tags to convey metadata about e.g. contact information, geographic coordinates or calendar events. hCard, the short form of HTML vCard, is maybe the best known microformat. The "philosophy" of its promoters (see: http://microformats.org/about/people/) is that machine-usable data and human-usable information should not unnecessarily be separated. In a way W3C seems to acknowledge to a certain extent the usefulness of this "evolutionary" approach. The more recent efforts to standardize RDFa and GRDDL, which specify bridges between HTML and XML on the one side and RDF at the other side, might be interpreted as rapprochement.

2.2.2 Research perspectives

Semantic web technologies get a lot of attention. Searching for "semantic web" on Google and Yahoo! (17.7.2008) retrieved 8.170.000 hits at Google and 30.700.000 at Yahoo!, a company with a more visible engagement in semantic web technologies. The fact that the Scientific American published three articles by semantic web protagonists within 7 years is an indicator of attention to the subject by a larger public (cf. Berners-Lee et al. 2001; Shadbold et al. 2006, Feigenbaum et al. 2007).

It is also telling that semantic web technologies receive a lot of funding by national governments. For example the Quaero consortium in France receives support by the French Government of 99 million Euro (Quaero 2008; RAPID 2008), and the German Theseus consortium 90 million Euro (Theseus 2007). The importance of research into "semantic technologies" is also visible in the 6th and 7th Framework Programmes (cf. CORDIS 2006 and CORDIS 2007).

Another indicator is that more and more IT companies get active in the field. An expert said that the semantic web "is not in broad use, but under broad development at major relevant companies" (Steffen Staab). Feigenbaum et al. (2007) mention among others IBM, HP, Nokia, Oracle, Adobe as vendors supporting semantic web technologies. In fact we witness more and more prototypes, pilots, beta versions of semantic web applications (see e.g. the show cases in W3C 2008b).

While metadata for textual information can already be generated semi-automatically in some cases when technologies of information extraction and machine learning are combined, adding semantics to multimedia and audiovisual content is more difficult. The generation of textual metadata and content-based visual or audio descriptors – and the combination of both - is an area of extensive research (Stamou and Kollias 2005). The importance of research into "semantic technologies" is visible in the 6th and 7th Framework Programmes (cf. CORDIS 2006 and CORDIS 2007). In the opinion of one of the experts it is very important for Europe to continue research in this area, where it has the potential to remain world leader: "Europe must maintain its lead on development now" (expert communication).

Following the strategy paper of the Technology Platform NEM (Networked Electronic Media), important areas for research in the field are:

- Collaborative definition of ontology for audiovisual content to add more semantics and enrich the description of audiovisual content;
- Automatic generation of metadata; this is much easier to do when the content is being created, but automatic or machine-assisted generation of metadata from existing content would enormously enhance the value of archives;
- Harmonisation and integration of different metadata models, to facilitate translation and interoperability between different metadata standards;
- Collaborative generation of metadata, where users are invited to contribute semantic metadata by ‘tagging’ content;
- Semantic search of audiovisual content;
- Realisation of useful context-aware services" (NEM 2007a p. 24f).

Furthermore, research topics of Quaero and Theseus tell us where research is heading. We see attempts to develop better search engines, especially for multimedia content, in-house content and asset management systems, and to a minor extent applications which target consumers directly (see Textbox 1 next page).

Textbox 1: Research in Quaero and Theseus

Quaero: The Quaero consortium was created to meet new multimedia content analysis requirements for consumers and professionals. The consortium is composed of 24 partners (most of them French, a few from Germany). It is coordinated by Thomson. The budget for the five year research programme (2008—2012) is c. 200 million Euro, of which 99 million stems from funding by the French state.

Within the program there are five major application projects

- Multimedia search on the internet aiming to build a Multimedia search engine
- Enrichment of access services to audiovisual content on portals aiming at a new
  generation of access services to audiovisual content
- Personalised video selection and broadcasting aiming to deliver software for telecom
  operators, retailers and enterprise video
- Professional audiovisual asset management aiming to develop software for
  broadcasters, media companies, audiovisual archives
- Digitisation and content enrichment for libraries, audiovisual heritage and scientific
  publishing aiming to provide software and services for editors, patent offices and
  libraries

Theseus: THESEUS is a research program initiated by the Federal Ministry of Economy and Technology (BMWi), with the goal of developing a new Internet-based infrastructure in order to better use and utilize the knowledge available on the Internet. The focus of the research program is on semantic technologies. At present 30 research institutions, universities, and companies have joined the THESEUS program. Funding by the ministry is c. 90 million Euro. Partners are expected to contribute at least the same amount to the budget.

Consortium members will develop prototypes and test them in 6 application scenarios.

- ALEXANDRIA – A consumer orientated knowledge database aims to support users in publishing, processing or searching for content by linking semantic technology with social search functions.
- CONTENTUS – Safeguarding cultural heritage will enable cultural institutions to integrate their cultural assets and works of art in an innovative and structured framework and make them freely accessible to a wide audience online.
- MEDICO – Towards Scalable Semantic Image Search in Medicine aims to build an intelligent scalable robust search engine for the medical domain, with applications in Clinical Decision Support and Computer Aided Diagnosis.

- ORDO – organising digital information aims to create new services and software tools that will enable users to organise their entire store of digital information., making efficient, individual knowledge management possible.
- PROCESSUS – Optimisation of business processes aims to create an IT-based corporate control system allowing companies to compare products, solutions and details of business associates, as well as locating the complex and sometimes obscure specialist information needed by employees whose work involves high-density knowledge bases.
- TEXO – Business Webs in the Internet of Services aims to provide businesses with an infrastructure for new web-based applications and services, on the basis of service oriented architecture (SOA); this infrastructure will be independent of any individual company and provide a flexible, semantic-driven interface between service providers and their customers.

Sources: Quaero homepage: http://www.quaero.org/; Quaero (2008): Press conference 17 March 2008; Theseus homepage: http://theseus-programm.de/front/default.aspx

RAPID Press Release 11.03.2008

2.2.3 Vision No 1: The semantic search engine

So far we have looked at "semantic technologies" as an extension of technologies already in place. Now we look at the visions associated with the "semantic web", which present the "semantic web" as something totally new and disruptive (Berners-Lee et al. 2001, Richards 2008). Scanning the implicit and explicit visions present in the literature we end up distinguishing two related perspectives.

One perspective is to obtain better search results on the Internet by semantic search. The next vision revolves around "intelligent software agents" doing every day tasks for human beings.

Without doubt, current search engines often generate too many research results, and not all of them match well with the question. Search engines create the content they provide dynamically in response to the search specifications of users. Automated crawlers explore the World Wide Web and extract information from the pages that this automated device recovers and feed them into databases.

Incoming search requests trigger the search engine to analyse the content of the database and to generate a list of sites that might be responsive to the user's request. This type of search engine is limited in so far as the crawler can only search the "surface-web" and not the "deep web" (all the content hidden in databases connected to the web) and because the information processing does not include semantics. If search mechanisms were able to select and rank results based on properties of content and context, this could bring about better results. There is room for improvement and with the growth of information on the Internet these improvements may be urgently needed (statement by Luiz Rodriguez-Roselló at the STOA Workshop 26.6.2008). The demand for better search engines is often combined with motivations to overcome the dominance of Google in the search engine market.

A need for better search tools is not only visible with respect to the WWW at large, but also with respect to particular sites or information collections on the Web like e.g. Wikipedia or Social Networking Sites. Another relevant application area is the search of database clusters belonging to a specific domain. One of the experts described an example of semantic search targeted at a specific domain within the field of biology. For these biologists about thirteen complementary databases are relevant, which can be accessed via Web interfaces one by one. Now a system is developed to place a Semantic Web layer above the databases allowing to harvest linked data from Web interfaces. Core to this semantic layer is the linking of data, the self-description of data as well as their dynamic updating. This example shows the potential of semantic technologies for knowledge work in so far as different sources are made interoperable at the semantic level and can be handled as one. The key issue of the semantic web is thus the expert put it "harvesting and re-purposing of structured and unstructured data" (Steffen Staab, expert communication).

Semantic web technologies have already proved to be useful as a navigation and search interface to databases at particular web sites. To give but a few easily available examples of semantic search: DBpedia is meant for semantic search at Wikipedia, the "Search Extender" is an add on to "Google Desktop" automatically clustering search results on-the-fly, enabling users to filter their results based on information contained within - e.g. by the people, companies, places which occur in the results) (cf. Inxight 2008). Who is looking for a semantic technology based Social networking Site may look for FOAF – Friend of a Friend.

In a more general approach Yahoo! is currently extending its Web Search engine to exploit semantic descriptions. As announced in June 2008 by the director of research, Prof. Ricardo Baeza-Yates, the rank of documents will still be determined by page rank and its likes, but how a Web page provider advertises his page on the result list can be determined by the Web page provider using semantic annotation. (Steffen Staab, expert communication). That sounds nice, but is still far away from a global semantic search engine able to compete with Google.

Meanwhile search engine specialists and semantic web advocates will agree that a global semantic search engine is far from reality, because billions of existing documents have no semantic annotations, and still the overwhelming majority of new documents are not annotated neither. The development of ontologies is normally an enormously laborious intellectual task requiring maintenance of the controlled terms, and the many different metadata standards (or metadata models), such as Dublin Core, MPEG-7, LOM (Learning Object Metadata), OWL (Ontology Web Language) etc. are another impediment to worldwide reach. As these standards are specialised in different knowledge areas, it is difficult to match meanings of metadata expressed in different standards in a general search process (cf. NEM 2007a, p. 24).

Maurer (2007) concludes from a similar diagnosis that "even after almost eight years - this is how long the concept of semantic web has already been around - , there is no sign of mass implementation. Billions of web pages and documents still contain no or very few annotations and pieces of meta information. Thus, a mechanism is required to effectively finding the context of information and bridge the gap between conventional and semantic web" (ibid, p. 126). What these authors propose is "an information supply model for knowledge workers based on similarity detection. The proposed information supply method is utilized at the level where information seekers have an initial draft of their work available in written form" (ibid.).

Wahlster, a semantic web expert already quoted, admits: that "as long as so few Internet pages are annotated with ontology description languages such as Web Ontology Language (OWL), the semantic Web will be little more than an experiment in this context. However, it is unlikely that everyone with content on the Web will add semantic descriptions to that data" (Wahlster 2007a). And he continues explaining a modified vision called "Web 3.0" which combines semantic annotation techniques and user participation:

> That's why we need a next-generation Internet that combines the user participation typical of Web 2.0 with the semantic Web. […]If we are going to describe websites semantically we need users on board. What's more, we need their support on a scale like that of the ubiquitous blogs and social networking sites that populate the Web. End-users are the key to completing this enormous task, which would be way beyond the capabilities of any single company or state body.
>
> Research work is focused on making the tools we need to achieve this as simple as possible. When assigning keywords on photo or video portals, a range of alternatives can be offered straight away for ambiguous terms. Just one more click to select the required meaning and the user jumps into an ontology where this meaning is linked to other terms. Getting users involved makes semantic annotation cost effective, thereby helping us cope with this huge challenge.
>
> However, the changeover from a syntax-based Web to a semantic Web will not happen overnight – it will be a gradual evolution. The HTML documents that exist today will be enhanced with semantic data as part of a step-by-step process (Wahlster 2007a).

Indeed, the growing together of Web 2.0 and semantic technologies is now widely acknowledged as a necessity for the semantic web to prosper beyond niches. The *Journal of Web Semantics* published a special issue on "Semantic Web and Web 2.0" this year confirming the new guiding "Web 3.0"-vision. In the Editorial it reads: "In the past year, it has become clear that these two techniques are natural complements of each other. Further, the combination of semantic Web technologies with Web 2.0 application design patterns should give rise to a new and exiting off-spring: the social semantic web, also referred to as Web 3.0" (Greaves and Mika 2008).

We would like to add that there are other options too to enhance search on the Internet: Google's method of determining the page rank of a webpage is ultimately based on user behaviour. The extent of attention that a particular page receives in terms of links implemented ideally by humans is used as the basis for ranking. A research group of Yahoo is working on another option. They develop computerized mechanisms which lead to behavioural-statistical tags. The research group has written about the approach in an article titled "Watch what I watch. Using Community Activity to Understand Content". They analyze the constant stream of data about how media is being consumed, shared and re-used and on this grounds they organize and index media.

The researchers describe their research as "a shift from semantics to pragmatics" (Shamma et al. 2007). In the opinion of Cory Doctorow: "This sort of *observational metadata* is far more reliable than the stuff that human beings create for the purposes of having their documents found. It cuts through the marketing bullshit, the self-delusion, and the vocabulary collisions" (2001; emphasis is ours).

The semantic web community is of course aware that computerized mechanisms to extract semantic information from text and multimedia documents are required to make further progress towards the semantic web. They may however have underestimated the potential of Web Mining technologies to improve search results and to build the Semantic Web. Stumme et al. (2006) plead for convergence of Semantic Web and Web Mining:

> Semantic Web Mining aims at combining the two fast-developing research areas Semantic Web and Web Mining. […] Given the enormous size even of today's Web, it is impossible to manually enrich all of these resources. Therefore, automated schemes for learning the relevant information are increasingly being used. Web Mining aims at discovering insights about the meaning of Web resources and their usage. Given the primarily syntactical nature of the data being mined, the discovery of meaning is impossible based on these data only. Therefore, formalizations of the semantics of Web sites and navigation behaviour are becoming more and more common. Furthermore, mining the Semantic Web itself is another upcoming application (ibid).

Given that analyzing user behaviour, web mining, and mining of the semantic web are increasingly important, we would wonder if Google would be the odd one out.

2.2.4 Vision No 2: Personalized intelligent software agents

The most ambitious vision of the semantic web envisages personalized intelligent software agents, which do not only answer natural language questions, but also perform tasks for users. Feigenbaum et al. (2007) name it the "the grand vision of agents automating the mundane tasks of our daily lives". Humans are capable of using the Web for information work carrying out tasks such booking, buying, searching, looking up things etc. However, computers can not yet do so, because web pages and applications are designed to be used by people. And even if you can program a tool for a simple task, e.g. a programme that bids for you on Ebay, you dismiss the fact that in most cases tasks are a combination of many steps involving many tiny decisions.

The concept of the "*Internet of services*" is helpful here. It envisages the Internet as a huge network of applications able to perform tasks based on requests by users. Complex tasks can be designed as a sequence of actions performed by interoperable semantic web services. This vision builds on the idea of semantic interoperability across applications: data of one application can be reused in other applications, data derived from many applications can be recombined, synchronized, re-used, and repurposed without loosing meaning. What is added in this vision is that we leave the "docuverse" of static content and move on to "actionable information" – with the actions performed by web services with interfaces to other web services etc.

To give but one example (inspired by Wahlster 2007b p. 62).

> A user would ask in natural language "How do I get best from Tokyo Airport to the Hanami Hotel?" In a dialogue with the user (or her secretary) the intelligent software agent application would probably ask first for information on flight and arrival time. It would than calculate the time needed after arrival to get to a taxi, bus or train station with luggage etc. using the airport's information system. It would use a Tokyo map service to identify the distance from airport to hotel.

> It would then visit websites one by one provided by transport companies with schedules of buses, trains, taxis and information about the costs associated. Latest at this stage the question would have to be translated to Japanese, the time zone to be taken into account and the currency converted. Out of the data retrieved the intelligent agent would compose a list of options. The agent might also check costs and possibilities to book on the train in advance, and so forth.

Today, as Mateos-Garcia et al. put it: "… the vision of having an artificial agent that can reliably search for information is still largely a vision rather than a reality" (2007b, p. 26).

2.2.5 Semantic technologies and media industries

Semantic technologies have made progress in specific communities, as said before, among them segments of the media sector. In most cases the applications are still at an experimental stage. Automatic extraction of semantics, e.g. from audiovisual and other multimedia content, is an important research topic and improvements in this field would be very useful for media companies. Especially media (and multimedia) archives and repositories held in databases of media companies like broadcasting companies, music labels, film industries, user generated content platforms can gain from semantic technologies enabling better search facilities and better facilities to generate programmes out of these resources, and better asset management. These facilities can be thought of as in-house-services and as services provided to the public via web-interfaces. The full potential of these technologies can be leveraged when many resources are made interoperable at the semantic level.

At the level of schema with relevance for media industries there are already some which are amenable to or based on semantic technologies. For example the Digital Object Identifier (DOI) propagated by media industries can be expressed as resource in RFD; the Dublin Core, a metadata scheme used to describe content of Open Access Repositories is compatible with ontology languages, the Creative Commons schema lets you describe copyright licenses in RDF; ACAP, the Automated Content Access Protocol, a set of metatags ruling what search robots are allowed to do and what is forbidden with respect to content they encounter on the Internet, can also be expressed in RDF, and RSS 1.0 (Rich Site Summary), one of the standards for content syndication on the Internet, is based on an RDF Schema declaration.

In the long run the semantic web has the potential to bring about a rise of secondary media on the Internet. Secondary media are those which build on the fact that activities on the net can be monitored and measured and that content can be mined and analysed automatically. Search engines indexing the Internet are the most prominent type of secondary media. Exploiting the content produced by others, they provide dynamic services to access resources in a personalized way (each search result is a personalized edition of a secondary medium). Therefore, Google has once been described by the "The Economist" (2006) as a huge media company without proprietary content.

Semantic web technologies are able to reinforce the dominance of secondary media on the Internet considerably. In a certain way secondary media are at the core of the semantic web.

That is rather evident if we listen to semantic web experts: Steffen Staab said that "harvesting and re-purposing of structured and unstructured data is the key issue" (expert communication) and Berners-Lee is quoted "A semantic web - a web with linked data easily readable by machines - would make available more knowledge for reuse in serendipitous applications by people and organisations which are not the ones who originally created or published the information" (Berners-Lee quoted in Lombardi 2006).

Semantic technologies could reinforce the automatic production of secondary media. Exploiting the semantic relations of resources radio stations on the Internet or movie channels could harvest the Internet and elaborate programmes for their customers almost automatically without even employing personnel for this purpose. A step further, interference and reasoning machines would be able to autonomously generate new knowledge from existing one. Secondary media production would eventually be automated media production.

Of course the principle of harvesting content across resources and repurposing it implies crucial questions of copyright and digital rights management. In addition the knowledge, which semantic search engines would be able to collect about persons, their behaviour and their preferences appears as a nightmare for privacy - presumably the main issue to be watched and regulated by politics.

Scanning the state of semantic web technologies and considering the far reaching visions we have observed that the "semantic web" can not be conceptualized in isolation from other trends and is not a technology as disruptive as some protagonists claimed some years ago. The gradual enrichment of the WordWideWeb with semantics appears today as an evolutionary process in touch with other developments. We have seen that bridges between the "syntactic web" (HTML, XML etc.) and the semantic Web are required and that there is no clear delineation where information about structure ends, and semantics begin. We also learned that user involvement is crucial for the development of the semantic web, because without user involvement the billions of documents will never be semantically annotated, and because human intervention is needed as a corrective to automated processing of meaning. Last not least, further improvements of search engines will not only depend on semantic descriptions based on ontologies. But there are many more approaches how to improve Web searches based on web mining, "semantic web mining", "observational metadata", or "similarity detection". Improved search engines are likely to take the best of all approaches and combine them.

2.3 Scanning the Horizon

2.3.1 Virtual environment, virtual reality, and "immersive" media

There are many speculations, predictions and studies investigating possible futures that address ICTs and the media. These include two so-called horizon-scanning activities for the UK Foresight Directorate (DeltaScan by the Institute for the Future 2005f; SigmaScan by the Ipsos-MORI Consortium 2005f), a US expert survey on the future of the Internet (Elon University 2005) and a project by a UK charity centred on everyday life tomorrow (The "Tomorrow" Project 2001 et seq.).

It is almost certain that communication costs will fall and a broadband infrastructure will be in place by about 2015 to enable the "anytime", "anywhere" and "always on-line" visions. Mobile TV and location-based services including interactive guidebooks for tourists will thus be technologically feasible. By 2014, 60% of internet access is expected to be from mobile devices and there will be a portable translation device for simple conversation. Applications of RFID and GPS are expected to be widespread by 2010.

Technologies permitting greater "immersion" of users into virtual environments are expected to become available, partly through a continuing miniaturisation of devices and components such as memory (flash cards). Clothes incorporating ICT devices – "wearables" – are expected to be a key component in the realisation of "virtual reality". Virtual reality itself is not expected to be of as great interest to users as "augmented reality", meaning the mapping of digital data onto the physical world, such as in mobile services related to tourism or in enhancing spectator experience at the sports ground. Even so, virtual reality is expected to represent an everyday alternative to the real world.

The application areas for virtual reality include socialising, entertainment and business, including immersive virtual reality shopping booths. Such virtual worlds are expected to be "compelling" with the potential to foster productivity and creativity on the one hand, but also addictive with correspondingly negative impact on the other. In the future, it is expected that there will be synthetic TV celebrities and that television will be holographic. A foretaste of this kind of experience was the speech by a "holographic" Al Gore at the 2007 "Live Earth" event.

Displays are expected to be virtually ubiquitous within the next two decades, including "smart walls" and public display boards, e-paper and textiles, thin digital displays and light headmounted displays to view virtual and augmented reality. It is also expected that special attention will be given to the user interface needs of an ageing population.

The "Tomorrow Project" advises that caution is called for when predicting the future of the media: certain products and applications might well be used in other ways than we would currently think. While it has often been argued that intensive use of ICT isolates users, it can also be put forward that many go on-line to "meet" other people both in the multiplayer environments and on social networking sites. Media technologies need not threaten the integrity of families since video-messaging and conferencing provide the opportunity to actually strengthen ties. Niches are likely to be very popular, potentially accelerating fragmentation of society, but at the same time there will still be the large events and "blockbuster" programmes which are a talking point throughout the population. Since neighbourhoods and communities are embracing their own websites and TV broadcasts, multimedia can contribute to strengthening local communities rather than weakening them, as is frequently feared.

Virtual reality provides the opportunity to experiment with alternative values or with different roles, so that people could become more self-conscious about their choice of identity and values. Over all culture is expected to become more extroverted with always-on music, visual stimulation and haptic interfaces. Different needs in this respect would lead to the creation of "introverted" spaces for recreation.

2.3.2 Further far reaching visions

On the more general level, a project by Elon University and the "Pew Internet project" (Elon University/Pew Internet Project 2005) is trying to look forward at the internet in the next 150 years and picks out major trends expected for time horizons extending from 2010 to 2150. It describes 4 to 5 items for each time period and lists "other possibilities" from a list compiled by Ian Neild and Ian Pearson for a British Telecom Technology timeline.

By 2010 the NSF is expected to fund a project for the redesign of the Internet called the Global Environment for Networking Investigations (GENI). This will focus on security as its main concern, be able to cope with the increased volume of traffic and also be geared to handling content-delivery for more video and other large-scale projects. According to NSF, GENI will "enable the vision of pervasive computing and bridge the gap between the physical and virtual worlds by including mobile, wireless and sensor networks".

Among the items forecasted for 2015 are self-aware machine intelligence, computer-enhanced dreaming and robot dance tutors, the use of virtual reality scenes as décor in household rooms and electronic stimulation of brain sensation as a recreational substitute for drugs.

By 2020, robots will have become ubiquitous, taking over many physical jobs and have been granted their own set of rights.

There are actually predictions that computers will surpass the intelligence capacity of humans around 2010. In a vision currently being discussed Web 4.0 is equated with WebOS, the Web Operating System: "The WebOS implies that machine intelligence has reached a point that the Internet becomes the planetary computer, a massive web of highly intelligent interactions." (see e.g. Farber 2007). This vision is linked strongly with the one of Ray Kurzweil's termed "singularity" and meaning a period of extreme technological progress when man can no longer keep pace with developments. The "singularity" also plays a role in discussions on the convergence of Nanotechnology, Biotechnology, Information Technology and the Cognitive Sciences (NBIC).

This does not, however, imply that the secrets of human intelligence will necessarily have been unravelled by 2010, so that computers would be able to out-perform humans at virtually everything. Kurzweil feels that the Web 4.0 will be equivalent or superior to, the human brain by 2029:

> "By 2029, sufficient computation to simulate the entire human brain, which I estimate at about 1016 (10 million billion) calculations per second (cps), will cost about a dollar. By that time, intelligent machines will combine the subtle and supple skills that humans now excel in (essentially our powers of pattern recognition) with ways in which machines are already superior, such as remembering trillions of facts accurately, searching quickly through vast databases, and downloading skills and knowledge" (Kurzweil 2008).

The achievability of this vision and its implications depend on breakthroughs and other advances in brain research, which while facilitated by the availability of new technology to observe the workings of the human brain, are not a foregone conclusion.

3. European Media Industries in Context

There are clear indicators that the Internet as Internet of media is turning into the growth motor of the media and entertainment industries. Traditional media migrating to the Internet are able to compensate for lower growth rates or losses in the physical world, but digital born content like video games shows the highest growth rates. Forecasts see EU27 members from Southern and Eastern Europe as most dynamic. International comparison of media companies shows the importance of US-based global players (Google, MSN, Yahoo), but also the strength of national actors often belonging to incumbent media industries in Europe.

The audio-visual sector is being faced with upheavals due to digitisation. On-demand viewing is likely to be driven by TV-based platforms including IP TV rather than public Internet platforms. Radio broadcasting traditionally has a very strong regional element. Due to uncertainty on future standards, existing broadcasters are currently showing little interest in the transition to digital. The adoption of on-line radio is slow due to lack of adequate affordable broadband access in parts of Europe and the slow diffusion of suitable listening devices.

For a long time, the computer industry regarded gaming as a niche segment, but now realises that it has become a mainstream entertainment activity, competing with listening to music or watching television. Online games seem to be over all more attractive and compelling than educational software indicating that there are lessons to be learned from computer gaming for the development of educational software. To make optimum use of the potential benefits provided by educational programmes with educational elements, it would be useful to develop Europe-wide recommendations on uses and applications for various levels and types of school. On the downside, there is a need to take steps against addiction to computer gaming.

Content industries could benefit from a more dynamic development of the mobile Internet in Europe. Available facts and figures indicate that the importance of data services is growing in Europe. For content industries the pace of change however is too slow. It is argued that it would be beneficial for the content industries if European operators were to encourage more use of Internet standards, i.e. cheap E-mails with links, instead of expensive SMS. Lessons from world leader Japan suggest that increased competition and policy measures encouraging competition, e.g. alternative options for spectrum regulation under discussion, could push the mobile Internet in Europe.

3.1 European Media Industry Perspectives

According to PWC (2007) the strongest motor of growth for the media and entertainment industries is the globally accelerated migration to digital formats which makes digital content available via various platforms. In 2006, the value of entertainment and media content distributed over digital and mobile platforms grew by 39 percent. Digital content covers online digital streaming, digital movie/TV downloads, video-on-demand, music downloaded from the Internet, music downloaded to wireless phones, online advertising, online video games, wireless video games, electronic books, and online gaming.

Digital/mobile products are competing directly with their physical counterparts. In 2006, for the first time ever, digital/mobile spending streams contributed more to global entertainment and media spending growth than did directly competing spending streams. Digital/mobile spending increased by USD 16.4 billion in 2006 (ca. 13.1 EUR) compared with a USD 11.4-billion (ca. 9.1 EUR) gain for streams in direct competition. (cf. PWC 2007, p.17). The Internet is helping in a major sense to compensate for reduced growth rates or losses in the traditional distribution channels.

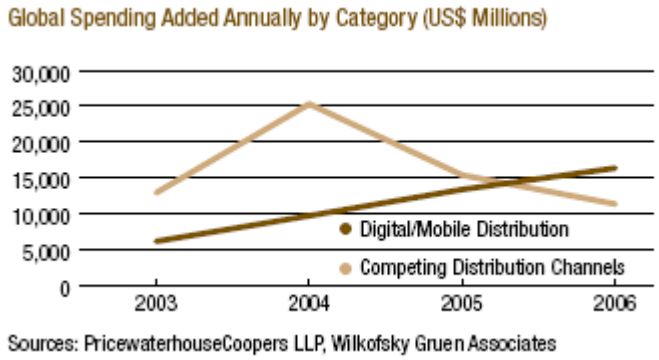


Figure 5: Contribution to industry growth (PWC 2007, p. 17)

Computers and wireless telephones now can function as sophisticated multimedia devices, and spending related to entertainment and media content distribution through those devices is growing at double-digit rates. In addition to new subscribers, mobile distribution will be enhanced by the introduction of new handsets specifically designed to play music, to provide video games, and to receive television broadcasts.

Table 7: PWC's Forecast of global consumer/end-user spending (rounded; in billion USD);

Media sector	**2007**	**2011**	**Average growth rate %**
Film entertainment	84	103	4.9
TV Networks	53	67	5.6
Recorded music	36	40	2.3
Radio	15	19	65
Video games	37	49	9.1
Internet access	170	258	12.2
TV distribution	141	216	10.9

Source: PWC 2007, p. 16

Global growth is increasingly being fuelled by the demand of developing countries in Asia and Latin-America. A look at 20 European countries reveals considerable differences in actual consumer spending and in forecasted growth rates between the countries, as Table 8 next page shows.

The United Kingdom will remain the largest market in the region followed by Germany and France. Countries of Southern Europe are expected to show high growth rates in the coming years. The same is true for the new member states of the EU covered. PWC forecasts roughly the double growth rates for these countries compared to for those, for example, of the Scandinavian countries.

Table 8: PWC's Forecast of consumer/end-user spending

European Countries	2007 million USD	2011 million USD	**Calculated annual growth in %**
Austria	9,118	10,498	3.8
Belgium	8,484	9,801	3.8
Czech Republic	3,287	4,312	7.1
Denmark	7,603	8,636	3.5
Finland	5,935	6,605	2.9
France	64,320	76,638	4.7
Germany	88,244	100,967	3.1
Greece	5,332	6,618	5.8
Hungary	3,485	4,648	7.7
Ireland	3,385	4,202	5.7
Italy	45,571	57,737	6.1
Netherlands	16,885	19,490	3.7
Norway	9,500	11,256	4.4
Poland	8,323	10,990	7.6
Portugal	4,685	6,108	7.3
Romania	1,636	2,339	10.2
Spain	32,289	43,795	7.8
Sweden	10,479	12,128	3.8
Switzerland	9,782	11,212	3.6
United Kingdom	101,344	123,622	5.2
Total	439,687	531,602	

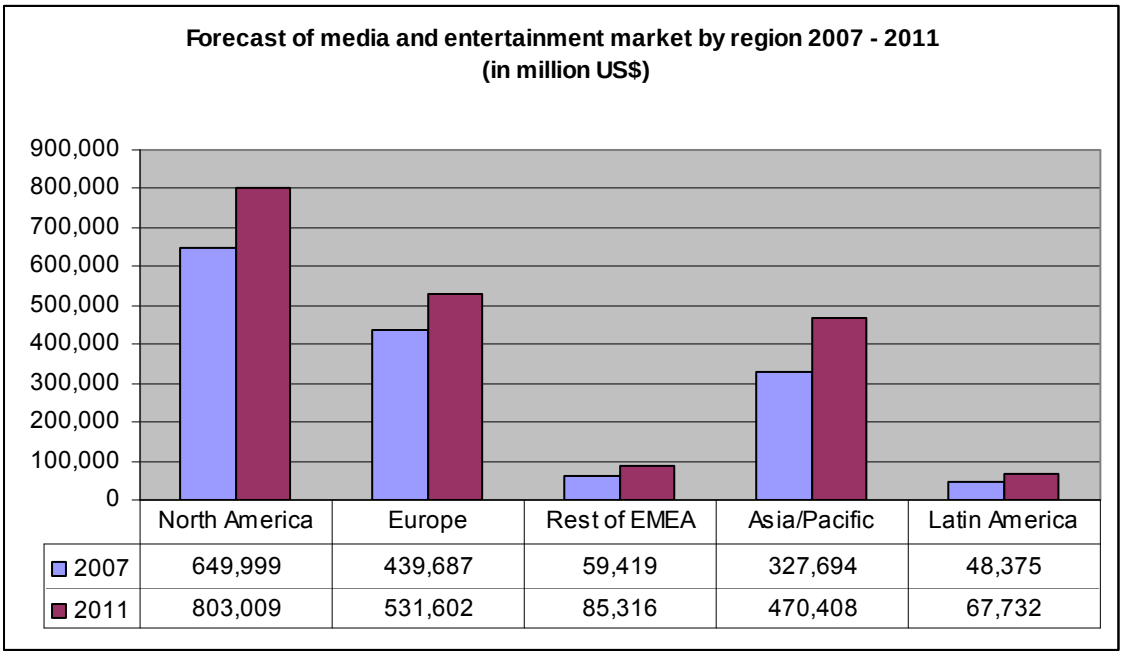
Source: PWC 2007, p. 54f

In more general terms the PWC analysts expect with respect to Europe:

- TV distribution, Internet advertising and access spending, and video games to increase with double digit annual rates during the next five years;
- penetration growth fuelled by the entrance of telephone companies and the introduction of triple-play packages to stimulate the TV distribution market;
- triple-play rollouts to boost broadband penetration, which in turn will stimulate online advertising, thereby fuelling the Internet market;

- games for the new video game consoles to generate near-term increases in the video game market, while increased spending on online and wireless games will sustain growth in the long run.

Following North American business practice, PWC aggregates data for Europe, the Middle, East and Africa (EMEA) for purposes of regional comparison. EMEA combines 20 European countries (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, Czech Republic, Hungary, Poland, Romania) with Russia and Turkey, Israel, the Arabic states and South Africa. Due to the relatively low market share of the non-European countries, EMEA can serve as a rough proxy for Europe. In the following Figure 6 data allow for a separation of Europe and the remaining EMEA-countries.



	North America	Europe	Rest of EMEA	Asia/Pacific	Latin America
2007	649,999	439,687	59,419	327,694	48,375
2011	803,009	531,602	85,316	470,408	67,732

Figure 6: Forecast of media and entertainment market by region 2007 – 2011. Data by PWC 2007; own calculations.

If we go into further detail we see that despite the overall lead of North America, each media sector has its own dynamics. According to statistics for the year 2006 provided by PWC for Internet advertising, recorded music, film industries, and video games:

- Internet can be treated as an indicator for the shift to digital markets. The commercial Internet relying on ads appears to be most advanced in the US.
- The film market, which includes box office sales, DVD, Blue Ray DVD, digital downloads, streaming, online rental of DVDs etc. is also strongest in the US.
- The market for recorded music, covering physical formats and digital formats – Internet and mobile – is strongest in the EMEA region.
- The market for video games including consoles, online games, and mobile games is strongest in the Asia-Pacific region.

Finally we have compiled recent data on those companies whose websites attracted most visitors as of 2008 (see Table 9 next page). Comparing the top 25 companies from the USA, Japan, the United Kingdom, Germany and France, we note that the largest players like Google and Microsoft always rank high, but the more we go down the table we discover the presence of national companies. We expect competition between huge global players adapting to national and regional contexts and players at national level who may be aiming at regional and worldwide audiences. The table also shows the obvious competition between media companies, UGC platforms (Wikipedia, Facebook), Internet companies and telcos.

Table 9: Top 25 Properties in U.S., Japan, UK, Germany and France

No	USA	UV	Japan	UV	UK	UV	Germany	UV	France	UV
1	Yahoo! Sites	140	Yahoo! Sites	43	Google Sites	29	Google Sites	24	Google Sites	21
2	Google Sites	137	Google Sites	33	Microsoft Sites	27	eBay	19	Microsoft Sites	19
3	Microsoft Sites	121	Rakuten Inc	29	eBay	21	Microsoft Sites	18	Orange Sites	15
4	AOL LLC	112	Microsoft Sites	29	Yahoo! Sites	21	AOL LLC	16	Iliad/Free.fr Sites	13
5	Fox Interactive Media	88	FC2 inc.	28	BBC Sites	18	United-Internet Sites	15	eBay	12
6	eBay	82	NTT Group	27	Ask Network	14	Wikipedia Sites	14	Groupe Pages Jaunes	12
7	Wikipedia Sites	59	GMO Internet Group	23	Wikipedia Sites	13	Otto Gruppe	14	Yahoo! Sites	12
8	Amazon Sites	59	Livedoor	22	FACEBOOK.COM	13	Arcandor AG	14	Skyrock Network	11
9	Ask Network	55	Nifty Corporation	22	Amazon Sites	13	ProSiebenSat1 Sites	13	Groupe PPR	11
10	Time Warner (not AOL)	55	Wikipedia Sites	21	Fox Interactive Media	11	T-Online Sites	13	Wikipedia Sites	10
11	Apple Inc.	48	Amazon Sites	18	BEBO.COM	11	Vodafone Group	12	DAILYMOTION.COM	9
12	New York Times Digital	48	Apple Inc.	16	Lycos Europe Sites	11	Yahoo! Sites	12	Groupe PriceMinister	8
13	Viacom Digital	45	NEC Corporation	15	Apple Inc.	10	Deutsche Telekom	12	AOL LLC	8
14	Weather Channel, The	41	Sony Online	15	AOL LLC	10	Freenet.de Sites	10	NextRadio TV	8
15	Facebook.com	36	Sakura Internet	15	DMGT	10	Amazon Sites	10	Benchmark Group	8

No	USA	UV	Japan	UV	UK	UV	Germany	UV	France	UV
16	CNET Networks	35	Excite Japan	15	CNET Networks	9	Axel Springer AG	9	Groupe Lagardere	8
17	Glam Media	34	AMEBLO.JP	14	BSkyB	8	Lycos Europe Sites	9	Groupe Doctissimo	8
18	AT&T, Inc.	31	Internet Initiative Jp	13	Tesco Stores	7	Holtzbrinck	9	Lycos Europe Sites	8
19	Adobe Sites	31	KDDI Corporation	13	Home Retail Group	7	Mozilla Organization	8	COMMENT-CAMARCHE.NET	7
20	Target Corporation	30	MIXI, Inc.	12	Yellow Book Network	6	Vogel Burda	6	Groupe TF1	7
21	Verizon	29	Hatena	12	Adobe Sites	6	Fox Interactive Media	6	Bestofmedia Group	7
22	Wal-Mart	29	SEESAA.NET	12	News International	6	ARD Sites	6	auFeminin.com Network	6
23	Gorilla Nation	29	NICOVIDEO.JP	10	Viacom Digital	6	RTL Group Sites	6	AlloCine Sites	6
24	CBS Corporation	29	TRACK-WORD.NET	10	Moneysupermarket.com	6	Sparkassen-Finanzgruppe	5	Groupe Spir Communication	6
25	craigslist, inc.	29	DTIBLOG.COM	8	Orange Sites	6	Ciao Sites	5	Groupe Hi-Media	6

Legend: Data correspond to February 2008, data for the US to March 2008); UV = Unique Visitors in million (rounded)
Source: comScore 2008

3.2 The Audio-Visual Sector – a Product of Technology

The audio-visual media sector is originally a result of the availability and use of technologies and of changed patterns in the amount of leisure time and its use. Recorded music gradually displaced sheet music and "software" for mechanical instruments (music boxes, player pianos). The advent of radio was a threat to the recording industry, in particular in times of economic depression, when it represented a cheap alternative to gramophone records.

The film industry eroded the audience for theatres, operas, concert and music halls and vaudeville shows only to be challenged by television in the period following the Second World War. The solution to possible past conflicts has been to establish a symbiotic relationship between the industries concerned, in the shape of mutually beneficial business models: e.g. disc-jockeys promoting music sales, or restricting of film viewing on TV to the "back catalogue".

New threats to the recording and film industries were posed in the past by the possibility of recording on magnetic tape, although the industry responded by the introduction of pre-recorded tapes culminating in compact cassettes and in video cassettes manufactured and distributed by the film industry. The availability of blank tapes for home use by consumers raised copyright concerns and gave rise to discussions on piracy in both of these cases.

3.2.1 The Shift to Digital

The advent of digital recording and transmission technologies has even greater disruptive potential for the audio-visual sector than the historical examples mentioned above:

- It is possible to make exact digital copies of files representing recorded sound and motion.
- There is no longer any need to possess a physical artefact such as a tape, record or CD to be able to make a copy since files can be stored on a broad range of media.
- Like any other digital file, audio-visual files can be transmitted on data networks such as the Internet without compromising quality.
- Much of the equipment needed for the production of commercialised audio-visual content is now affordable for amateur use. The Internet provides a platform for transmitting or distributing such content, making it easier than in the past for content producers to reach an audience.

The rise of the Internet has radically changed the playing field for the audio-visual sector. In many ways, the producers of content are in a stronger position due to the availability of content production technology and Internet platforms for dissemination and distribution. There are already examples of "hit" records originally launched using "myspace.com". While it is probably less easy to produce full-length feature films without the backing of industry, Internet platforms like youtube provide a medium to advertise creative talents in the shape of short films. Another important aspect of the Internet is its outreach, which makes it possible to address dispersed minority audiences, who might not account for a large percentage of any local population, but represent a sufficiently large market to make content distribution worthwhile. This is one aspect of the "long-tail effect" discussed elsewhere in this report.

Use of the Internet for file-sharing has disrupted existing production and distribution patterns in more ways than one. It is possible for producers of audio-visual content to bypass individual or all links in the traditional supply chain for their sector, by offering content for download.

This can be free of charge to advertise live performances, at a lower charge than would be the case for conventional channels to increase dissemination, or at a similar price as via conventional channels with the intention of investing profits in the production of new content. The Internet has also found massive use for the copying and exchange of commercially produced content, mainly music and films. The bulk of this file-sharing has involved copyrighted material and taken place without the consent of the copyright owners, resulting in massive loss of revenue by the music and film industries, in particular. While purchased music downloads on a variety of platforms using much the same technology as the illegal variant are very popular, the financial volume is still far from offsetting losses in sales of CDs and DVDs. The industry still needs to achieve a balance between its own and consumer interests with respect to digital rights management (see also chapter 5.3).

The decreased costs of digital distribution lower barriers to entry in the media market, thus potentially strengthening competition. Content communities, such as MySpace, YouTube or LastFM are providing platforms for information and communication among producers and consumers of creative content. Perhaps ironically, MySpace launched its own music label for the physical world shortly after its acquisition by Rupert Murdoch's News Corporation.

3.2.2 The crisis of recorded music and the future of audio broadcasting

The importance of recorded music is declining in comparison with films and games. Nonetheless, growth rates for the 2007 – 2011 period are expected to be an annual average of 2.3 percent (PWC 2007, p. 12).

Sales of digital music files have not been able to offset an overall decline in sales of recorded music. The digital music market is split between downloads, which are predominant in markets like the US, UK and Germany, and mobile applications, including downloads to mobile devices, which are predominant in Japan and parts of continental Europe (e.g. Italy). The online segment is expected to account for 12 percent of all European music revenues by 2010 (Screen Digest et al., p.43). New digital formats have appeared as a result of the availability of technology: master ringtones (excerpts from original recordings as ringtones on mobile phones), full track downloads to mobile phones now equipped with playback software and sufficient storage space, and music videos. While à la carte sales of downloads and mobile ringtones have taken off well, other business models including personalised radio channels (e.g. Last.fm), "all you can eat" services proving access to music on a non-ownership principle (the legal version of Napster), access streaming (radio-like services on mobile phones and portable devices), videos on-demand and over-the-air broadcasts delivered digitally, have yet to be turned into viable revenue streams (Screen Digest et al., p.45).

The global radio market in 2008 was estimated to have a volume of 49,864 million dollars growing annually by 4.5 percent to an estimated 57,340 million dollars in 2011. Growth in Europe is expected to be rather slower than average for the world, due to the predominance of public radio licensing.

The digitisation of radio broadcasting in Europe is lagging behind other media. Due to the strong focus on visual entertainment, radio is often neglected in discussions of digital and interactive media. There is pressure on radio to upgrade due to competition from interactive forms of other media. Despite the existence of national broadcasting systems in some countries, the strength of radio has traditionally been its strong local ties. Radio listening is usually free of charge or subject to the purchase of a virtually compulsory license, and in countries with a strong public broadcast system additionally has little time devoted to advertising.

Existing broadcasters are currently showing little interest in the transition to digital, which has to do with uncertainty with regard to future standards and also with a lack of skills to make decisions related to digital broadcasting – most local broadcasters are small or medium-sized enterprises. In most EU countries, a complete switch to digital radio is currently unlikely. The major threat to existing radio broadcasters seems to be coming from broadband music services and MP3 players, which are particularly popular with young target groups, who are increasingly turning away from traditional FM radio. One response has been the use of the Internet to stream content, but to date no viable business model has been developed for this variant. Since there is considerable uncertainty about the dominant forms likely to replace FM radio, there is a need to use different distribution channels in parallel.

There are also increasing numbers of Internet-only radio services, incorporating features of social networking, such as recommendation and feedback options. Well-known examples are LastFM or Pandora (see Textbox 2).

Textbox 2: Internet-only Radio

Internet-only radio frequently serves the listening wishes of niche audiences, such as those with minority tastes in music. Internet-only broadcasting is financed either by subscription, or by participation in affiliate programmes run by companies like Amazon or i-Tunes: if a listener particularly likes a piece of music, it can be purchased directly from such merchants.

A well-known example is the Last.fm customised radio station and music community site. Users can form "communities of interest" which share similar music tastes, join discussion forums and a wiki space. Using a unique music recommendation system known as "Audioscrobbler", Last.fm builds a detailed profile of each user's musical taste by recording details of all the songs the user listens to, either on the streamed radio stations or on the user's computer or portable music device. This information is transferred to Last.fm's database ("Scrobbled") via a plugin installed on the user's music player. The profile data is displayed on a personal web page. The site offers numerous social networking features and can recommend and play artists similar to the user's favourites.

The service was originally set up in the United Kingdom by an SME and bought by CBS for 280 million dollars in 2007. The company is still located physically in the UK and now has arrangements with EMI, Warner Music and Sony/CBS. It is changing from a radio station to a complex music platform with a built-in recommendation system and moving into mobile and music TV. Free listening is linked with advertising, but subscribers paying EUR 2.50 per month can avoid advertising and have the benefit of additional features.

One of Last FM's major rivals is Pandora. Here, users enter the names of songs or artists they enjoy and the system builds a programme based on this original entry. Pandora users can fine-tune their profile for further listening programming with their feedback. Users can chose between free listening supported by advertising and fee-based subscriptions without advertising. Due to changes in the copyright royalty system, the system is now restricted to the US.

Sources: http://de.wikipedia.org/wiki/Last.fm
http://en.wikipedia.org/wiki/Last.fm
http://en.wikipedia.org/wiki/Pandora_%28music_service%29
http://en.wikipedia.org/wiki/Internet_Radio

The adoption of on-line radio is slowed by lack of affordable broadband access (genuine flatrates) in some regions of Europe. In addition, much radio listening takes place in kitchens, cars and other places without access to computers, which are still the dominant platform for this form of radio.

This could change as WiFi radios gain acceptance and are more widely diffused. Podcasts are regarded by existing broadcasters mainly as a marketing tool and are still very much a minority phenomenon: 0.02 percent of the population of the EU 15 countries used podcasts in 2005; 2.4 percent of the EU 25 population are expected to use them in 2010.

3.2.3 Films and TV

Growth rates for the filmed entertainment sector depend heavily on the appeal of new releases to consumers and thus are subject to strong variation. The sector is expected grow annually at a rate just under 5 percent from 2007 to 2011, with strongest growth in the Asia-Pacific and South American markets. European growth is expected due to new digital cinemas, the introduction of high-definition DVDs and online DVD rental services.

Although there was recently a decline in revenues in the European motion picture market, this was regarded as a short-term fluctuation rather than a turning point in an otherwise positive trend. Growth had been boosted mainly by sales of DVDs, which accounted for almost 60 percent of consumer spending in 2005. In contrast to the music industry, which investigated the digital download segment only after domination by illegal applications, the movie industry started exploring business models such as video-on-demand and digital retail in the early days of technical viability. With a volume of EUR 30 m in 2005, à la carte sales of movie files on a pay-per-view basis are still quite modest compared to predictions of EUR 1.3 bn in 2010 (Screen Digest et al., p. 57). The increase will be driven largely by digital retail offerings provided over the open Internet.

The most dramatic current change in the video sector is technology enablement, e.g. the roll-out of broadband services enabling the delivery of high-quality digital video content to homes. For many years, the standard form of television was analogue broadcast to sets equipped with cathode ray tubes for displays which are now giving way to LCD and plasma displays. Reception was generally via aerials located on rooftops or other high locations which gave way to the familiar dish antennae or cable TV transmitted through fixed optical or coaxial cables. Increasingly, the same cables are finding use to provide FM radio reception, high-speed internet access and similar services.

The market for television networks is expected to grow at an average annual rate of 5.8% to 228,335 million dollars (143,557 million EUR) in 2011. Growth rates in this segment are highly dependent on such events as the Summer Olympics or the FIFA World Cup. Television networks are currently making a switch from analogue technology to digital. Public TV licenses as frequently existing in European countries are characterised as a slow-growing element of the market.

Cable TV is now making the transition to digital delivery to so-called set-top boxes which convert the digital signals into analogue form for display on older TV sets existing in many homes. A switch from analogue to digital transmission/reception technology is scheduled in many countries, including most EU member states. This is linked with high-definition standards promising better resolution and occupying less bandwidth than analogue television due to digital signal compression technology. Digital transmission technology enables the reception of large numbers of channels both via set-top boxes and digital (HD) TV sets. Digital technology also enables the addition of a feedback channel for interactive features.

Broadband connections to the Internet facilitate the transmission of audiovisual signals so that various forms of television are gradually becoming available by this means. A distinction is made between Internet Protocol Television (IPTV) and Internet Television. IPTV is typically offered on discrete provider networks ("walled gardens") and coupled with video on demand.

In Internet TV, the viewer does not have any kind of contractual relationship with the broadcaster, who is offering programs "into the blue", financed by advertising to cover at least part of the costs. IPTV users generally have access to a relatively limited range of channels and programs, but of high technical quality. There are enormous numbers of Internet TV channels which can be watched from practically anywhere in the world, although connections can be unreliable, so that there is no guarantee of enjoyable, uninterrupted viewing.

The feedback channel or "broadband return path" available through coaxial and optical cables can be used allow viewers to affect the program being watched, e.g. by voting. Other uses are the selection of viewing angles for sports transmissions, and transmission of information to the broadcaster.

Already, television viewing has changed dramatically: "In 1995 there were 225 shows across British television that delivered audiences of more than 15 million. By 2005 there were none" (Michael Grade, BBC Chairman, quoted in Future exploration network 2007) Digital terrestrial TV is expected to find widespread acceptance. Internet Protocol TV will compete with established TV platforms and pay-TV operators. Internet-based content aggregators will make more video content available. A true change in viewing patterns is expected to need 10 to 15 years to take effect: older consumers are largely retaining established viewing habits, i.e. watching movies, sports and other TV shows on schedule. Such viewers are happy to experiment with new content and media (Bain & Company 2007, p.8). Younger viewers are also still to a large extent watching traditional TV in addition to making strong use of new options, such as Youtube. Bain & Company (ibid., p. 4) describes Europe as "in a phase of migration towards a mass market for new digital video platforms and on-demand consumption". The most likely scenario for the next five years is that on-demand viewing will grow to a share of 20% of viewing hours by 2012 and continue steady growth in the next five-year period. The greater share of on-demand viewing will be driven by TV-based platforms (including IP TV) rather than public Internet platforms (ibid.).

Television distribution was worth 189,525 million dollars worldwide in 2008, and expected to grow to 250,745 million in 2011 (annual growth rate 9.3 percent). Growth is expected from subscriptions and video-on-demand via digital platforms, including mobile platforms.

In the exhibition of content on television, a distinction is made between channels – aggregators of content – and the platform – cable, satellite, IPTV operator – which makes channels available to the public. The previous distinction between channel, distributor and platform blurs when content is made available on an on-demand basis. The segment is still dominated by the business models of traditional channels and platforms. Digital compression has enabled a multiplication (by roughly six) of the number of channels against analogue distribution. IPTV over DSL is also possible due to digital compression. Despite the availability of more transmission channels, competition among content providers has increased, shifting the balance of power to platform operators to assign limited capacity. Typical business models are advertising-based, on-demand viewing and subscriptions. Public licenses which are typical for many European countries are a form of compulsory subscription and are coming under attack from private TV companies. The dominant form of broadcast is still free-to-air. The development of Personal Video Recorders, sometimes bundled with pay TV set-top boxes is proving the biggest single threat to the existing free-to-air TV. These permit time-shifted viewing of programs and skipping advertising.

Platforms basically aggregate channels and transmit them to the end-user. Current platforms include terrestrial channel networks, cable and satellite operators and IPTV service operators. The shift to IPTV means that mobile network operators, broadband internet service providers and major internet portals are moving into the platform business. Mobile TV applications can either make use of existing network infrastructure, such as IP broadcast and "streaming TV", or new forms, like DMB (Digital Multimedia Broadcasting), DVB-H (Digital Video Broadcasting for handheld devices), or DAB-IP (Digital Audio Broadcasting over Internet Provider).

A comparatively new development in the distribution of audiovisual content is the setting up of TV content services, such as Joost.com or Hulu.com.

Textbox 3: Joost TV Content Distribution Service

Joost is a system for the peer-to-peer distribution of TV shows and other forms of video over the web, originally developed and marketed from part of the proceeds for the sale of Skype to eBay (USD 2.6 bllion). Joost was created by a team of 150 software developers in six cities (NYC, London, Leiden, Toulouse).

As of January 2008, Joost was advertising over 20,000 TV shows in 400+ channels. Among others, the content providers include Warner Music, Viacom, Paramount Pictures and Indianapolis Speedway Productions. Joost is continually adding channels as indicated by regular updates in its forum, however, the last thread on this topic was launched at the beginning of February 2008 indicating that expansion might be slowing down. Some content is restricted to US users for copyright reasons. Joost is currently concentrated on "high-quality TV content from well-known TV brands", but future versions might allow users to upload videos of their own. There are currently no definite plans for this.

Users must download Joost software to use the service, which they can invite friends to join. It is possible to chat with others while viewing (instant messaging service) and the Joost website invites Blogging. Joost is still at the beta-testing stage, but open to all users.

Users in the Joost forum sometimes criticise that the material available via the system is not up-to-date, so that advantages over conventional TV are limited. Joost collects data about users and derives user profiles. The data collected in this way is sold to third parties, although it is possible to opt out of the receipt of advertising e-mail. Other user complaints concern the frequency and length of advertising which is included to pay for the service. A major problem seems to the need to install special software. A new system called "Hulu", which builds on the widely disseminated Adobe Flash software has emerged as a powerful rival to Joost in a very small period of time, although its use is currently restricted to the US.

Sources: http://en.wikipedia.org/wiki/Joost; http://www.joost.com; http://en.wikipedia.org/wiki/P2P_TV http://www.alleyinsider.com/2008/5/joost_web_version_almost_ready_still_requires_software_download

3.3 From the Fringe to the Mainstream – The Economic Significance of Computer Games

For a long time, the computer industry regarded gaming as a niche segment, but now realises that it has become a mainstream entertainment activity, competing with listening to music or watching television. This implies a major change that could have an impact on both the TV and movie markets (te Brake 2008). In terms of media consumption patterns online games, providing interactivity and non linearity as media experience, are turning into popular entertainment media for the masses. Sales of computer games already look like leaving behind the recorded music industry and maybe later the film and TV industries.

Bruce Everiss, a games business expert, reports data from DFC intelligence indicating that the worldwide videogame and interactive entertainment industry turns over about 21 billion EUR per year and that this will increase by about 40% in just two years. Online games and mobile games are expected to grow strongest at the expense of boxed games (Everiss 2008a, 2008c).

Price Waterhouse Coopers expect consumer spending in EMEA (mainly Europe in terms of spending, but also the Middle East-South-Africa region) for video games to be worth c. 6,6 billion EUR in 2005 and forecasts an increase to 11,7 billion EUR by 2010 equivalent to a compound annual growth rate of 10,2% (PWC 2007, p. 38).

Revenue for the online gaming market was expected to treble from EUR 3.0 billion in 2006 by 2011 (te Brake 2008, based on Strategy Analysis). The total revenues of the European online/mobile games market were estimated at EUR 699 million in 2005, of which about 48 per cent were contributed by the mobile sector. The physical retail market stood at EUR 5.5 billion in 2005. Digital revenues accounted for just over 11% of the combined total market value. This share is expected to grow to 33% by 2010 (Screen Digest et al. 2007).

3.3.1 A Future on the Web

Evidence for the growth of web-based gaming is provided by Everiss (2008c):

- Major on-line games like World of Warcraft, Habbo Hotel, MapleStory and Runescape each have millions of regular players;
- All three major gaming console producers, Microsoft, Nintendo and Sony, have found that online use is vastly more popular than their most optimistic predictions. All three are in a position to move to an online-only business model.
- The casual gaming portal Pogo, one of several such portals, ranks among the top ten websites in the USA in terms of the time spent on it and it has an average of well over 2 million visitors per day.
- Games are increasingly being featured on the social networking sites FaceBook and MySpace which each have millions of active users (cf. Everiss 2008c, PWC 2007).

Drivers of the online games sector are new consoles with Internet capabilities, growing broadband penetration, new wireless handsets with enhanced graphics, high-speed wireless networks. Three further crucial factors help to explain the rapid development of this segment:

- First, the rise of casual games, which do not require the same skills and training as complex console games or MMOs (massive multiplayer online games);
- General purpose devices such as PCs and mobile phones as platforms instead of consoles and other dedicated game devices, and
- E-commerce platforms for online games ensuring convenience for users and enabling sustainable business models for game producers.

The gaming platform, Steam, created by Valve Corporation is seeking to emulate the iTunes model for the games industry. Steam is a digital distribution, digital rights management, multiplayer and communications platform and is already the main distribution model for PC games. It is used to digitally distribute and manage games ranging from single-person shooters to racing games and cross-genre independent titles. As of January 2008 over 250 games are available on Steam, and as of February 2008, there were over 15 million accounts (Wikpedia).

The PC and also mobile phones are ubiquitous in a way that consoles never have been. They are in every office and most homes in the west and many people use two or even three different PCs every day. Most of these PCs come with Microsoft Windows, which already has a suite of games. More than 200 million people play online casual games every month. MMOs have huge audiences, and as gaming and social networking converge we are seeing more games played more often on the big social networking sites. These numbers are a reflection of the huge business advantages of online games, which are summarized by Everiss (2008b):

- No piracy: the theft of games has virtually destroyed the business models of the Play Station Portable (PSP) and of PC boxed games. It could just as easily invalidate the business model of any console that relies on boxed games.
- Instant distribution. When you launch a new game it is available worldwide straight away.
- Far lower costs. No manufacturing or distribution costs. No retailer's margin. At a given price point your earnings can easily be double.
- Servicing niches: retailers will only stock boxed games likely to enter the mainstream, holding back innovation. Online, it is possible to try anything and reach customers worldwide.
- No publisher advantages of scale: Since production and distribution costs are cut dramatically, small publishers can enter the market and thrive.
- Long sales window. Most revenue from traditional product comes within the first few weeks on shelf. Online games can continue to generate revenue for years, making niche products far more viable.
- Added power of online marketing ("All anyone has to do is click your marketing and they can buy your game without leaving their seat").

3.3.2 Massive Multiplayer Online Games

The most important segment of online games in economic terms are still Massive Multi-Player Online Games (MMOs) and within this category Massive Multi-Player Online Role-Playing Games (MMORPGs). These are online games "that involve gameplay within a persistent, always on and often shared game world, and that are designed to be played by hundreds, thousands and even hundreds of thousands of users" (Screen Digest et al. 2007, p. 23). MMORPGs take the biggest share in revenue of all MMOs. It has been estimated that about 50% of revenues from online video games (NCsoft 2008b) are made by MMOs and especially MMORPGs (see Figure 7 next page).

Blizzard Entertainment, the largest company in the field globally, is a subsidiary of the French company Vivendi Games, but the development of its major product "World of Warcraft" (WoW) took place in the US. NCsoft, Blizzard's main competitor, is a South Korean company, but its game GuildWars was developed by its subsidiary ArenaNet, also located in the US. NCsoft's Lineage games were developed in Korea. According to Maghiros et al. (2007), the main European company in the sector of MMORPGs is the Norwegian company Funcom with revenues of USD 7 million, for 2007 (Funcom 2008) against €800 million for Blizzard Entertainment.

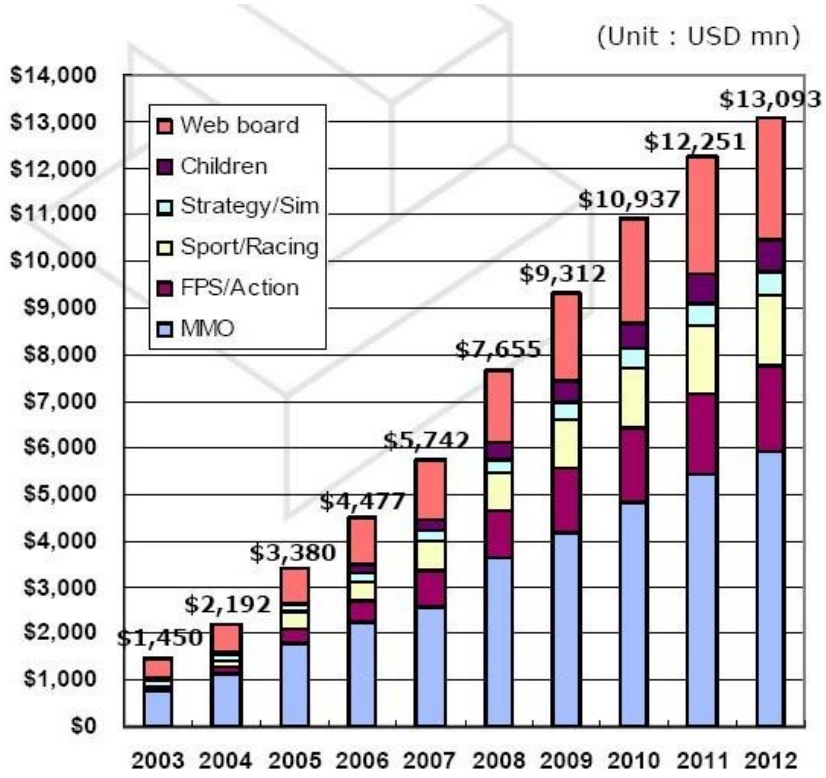


Figure 7: Global online game market (NCsoft 2008b)

Gamers play MMORPGs for hours on end and, in doing so, interact with other players. Further success factors for the most popular games are:

- The provider continuously provides new content, worlds in which the gamers feel "at home", with attractive graphics, and "depth of game" (Wyatt 2008).
- The provider makes sure that players feel treated fairly, e.g. that other players do not easily "kill" a player, and that cheating does not occur (e.g., by creating counterfeit money) (O'Brien and Gray 2008).
- High service quality is also essential, either with high quality code, or a large support staff.
- Another success factor is single payment pricing, which is leading to more users taking part, but also is a limit to revenues.

There are different business models in place. One business model is based on subscriptions, the other on revenues coming from advertising, premium membership levels and micro payments for in game items. A third business model which is successful on the Internet is "free" (Anderson 2008; Everiss 2008d), and it may have potential for the gaming industry as well.

3.3.3 The Future: Casual, Mobile and Pervasive?

According to analysts another type of game with a bright future are so called casual games, a segment probably growing faster than any other area of gaming (Everiss 2008c). The ability to just drop in and spend a little time having fun is very convenient. This is far more attractive for many people than the commitment needed for MMORPGs. There are more than 200 million people who play online casual games every month - both downloadable and browser games.

These games are cheap to develop using Flash programming. Casual-gaming software already brings in significant revenue. The Casual Games Association (CGA) found that the casual market brings in USD 2.25 billion (EUR 1.43) a year and is currently growing at a clip of 20 percent annually (CGA quoted in te Brake 2008).

Most mobile phone games can be regarded as a sub-section of the casual games section. If one adds these mobile phone games to the casual games space, the market for casual gaming is set to explode. According to Juniper Research, the global mobile gaming market is poised to grow from EUR 2.4 billion in 2006 to EUR 13.5 billion by 2011 (te Brake 2008). In his review of the Game Developers Conference 2008 te Brake highlights as a major step forward mobile gaming on the Apple iPhone and the reinvention of Nokia's nGage as a software based gaming platform. "The N-Gage platform will allow developers to write a game once that will appear on a number of handsets, eliminating the need for porting the game. Combined with the powerful N-series phones, Nokia is betting it can propel mobile gaming beyond simple puzzles and primitive games" (te Brake 2008). "It appears", so te Brake concludes "that casual gaming is ready to develop into an even more important part of the gaming marketplace, and in the process, become a larger part of people's personal entertainment experience."

Pervasive games were expected be the next growth market after mobile games. "Pervasive gaming can best be described as extending the gaming experiences out into the physical world. The pc-gaming experience of today is screen-based; the gaming experience of tomorrow uses your home city street as a playground with everyday life co-existing side by side. The "tools" used for gaming may be your mobile phone, physical objects with augmented computing functionality or other location-based activities or services" (Åresund 2006, p.20).

3.3.4 Online-games as a paradigm for educational content

In the context of media, there are frequent uses of virtual reality, which is the computer-based simulation of a real or imagined environment. Such simulations are largely visual, although the addition of sound is quite common and more sophisticated applications increasingly include tactile information (i.e. force feedback). A user can experience or interact with the environment through computer screens or special displays, loudspeakers or headphones, standard computer input devices like the mouse, keyboard or joystick, or special peripheral devices like wired gloves.

Applications include the simulation of real-life situations in the training of professions like surgeons, pilots, repair and rescue crews for hazardous environments etc., without endangering the person performing the task being simulated or patients, passengers or other persons.

Virtual reality, although usually restricted to sight and sound, is the basis for many computer games such as the MMOGs (massively multiplayer online games), in addition to PC or console-based games. Other notable applications are the simulation of not-yet existing buildings in architecture or the virtual reconstruction of no-longer existent historical buildings and environments to be explored by users. An example is the Singapore History City, which also has educational content.

The economic success stories linked with on-line communities centred on sites like "Second Life" are well-known, e.g. sales of virtual estate and artefacts for use in "Second Life". A regular 150 or more users have what Linden Labs, the owner of Second Life", terms a "positive monthly Linden Dollar Flow" equivalent to 5000 US dollars or more, i.e. make a monthly USD 5000 or more on Second Life. A total of around 50 Thousand unique users make any money at all on Second Life, out of a total of about 750 thousand monthly users (Second Life 2008). It has been reported that teenagers have learned to do business and to engage in civic activity through Second Life (http://www.globalkids. org/?id=30).

As in other areas of media development, there is a distinct trend towards user involvement in the development of content for existing games. This results in learning on the part of amateur users generating content which can be beneficial for these users' professional lives.

World of Warcraft was the location of the so-called "corrupted blood plague" incident, in which an epidemic killing characters spread from a limited location (Zul'Gurub) to the entire virtual world, transmitted mainly by pets that contracted the disease. Scientists have since analysed the incident for its insights into real-life epidemics, in particular the range and patterns of human behaviour in such crises. The players confronted with the disease apparently took the threat of contagion seriously, although they possibly took greater risks due to the virtual setting. Even so, a virtual world offers possibilities beyond those of computer models, which are based largely on mathematical rules. Real-life experiments with infectious diseases are impossible for ethical reasons, so the virtual world was viewed as a possibility to bridge the gap between a model and a real-life experiment (cf. BBC News, 21 August 2007).

Certain popular online games encourage and provide the opportunity to try out cooperative working: Guild Wars requires players to form guilds to play cooperatively against other guilds or to solve problems emerging from the environment. Richard Bartle of the University of Essex, one of the developers of the first multi-user games "Multi User Dungeon", argues that the virtual worlds in MMOs are places where people can be what they truly want and to find out what they really want to be. Furthermore, virtual worlds are non-discriminatory: players can have physical or psychological handicaps without others noticing. Bartle claims that people have changed as a result of the realisation of their true potential through game-playing.

There have long been examples of computer games with learning value for children and adults even if such value has not always been intentional (Sonja Kangas expert communication with many pointers to further information). The educational value has typically lain in the simulation of social, historical or economic processes. Examples are the SimCity series of games or the Civilization series, both of which were launched before or slightly after 1990. These games are distinct from edutainment software which seeks to combine education and entertainment values in a single product. However, the development of edutainment software has rarely been informed by educational advisors and does not focus on core skills such as literacy and numeracy (Wikipedia article Educational software, accessed 28.May 2008). Educational uses of games include rather massive simulation-type games, but also single-player "mini games" of the casual type available online from java and flash game portals.

While educational games were first developed in the 1950s and computer assisted education is commonplace, computers have been used mainly for "drill games". These are games designed to practice specific skills, such as mathematics. Educationalists have only recently addressed simulation videogames as a potential learning tool. The literature quoted by Guyne (2007) is exclusively from the new century. According to this literature, video games offer the following potential for learning (cf. Guyne, p.1):

- Typically, a videogame presents a problem to be solved with different ways to find a solution.

- Finding the solution is a process of trial and error, allocation of limited resources and requires patience and perseverance. Many computer games also combine aspects of competition and collaboration. Roles, power and limitations are clearly established by the game, gamers choose their own paths and are responsible for their own actions. Games simulate real-life consequences.

While gamers will spend hours to work their way through challenging game levels, challenging work at school rarely meets with the same dedication. Additionally, gamers often seek to improve their skills to be better at games. The anonymous, non-judgemental and non-confrontational setting of games usually allows gamers to fail and try again without losing face. The discovery and application of newly acquired skills in new contexts encourages exploration and experimentation. Gaming creates a sense of engagement in players – they are stakeholders in events taking place on screen.

Role playing games have a number of features which can be used more deliberately for educational purposes (cf. Guyne, op. cit. p. 2):

- Such games create social interaction between individuals with shared interests and provide a sense of empowerment and expertise.
- Learning experience is more powerful if it incorporates multiple forms of text representation, including text, graphics, photographs, moving images. Games have the potential to motivate additional research and learning.
- In certain games, players can assume the role of historical figures, providing motivation to learn more about the figure and its historical environment from primary source materials. Games allow players to experience historical events from the perspectives of different characters, who can have a different gender, social class or race.
- Playing through historical events can help gamer-students to develop an understanding of politics or historical events from various stakeholder perspectives. Similarly, it is conceivable that immersive games could be developed for other teaching subjects, such as languages, biology, geography etc.
- Gaming experience can be the starting point for discussions, writing assignments and various forms of presentation.

An example of educational software incorporating features and lessons from the commercial gaming environment is Quest Atlantis.

A common problem of many on-line endeavours is lack of critical mass in terms of numbers of players to make on-line work sufficiently interesting: unpopulated online worlds are simply boring and uninspiring. Games lacking interactive features and restricted to point and click commands do not provide learning motivation. Finally, efficient distributional channels for educational software are insufficiently developed.

Genuine simulations involving specially developed software and sophisticated peripherals are often too expensive for individual educational establishments, so that such applications would have to be located centrally in places like science centres.

A project with the title "Medical Imaging and Computer Games" conducted by the Nordic Innovation Centre (Avellán 2006) examined potential synergies between medical imaging and computer games, described as both very different and very similar. There are many computer game industries in the Nordic countries (87 commercial companies in Sweden alone). Training of future surgeons in reconstructive surgery is time consuming and expensive. Simulation tools could speed up education and the acquisition of surgeon skills.

Rather than recommending game companies to enter the medical market directly, the report argues for research programmes in areas where Nordic companies are at the forefront: haptic technologies, computer games, manufacturing of implants. Educational software can learn from the basic principles behind the success of certain games.

On the downside, there are concerns that immersion into virtual reality can cause addiction or evasion from real-life problems: anecdotes claim that young women are subscribing in great numbers to WOW so that they will at least encounter their partners virtually. "World of Warcraft" has been nicknamed "World of Warcrack" to underline its addictive character. Discussions on safeguards against excessive gaming are ongoing. Among the measures voluntarily introduced by game operators are compulsory breaks in playing.

3.3.5 Discussion

After a period of comparative neglect, online video games are a rapidly growing segment of the mainstream media and entertainment sector with huge business opportunities. Web-based and mobile online video games are turning the games sector into a distinctive type of networked electronic media. Online video games have thus the potential to become mass media for everyone – not just for youthful male aficionados, but also for women and older people. On the one side online games are competing with other mass entertainment media, TV and movies in particular and on the other side with device dependent games (e.g. consoles). The Internet enables efficient distribution platforms for online games and the typical approaches to profitable business on the Internet – subscription models, micropayment/advertising, and indirect revenue streams – are now being applied to the game business as well. An important segment for future growth are the so-called casual games which require less investment of time and learning skills on the part of players.

Based on the evidence of time spent by users, online games seem to be over all more attractive and compelling than educational software. While users spend literally thousands of hours exploring and playing the former, educational software tends to be put aside after a few hours. This could be due to less appealing graphics and content which fail to sustain interest. Educational software can learn from online games, on the other hand it might be in the public interest if game developers were willing to integrate educational elements in games primarily intended for entertainment.

The deliberate incorporation of features of "edutainment" in mainstream teaching of all subjects, and not only computer skills, requires dissemination of "best practice" to avoid costly mistakes with applications which do not capture pupils' interest and engagement or are unsuccessful in achieving their educational goals.

The utilization of edutainment features in teaching requires an adequate infrastructure for schools throughout Europe to provide equal access to the benefits of computer-based teaching methods, including on-line access, sufficiently fast and powerful computers etc.

There might be greater potential for the use of educational software outside compulsory education, e.g. in further education and adult education. To make optimum use of the potential benefits provided by educational programmes with educational elements, it would be useful to develop Europe-wide recommendations on uses and applications for various levels and types of school.

As a measure to diffuse and optimise the utilisation of networked electronic media for educational purposes, it would be useful to inventorise such media and to create platforms for the exchange of experience at the European level.

3.4 Mobile Internet

3.4.1 Global facts and figures for data and content

The mobile industry generates about 40% of the telecommunications sector's total revenues (OECD 2007e). In an environment of threatened or even already shrinking average revenues per subscriber (Ofcom 2006), mobile data is becoming increasingly relevant as a source of revenues for providers. If new data services take off, not only the network operator, but also the content provider would benefit. Table 10 provides an overview of data use in Europe. It clearly shows that SMS messaging is the data service most customers use, while a rather limited share of subscribers uses other data services. The UK subscribers are the heaviest users of the mobile Internet in Europe.

Table 10: Data use by mobile subscribers, in percent, 2006.

	UK	Italy	Spain	Germany	France
Sent Text Message	86	85	84	80	71
Sent MMS	30	31	28	21	21
Browsed for Information	14	7	7	3	8
Used Personal E-mail	7	9	9	6	6
Used Work E-mail	4	5	6	3	2
Downloaded Ringtone	5	6	8	5	5
Downloaded Game	5	4	5	3	1
Downloaded Graphics	2	3	3	2	2

Source: m:metrics 2007

The leading position of the UK in Europe is also visible if we look at the average revenues per user (ARPU) in different countries (see Table 11).

Table 11: Data revenues per user in key countries, 3Q 2007, USD

Country	Data ARPU	Data ARPU per capita
Japan	17.73	14.41
United Kingdom	11.96	14.17
Switzerland	11.94	13.48
USA	9.80	8.03
South Korea	8.37	7.46
France	8.21	6.68
Germany	5.96	6.78

Legend: ARPU = Average revenue per user. The figures include revenues from use of mobile phones, larger devices such as Blackberries, and from using laptop computers.

They are not entirely comparable as the figure for Japan does not include revenues from PHS-operators, which are much used for accessing the Internet from PCs (PHS, the Personal Handyphone System is a 2G system comparable to a DECT phone one can use with any base station). *Source:* Own computation based on Merrill Lynch (2007) data.

The European situation is further reflected in operator revenues. About 2/3 of non-voice revenues are from messaging. Although Non-SMS data revenues are growing, we have to take into account that this growth is not due in first place to the Internet use on mobile phones by consumers, but to business use with Blackberry-like devices and in particular with UMTS laptop cards (Lewis 2008 discusses this issue for Vodafone's rapidly growing data services).

Regarding sales by content producers, ringtones, games and adult services seem to be the most important ones (Sandra Baron, expert communication). Sales of ringtones are already declining all over Europe. Regarding the sales of music apart from ringtones, in 2005 revenues for mobile music in Europe were EUR 76 mio. (Screen Digest et al. 2007, p.12). In 2007 there was a surge in sales of full track downloads to mobile, with music downloads accounting for 12 per cent of all digital sales in the first half, compared to 6 per cent in the same period in 2006 (IFPI 2008, p.7). The UK has the most advanced mobile music market in Europe. It is estimated that 10-12 per cent of all chart sales in the UK are made through mobile channels (IFPI 2008, p.9f). At least in some countries, such as Germany, sales of music have also started to decline since phones are increasingly used as music players, with "side-loading" from the PC (m:metrics 2007).

Japan is widely regarded as the mobile data market leader. In order to possibly draw some lessons from the Japanese case, we take a closer look at developments there. The following Table 12 shows selected innovations in mobile communication and calculates the delay between Europe and Japan.

Table 12: Introduction of mobile innovations in Japan and in Europe

	Japan	Europe	Delay
Packet switching	1997	2000	3 years
Internet E-mail	1998	2002	4 years
Clamshell design	1999	2002	3 years
Camera	2000	2002	2 years
High-quality music	2002	2004	2 years
Technologies faster than W-CDMA	2003 (EV-DO)	2006	3 years
TV	2003	2006	3 years

Source: GSM Association 2008, Weber 2007

With regard to messaging, the situation in Japan is entirely different from the situation in Europe. In Japan, only about 15% of the data revenues are from sales of messages, which essentially are Internet standard (SMTP) E-mails. Access to the Internet is convenient as Internet-standards are the preconfigured default on each handset. Prices in Japan are set differently than in Europe. Mobile messages cost from 0.7 Euro-cents upwards (0.9 Yen), depending on message length. In Europe, however, messages cost 10-20 Euro-cents. These cheap mails made the mobile Internet in Japan "sticky". Subsequently, users have used it for surfing, which is also relatively cheap. In Japan, monthly fees for using the mobile Internet start at about EUR 2, whereas in Europe they start at EUR 5.

Using Internet standards allows for the easy and cheap communication of links (e.g., via newsletters). Forwarding links creates network effects for providers of content and users, and opportunities for "long tail" markets of content (Anderson 2006). In the words of Sandra Baron "If there is a killer application in Japan, it is the one-click-to-content via E-mail" (expert communication).

Funk (2007) showed that mobile commerce in Japan shows patterns very similar to those we know from the PC-Internet with a considerable share for ringtones and music, but also sales of physical goods such as fashion, and a large share for mobile entertainment including gambling. Due to the widespread use of wireless surfing on the WWW, Japan is a leader in mobile Internet use and user generated content in particular. The largest Japanese Social Networking Service, "Mixi", was launched in 2004. In 2007, it already had 8 million users who can access it from their handsets as well as from their PCs (Billich 2007). This segment also appears to have high growth rates in Europe with an estimated 812,000 users of such services in the UK, in the first quarter of 2008, where the UK is leading Europe once again (Nielsen Mobile 2008).

Japan has also been called an "international showcase" of mobile music by IFPI: "Japan is setting a fascinating example to the rest of the world. It is the first market where sales of full-track mobile downloads, as opposed to mastertones, are the leading digital format, accounting for over 40 per cent of sales value" (IFPI 2008, p. 9). In Japan mobile music makes up 90% of digital music revenues and is able to offset the fall in CD sales (cf. IFPI 2008, p. 9; KEA 2006).

Japan also exhibits the "world's most successful commercial mobile TV deployment" (Kutscher 2007). After a start in 2003 with analogue receivers, a co-ordinated action by many players led to a significant take-up, with 22 mio. TV-enabled handsets sold by March 2008. The service is free, and users are allowed to store transmissions on their handsets. In Europe, Italy and France are leading, with about 1 million subscribers each in 2007 (Baron, presentation at the STOA Workshop 26.6.2008).

3.4.2 Analysis of the European situation

The bottom line of this comparison is that in Europe, there is little use of the mobile Internet from mobile phones, revenues largely stem from overpriced messaging (SMS) and business use of data services. For the European mobile phone Internet to develop, and in particular for user generated content to develop, some obstacles can be identified:

- For years, European operators have tried to keep users on their portals. However, customers did not find enough information there. Some said that the operators created "fat Chinese walls" (Magedanz 2006). Meanwhile, operators have started to open their portals for the Internet, e.g., by allowing for easy access to search engines.
- Portals have also been criticised by representatives of the content industries (Screen Digest et al. 2007, p. 247), in particular for charging high shares of revenues, such as 40% and more, in contrast to a typical 15% in Japan. This has contributed to a lack of profitability for many mobile content companies.
- Operators did and still do not encourage the use of Internet standards such as E-mails. They are aware of the fact that E-mails with links would allow users to easily get onto the Internet. Having links in SMS or with WAP-push is much more difficult to handle, for both content providers and users. However, operators are afraid of cannibalisation of SMS-revenues (see Reding 2008). Even at a price of EUR 5 per MB, an E-mail the size of 1 kB would cost 0.5 Euro-cents, a small fraction of the price of an SMS.

With an ARPU of e.g. EUR 25, and a data ARPU of e.g. 20 percent, the possible loss might be up to EUR 5. Therefore, operators typically either charge at least about EUR 5 for a data flat rate, or 20 cents per E-mail, in order to avoid cannibalisation. However, surfing and network effects will not increase much if users have no messaging infrastructure available with clickable links.

- Operators were hesitant to further develop payment mechanisms for advanced mobile services beyond the carrier-user relation and the current micro-billing arrangement. It is still unclear which role payment service providers and content providers will play in future generation mobile payments (An overview suggesting several socio-technical design options is given in Van Bossuyt and Van Hove 2007).
- Consumers found data pricing high and unfair. Since the early days of WAP, there have been complaints about excessive data charges. Furthermore, roaming fees have been regarded unfair.
- Sometimes there was a lack of quality of the services. For instance, links were not clickable, buttons on the outside of handsets could be accidentally clicked (causing charges), MMS were not sent or did not arrive, etc. Lack of content, lack of quality and high prices led to "scorched earth".

In more detail, it becomes visible that smaller operators, such as KPN, or non-European ones, such as Chinese (HK) Hutchison Whampoa, are most actively competing against the larger operators. Hutchison (3 UK) not only offers free surfing for GBP 5 per month, but even allows for the use of Skype, for example. These operators have achieved some success in terms of revenues and subscribers, e.g. in the UK, in Germany and in Italy (cf. Table 10 with after all 14% of subscribers browsing for information on the mobile Internet in the UK).

Increasingly, hardware manufacturers, such as Nokia, Apple and Samsung are also attempting to carve a share out of the business, e.g., by preloading applications. This may result in the emergence of certain profitable types of content, such as location based services with traffic information, maps, etc. But these services will be limited in use if users do not access data services, because the operators continue to function as gatekeepers.

The European situation is likely to become even more difficult. If ARPUs continue to decline due to competition – witness the emergence of first free data services such as Blyk – competition will become even tougher (see www.3G.co.uk 2007).

We also see that innovations tend to originate from outside the European mobile system, e.g. Intel's WiFi, NTT DoCoMo's i-mode, Hutchison's "3" operators, the Apple's i-Phone, Google's Android and participation in FON. Before drawing conclusions, we review the factors governing the world's lead data market, Japan.

3.4.3 Analysis of the Japanese situation

The essential parameters of the Japanese model can be summarised in the following list (Weber and Wingert 2006):

- New services, which require new handset features, are well specified and their introduction is well orchestrated. Operators specify handsets in close co-operation with those who have a new idea and with their manufacturers. This leads to a high hardware and service quality.

- Operators are aware of the benefits of selling to a mass market and therefore keep the traditional form factor (keyboard, separate display). Yet new hardware features are incorporated into the same user interface. I.e. the operators arrived at the conclusion that the majority of their customers will not use larger, more complicated-to-use personal digital assistents (PDAs) or smart phones. Still, the typical Japanese handset has more capabilities than an Apple iPhone (Fasol 2007).
- Competition is different to Europe in the sense that several mobile radio infrastructures compete (similar to what is called "technology neutrality" in the European spectrum regulation debate). GSM-like PDC (Personal Digital Cellular) competed in Japan with cdmaOne (a variant of Qualcomm's code division multiple access technology) and PHS when the mobile Internet was specified. As of 2008, enhancements of cdma2000 are competing with Wideband-CDMA and PHS and their enhancements. Competing standards means different pros and cons of the respective technologies, and mean that the operators aim at differentiating themselves by offering features which benefit from the characteristic of their respective infrastructures. During the last 10 years, Japanese operators have differentiated themselves, e.g., in voice quality, provision of mobile music, inclusion of digital cameras in handsets, flat rates for PC-use, etc. It appears that the reduction of messaging prices from 10 Yen in the 1990s to 0.9 Yen has also been caused by infrastructure competition (Weber and Haas 2008). J-Phone provided an SMS-like system with "emoticons", such as a heart, exclusively in their handsets, in the 1990s. Subsequently, NTT DoCoMo lowered messaging prices, and provided links, by introducing i-mode.
- The regulator is aiming at keeping licensing costs for operators low, by providing spectrum in a Command & Control procedure, without auctioning, in a government-steered "beauty contest" of applicants. This allows issuing new licenses if profits surge, as happened in 2005, when new 3G licenses were provided.

It seems justified to say that the competition between infrastructures means that the competition becomes a discovery procedure (Hayek 1968). As operators can surprise each other by specifying new services, the Japanese mobile market is very dynamic and able to generate "disruptive innovations" (Fasol 2004). The case of Japan suggests that "technology neutrality" is able to speed up competition, leading to prices relatively close to costs.

3.4.4 Discussion

The current European situation can be described as one of declining, or at least threatened, ARPUs, with high messaging prices, little use of the mobile Internet, hardly profitable content providers, and most innovation and competition coming from non-European companies. The bottom line is that European mobile phone users hardly use the mobile Internet because the operators are afraid of cannibalisation of their SMS revenues. Operators may wish to continue along this path for many more years to come. It is entirely unclear if and when SMS revenues will decrease sufficiently to convince operators to push E-mails and mobile Internet uses. To bring about more competition and by this cheap mobile Internet services sooner – to the benefit of consumers and content providers - *pan-European licensed IP-services* and *spectrum commons* are worth considering.

1. Cheap, pan-European licensed IP-services: What would be needed is the Europe-wide provision of wireless Internet services, allowing for Voice over IP, without roaming fees. In terms of regulation, helpful means for achieving this goal could be:

- *Regulation of messaging and data prices:* This is in contrast to economic textbook wisdom and might not solve issues such as high shares taken by operators from content providers. However, as long as prices seem to be way above costs due to the oligopolistic nature of spectrum access, this option may need to be considered and could help in creating more thrust for the use of E-mails. The Commission is already moving in this direction (cf. Euractiv 2008). It would, however, be preferable to have a situation where competition among operators brings messaging prices down.
- *New operators:* Judging from the experience in Japan, and from the example of Hutchison, new operators (using new bands or renting spectrum as virtual operators) could increase competition. Of course, in the current environment, it is not certain that new operators can be identified, willing to bear the costs in an environment of threatened revenues.
- *Pan-European technology neutral licensing:* Spectrum could be provided on a European scale. The result could be that operators would compete in all EU-countries, with different technologies, without any roaming fees (for technology neutrality, see Radio Spectrum Policy Group 2005 or European Commission 2007d).
- *Command-and-control or redistribution of auction fees:* The experience of Japan suggests that licenses could be issued in a command-and-control manner. The biggest success stories in the history of mobile communications, GSM and i-mode, took place in command-and-control environments (see Weber and Wingert 2006). Imagine an "unburned" brand, such as Google, providing a European-wide roaming-cost free IP service on former TV-spectrum.

2. Spectrum commons: Given the tremendous success of unlicensed wireless LANs (WiFi), Europe could take the lead towards user-operated infrastructures, as proposed by Bohlin et al. (2007). Today, the limits of new radio approaches using "unlicensed" spectrum or "spectrum sharing" are unknown. New technical approaches with protection against interference, such as Ultra Wide Band, Software Defined Radio, over- and underlay networks, and spectrum "netiquette" could enable more communication free of charge than currently is the case (Werbach 2004). Part of increasingly unused TV "beachfront" spectrum could be re-used. Also this approach would require a pan-European provision of bands. The more expensive licensed spectrum would be used only if needed.

These are some options for European spectrum regulation, which would most likely be beneficial for the content industries. A working group composed mainly of those parties who would benefit from the new approach (and not dominated by incumbent spectrum owners) elaborating these options could be a first step on the agenda.

4. Web 2.0, User Generated Content and New Media

Web 2.0 is short-hand for recent trends in Web-technologies, a changing networked media landscape with new business models and perceived changes in the way people communicate via Internet. Web 2.0 is regarded as an environment empowering users, allowing for self-expression, creativity, and manifold forms of communication. Simultaneously Web 2.0 appears as replete with business opportunities for media companies, telecommunications and IT-industries. User generated content platforms emerge as new type of networked electronic media where user activities and commercial interests meet.

4.1 Web 2.0 Basics

The term "Web 2.0" was coined in 2004 by Tim O'Reilly, a publisher. The "TagCloud" (Figure 8) highlights some of the concepts and technologies associated with Web 2.0.

Figure 8: TagCloud Web 2.0; *source:* Angermeier 2005

Analysts have related the origin of the buzzword to the burst of the Internet bubble which created a need for a new vision, a function which "Web 2.0" was able to fulfil. Following its rapid take-off, Gartner situated "Web 2.0" at the peak of its "2006 Hype Cycle for Emerging technologies" which means the "peak of inflated expectations" (Gartner 2006). David Silver recently remarked: "Attached to any old noun, 2.0 makes the noun new" (2008). Tim Berners-Lee has said that there is nothing new about Web 2.0 (Berners-Lee 2006).

In our view, the Web - as we knew it as users four or five years ago - has changed, and "Web 2.0" is just a term to indicate these changes. Web 2.0 is shorthand for recent trends in Web technologies (cf. Chapter 2), overall changes in the way people communicate via Internet plus a changing networked media landscape with new business models. Of course Web 2.0 builds on and adds to functionalities and services already in place before 2005 such as search services, instant messaging, P2P-filesharing, e-mail.

The current state of Web 2.0 has at least six remarkable aspects which shape the media experience empowering users.

1. The Desktop and the Browser have turned into the user's powerful *media content control centre*. Today browsers integrate all types of applications needed to communicate and interact with all types of services offered on the Internet.

2. Everyone is able to *personalize the networked media experience* by searching, bookmarking, subscribing e.g. to RSS-feeds, alert services, blogs etc., and more and more tools are there which help to analyse content and monitor content changes.
3. Everyone can use the *Internet as an extension to the personal computer*, e.g. by uploading photos, video clips, bookmark lists, using resources like online encyclopaedias or dictionaries and by using server based applications for calculation, translation, spreadsheets etc. The older vision of the "net is the computer" has become part of Web 2.0.
4. Web 2.0 marks *a public (and semi-public) space*, with an interface on the one side to the private space of the users and on the other side to inner-organisational networks and databases. Both sides supply the Web with content.
5. Applications on the Internet have turned from individual use to social uses allowing interaction of many enabling new communication formats like "*virtual communities*" and new forms of distributed or "*collective intelligence*" as with Wikipedia.
6. Moreover the homogeneous underlying infrastructure brings together personal communication and media consumption, entertainment and work (also learning), commercial and not-for-profit purposes. And the interesting thing is that the private and the public, the commercial and the amateurish, playing and working can be arranged and composed in almost unlimited ways for each new service.

The most popular networked media generated by citizens (users) are blogs, wikis, social networking sites, video sharing platforms, photo sharing sites, and collaborative efforts like social bookmarking and collaborative tagging. Table 13 gives a short description of these media forms, some examples and some indicative numbers.

Table 13: Typical media forms on Web 2.0

Type of Platform	Description	Example/Numbers
Blogs	Web pages containing user-created entries updated at regular intervals and/or user-submitted content that was investigated outside of traditional media	Popular blogs are e.g. BoingBoing and Engadget; In April 2008 the blog search service technorati had indexed more than 112 million blogs with a daily increase of 70.000.
Wikis and other text-based open knowledge management systems	A wiki is a website that allows users to add, remove, or otherwise edit and change content collectively. Other sites allow users to log in and cooperate on the editing of particular documents.	In April 2008 Wikipedia, by far the biggest instance of a wiki consisted of over 10 million articles in 253 languages. The English edition had more than 2.3 million articles in April 2008 (Wikipedia 2008).
Social Network Sites	Sites allowing the creation of personal profiles; they may include media content from other sites.	MySpace, Facebook, Friendster etc. MySpace the largest social network site worldwide has more than 180 million members and a daily increase of more than 200,000
Video Sharing	Services allowing users to upload video clips and making them available to limited groups (privately) or the public	YouTube, Clipfish, Channel 101etc. In January 2008 alone, nearly 79 million users watched over 3 billion videos on YouTube (Yen 2008)

Table 13 *cont.*: Typical media forms on Web 2.0

Type of Platform	Description	Example/Numbers
Photo Sharing	Services allowing users to upload digital photographs to share them with others publicly or privately	Flickr, Photobucket, Snapfish, Webshots etc. Flickr claims more than 7 million registered users
Social bookmarks, collaborative tagging, folksonomies (information that is collectively created by users).	Collecting links of online content and rating, tagging, and otherwise aggregating them collaboratively	Digg: 20 million visitors March 2008; Del.icio.us 1,24 million visitors March 2008

Legend: This table uses information from Wikipedia, company sites, Site Analytics (2008), and is inspired by Mateos-Garcia (2007c).

It is worth distinguishing these sites from other networked media which in their majority distribute content originating from media companies. This distinction does of course not exclude mixtures of "user generated content" and content from commercial media companies. Furthermore it does not exclude user involvement. Podcasts, P2P-filesharing, Online games, and virtual worlds are popular networked media fuelled by content industries. Table 14 gives a short description of these media forms, some examples and again some indicative numbers.

Table 14: Types of Internet services with digital content from media companies

Type of Platform	Description	Example/Numbers
Podcasts	A podcast is a multimedia file distributed over the Internet using syndication feeds, for playback on personal computers and mobile devices	iTunes offers at present 5 million pieces of music, 550 TV series, and 500 films. It is claimed to have sold till 31. July 2007 more than 3 billion songs, 50 million times pieces of TV series, and 2 million movies
Online Games	MMOGs are video games capable of supporting hundreds or thousands of players simultaneously. A famous subcategory is MMORPG (Massively multiplayer online role-playing game)..	World Of Warcraft, Lineage II, Guild Wars etc. At the beginning of 2008, World of Warcraft had surpassed 10 million subscribers worldwide, with more than 2 million subscribers in Europe,
Virtual Worlds	Online virtual environments. In Second Life for example users build pieces of the virtual world, interact, communicate, shop by means of avatars.	Second Life, Active Worlds, Entropia Universe etc. Second Life has more than 11 million user accounts; up to 60.000 person show up online simultaneously;
P2P Filesharing	Sites arranging the sharing of mostly audio or video files available via decentralized storage of participants.	BitTorrent, Napster, Gnutella, Kazaa, eMule, eDonkey etc. Probably more than 50% of Internet traffic (ipoque 2007) stems from P2P services. In 2001 Napster had more than 80 million users before it was shut down.

Legend: This table uses information from Wikipedia where not otherwise indicated.

If we describe the new Web 2.0 environment in business terms, there are at least six key topics around which the discussion of changing media business revolves:

(1) The open source innovation paradigm has reached online media

Open source software has succeeded in providing a very large library of software tools and applications freely available, and, perhaps more importantly, highly customisable and extensible tools. This goes together with lower barriers for content creation (editing tools), publication on the web (knowledge management systems such as Wikis), circulation of content (P2P filesharing), and even the creation of new media services combining open source software (e.g. Joost). This in turn means less dependence on capital and funding. The open source movement which grew up in the eighties holds further lessons for media innovations: a new type of license allowing for re-use and further development, user involvement as a source of creativity, and "innovation communities" as new type of actors in the innovation process (von Hippel 2005, p. 95-102).

(2) The "long tail" explains how niche markets can be profitable on the Internet

Markets for digital goods are different from typical mass media markets. The ability to sell goods otherwise not profitable and the ability to make niche markets profitable via the Internet is due to the relatively low costs for creating and making available content on the one hand and to the global audience which can be reached on the other hand. The assumption is that many niches may together produce more revenues than mass markets. Particularly for a saturated market like television, creating value by appealing to specific tastes promises to be a profitable strategy. This interrelation has been termed the "long tail" (Anderson 2004, 2006). Business models leveraging the "long tail" imply that niche content can be easily found. There are different means to facilitate the discovery of niche content: through search engines, through rating, tagging or recommending on commercial sites, or by establishing platforms which aggregate niche content. An interesting observation in this context is that the dynamics of these platforms help to move niche content up to mass markets, and that mass market content is moving down the tail when fed into these platforms.

(3) Attention of users is mainly channelled by brand popularity and powerful search engines

The lowering of barriers to content creation and offerings has resulted in a flood of creative content. This in itself does not solve the problem of drawing attention to this content and of allowing a match of supply and demand. There are competing (and complementary) approaches addressing this problem. On the one hand powerful search engines (including indexing, filtering, ranking etc.) may provide a solution, on the other hand powerful actors creating lighthouses able to aggregate and promote content (e.g. iTunes), and third new intermediaries may help to solve the problem for particular communities or interest groups by establishing guides, catalogues, repositories etc. or by creating platforms (e.g. Digg, Technorati or Delicio) where users filter and evaluate content by tagging, rating or recommendation (Folksonomies). Nevertheless, in essence there are just two principles of economic relevance to localise content: brands combining visibility with confirmed reputation (e.g. platforms, portals) and search facilities.

(4) Advertising (also micro advertising) supported business models on the Internet are on the rise

Among the advertising supported business models on the Internet, micro-advertising may be most innovative as it combines targeted and personalized ads with a revenue share for those offering content – providing a type of solution to the micro-payment problem. Google's Adsense program is the most striking case in point. Targeted advertising tailored to the preferences of users, based on the automatic analysis of search patterns and taking into account website content, the user's geographical location, and other factors, seems to be more efficient and accepted than pop-up windows containing ads. This model has become the main source of revenue for social networking platforms such as MySpace, where advertisements are placed depending on the tastes of the user, as specified in their personal profile.

(5) Glocal webbing as business opportunity supporting cultural and regional diversity

Contrary to expectations that the mass adoption of the World Wide Web would serve "globalisation" first, we observe enhanced availability of highly localised content and services. But of course on the Internet it is presented simultaneously to local and global audiences. This development is particularly important for the content sector, which produces goods in many cases characterised by a high cultural specificity. Tourism is a good example where local content can be of great interest in a global setting. The European Communication Council (ECC 2006, p. 23f) has observed a rise of "meso media" (see Figure 9) which underlines the importance of highly localised content in combination with global media companies. Newspapers come in many local e-paper editions and of course classified ads are shaped for local markets.

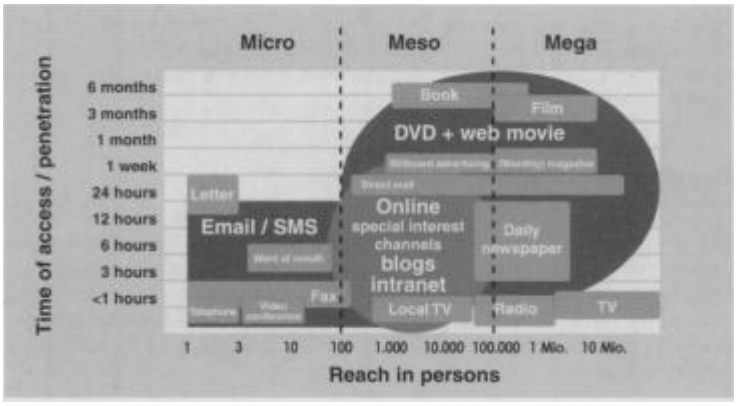


Figure 9: Micro-, meso-, mega-media (ECC 2006, p. 24)

YouTube is another example of glocal webbing: videos posted in many cases by users in order to communicate with their friends and geographically based groups are simultaneously accessible by a global audience with, in some occasions, surprising success in terms of attracting audience and broader public attention. Mateos-Garcia et al. (2007b, p. 38) draw attention to "inworld advertising" becoming growingly important in the video game sector. In this case, posters and billboards for products are incorporated into the game world depending on the locality of the gamer.

(6) Monopoly mechanisms work, but high innovation dynamics work against irreversibility

The existence of network externalities provides an advantage to those who can first gain prominence with a new technology or service. Switching costs and lock-ins make it even harder for new service providers to attract users. The new service must compensate for these switching costs by offering important new advantages.

Nevertheless the innovation dynamics of the Internet do not guarantee sustained "winner takes it all" logics. For instance, Google ousted Altavista as the most popular Search engine, World of Warcraft outstripped EverQuest as the most popular online game etc.

4.2 User Generated Content and New Media

4.2.1 Some empirical indications

The empowerment of users as one building block of Web 2.0 leads us to take a closer look at "User Generated Content" (UGC) and new media forms based on them. At first glance the growing spectrum of activities to be performed by users of the World Wide Web indicates what empowerment means. There are increased facilities:

1. to *communicate* with others (1:1, 1:few, 1:many, groups, communities),
2. to *share* and exchange existing content,
3. to *create* new digital content, to make one's own creative works public,
4. to generate content *in co-operative ways,*
5. to build new content by *combining and altering existing content* (mashups, syndication, embedding),
6. to react visibly to content offerings and to *contextualise* them (links, comments)
7. to *act as broker* between demand and supply (by recommendations, ratings)
8. to *engage* in virtual worlds and online games
9. to engage in *programming* of web services (open source)
10. to hear, to watch, to play, to learn, to get informed on many sites, channels and in many formats.

What do we know from surveys about these possibilities? In the "Community survey on ICT usage in Households and by Individuals" EUROSTAT (2007) collects, among other things, data on skills and activities of users. The creation of a webpage is one of the activities surveyed. The data available show that this activity varies significantly between countries and it depends on age. In 2006 seventeen per cent of all European Internet users had created web pages. Iceland led with the highest percentage of individuals who had created web pages (31%). The percentage of 16 to 24 year olds, with access to Internet, who created webpages was overall higher with the highest rate (60%) for young people in Norway.

There are other surveys and sources which lead us to assume a much stronger role of user generated content. According to comScore (October 2007, quoted in E-Consultancy 2008) 56% of the European online population used social networks in August 2007. The UK social networking usage proved to be the highest in Europe, with 24.9 million unique visitors – 78% of the UK's web users.

Table 15: European Usage of Social Networking Sites

Territory	Total Unique Visitors (000)	% Reach of Country's Total Online Population	Average Hours per User	Average Pages per User	Average Visits per User
Europe	127,297	56.4	**3.0**	523	15.8
U.K.	24,857	77.9	**5.8**	839	23.3
Germany	15,475	46.9	**3.1**	423	13.8
France	13,332	49.6	**2.0**	476	16.8
Spain	8,828	61.5	**1.8**	251	14.9
Italy	8,736	49.3	**1.8**	346	12.6

Legend: Data August 2007, only available for selected countries; ranked by total unique visitors; age 15+; home & work locations; excludes traffic from public computers such as Internet cafes or access from mobile phones or PDAs. *Source*: comScore World Metrix quoted in E-Consultancy 2008.

In April 2008 eMarketer published a forecast for the US, which is in line with the data from comScore: 50% of Internet-users were using so called user generated content in 2007. This share is expected to grow by 10% within five years. What is even more astonishing is the activity level of users have already achieved. 41% engage at least once a month in creative use of the Internet, and again this share is expected to grow by almost 10% in the next five years.

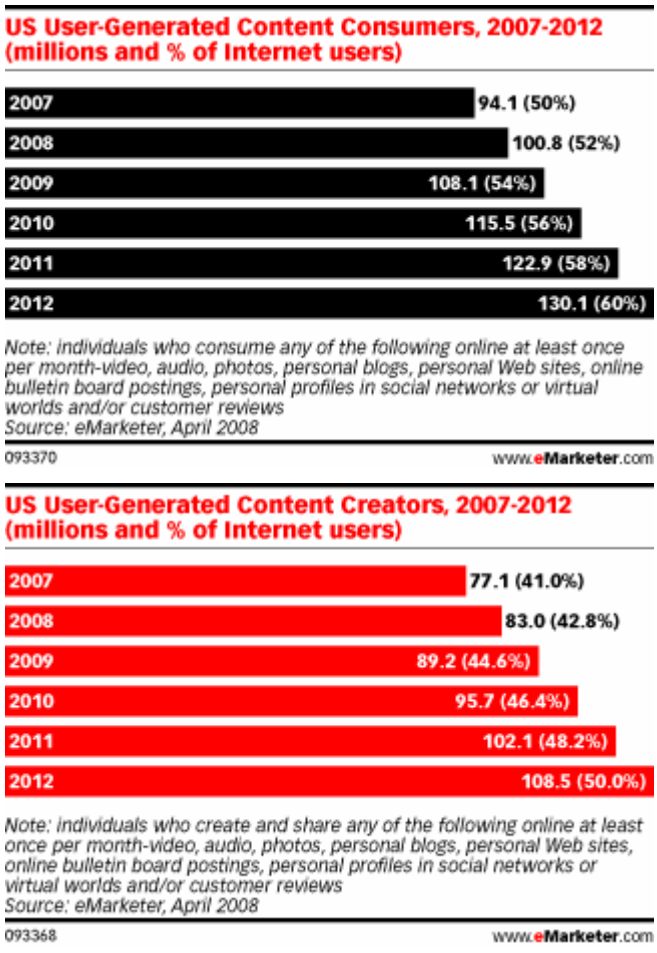
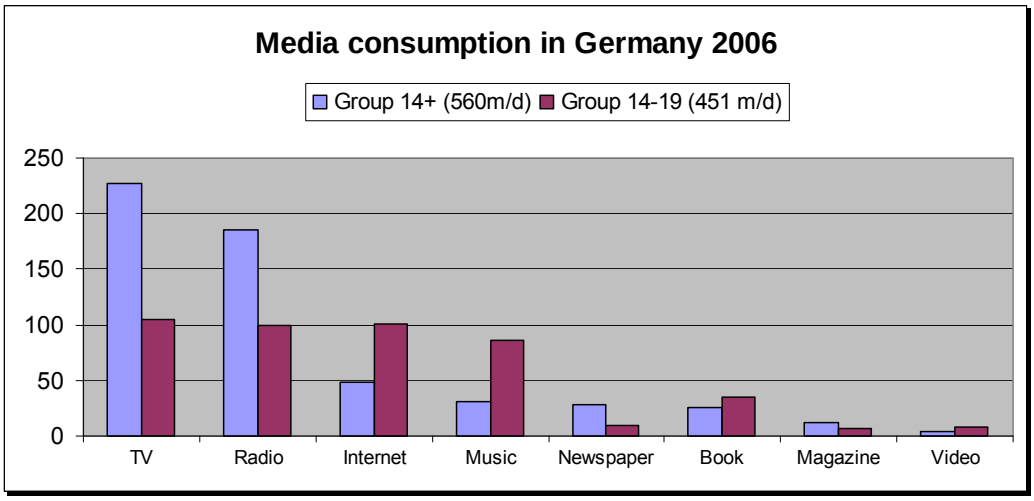


Figure 10: US User Generated Content Forecast (Verna 2008)

Though the growing importance of UGC for media industries can not be denied, one should bear in mind that only a minority of users are very active social networkers and very active content creators. Passive activities such as viewing or reading are the most universal activities on the World Wide Web, while activities that require a minor effort such as commenting, rating or tagging are taken up by only half of these users. A survey carried out for the Citizen media project in four social networking communities in the Nordic countries showed that the majority of community members use these to make and keep contact with relatives and friends, to read or view new contributions, surf for new information, or to simply kill some time (SINTEF 2007 quoted in Limonard and Esmeijer 2007, p. 24). The comparison of Internet use with the use of other media reveals that the Internet is gaining importance, but is still far from dominant (see Textbox 4 next page).

Textbox 4: Media consumption in comparison

A study about daily media consumption in Germany (Blödom et al. 2007 quoted in Holznagel et al. 2008, p. 19) reveals an incredible time budget (compared to other studies of other countries) of ca. eight hours a day with TV and radio accounting for three quarters (74%). Internet use comes next with 8% followed by music (6%), newspapers (5%), books (4%), magazines (2%), and Video/DVD (1%). If we take a look at the younger generation (14-19) the patterns are very different:



Their media usage appears to be more balanced with about one and a half hours each for TV, radio, Internet and music. Internet use and music consumption are without doubt important activities for the age group of 14 to 19. Another study (Goldbach Mediarena, quoted in Holznagel et al 2008, p. 21) asked what people needed most. 61% of respondents aged between 15-27 years "could not live without…" mobile phones, 47% not without computers. For persons aged between 42-59 years TV (62%) and print, i.e. newspapers, magazines, book, (52%) were indispensable.

4.2.2 UGC-Platforms as new media

The OECD defines UGC "as: i) content made publicly available over the Internet, ii) which reflects a certain amount of creative effort., and iii) which is created outside of professional routines and practices" (OECD 2008a, p. 14). This definition is a solid starting point, but is still too specific when it comes to the role of users in the value chain of networked electronic media. Therefore, the expression "user generated content" is often used in a broader sense for all the activities in which users might be involved – including even the involuntary production of data traces as soon as they are commercially exploited.

User generated content which started with webpages has now become a part of the media landscape. The first platforms enabling this kind of content publishing and sharing were mainly set up outside the realm of established media companies and started as grassroots initiatives. User generated content in principle serves a niche market. If an amateur uploads a video, this video will only attract a small audience, as this user does not have access to mass media channels.

UGC-Platforms however host numerous niches. On the basis of aggregating and integrating niches these platforms become a new form of networked media. The role of the user is not only to upload original content, but also to act as broker between supply and demand by tagging, recommending etc. Thirdly the content provided may serve again as the basis for new creative activities when re-using and altering the content.

UGC-platforms have attracted considerable interest of major media and Internet companies. Some major media and Internet companies have been quick to see the potential financial opportunities of Web 2.0, as indicated by some acquisitions. NewsCorp buying the social networking site MySpace in 2005, Google buying the video sharing site YouTube in 2006 and CBS buying the social music site Last.fm (UK) in 2007 are just three striking examples. The short story of YouTube tells about the dynamics of UGC-Platforms. Way back in August 2006, The Wall Street Journal published an article talking of 6.1 million videos (requiring about 45 terabytes of storage space) on YouTube and ca. 500,000 user accounts (Gomes 2006). In April 2008, a YouTube search returned more than 80 million videos and 3.75 million user channels.

A combination of UGC, professional content and interactivity characterizes these platforms today. There is an interchange between media industries and users on these sites. Successful authors of UGC can become famous and get contracts with media companies, successful content from UGC-sites is licensed to TV companies. On the other hand content from media companies is input to UGC-sites to raise awareness for this content and to reach a potential audience. Micro advertising is the most common form of generating revenues.

Mutual understanding between established media companies and the new web 2.0 start-ups is growing. The traditional media companies see that UGC platforms are here to stay and can be used to their own benefit. Owners of the new user generated content platforms and users increasingly recognize that building a feasible business model requires good relations with all stakeholders, including professional content owners. Apart from the fact that they are making deals with these platforms, established media companies are also setting up Web 2.0 services incorporating user generated content (Limonard and Esmeijer 2007).

Although these developments empower non-commercial activities, they are not separated from commercial activities in two directions: commercial media companies make use of the new technologies in order to strengthen the relations with their audience, build communities, and team up with new platforms to build synergies uploading content, and licensing content from platforms for presentation in other mainstream media.

UGC in principle serves niche markets and follows the long tail dynamics. Whether UGC will be a threat to existing media players is still uncertain. There are some markets that have been heavily impacted by the rise of user generated content services. The most notable examples are encyclopaedias, the online adult industry and the market for music videos. The Citizen Media project also assumes that MTV and other music video based TV channels are being heavily impacted by the rise of on-line content libraries that attract the same age groups and host the same kind of short clipped content (Limonard and Esmeijer 2007, p. 35). In other markets UGC complements the existing offer. All major media companies are in the middle of setting up UGC services or taking over successful grass roots initiatives.

Strategies applied to create and capture value with user generated content differ depending on the type of player involved. Limonard and Esmeijer (2007) have distinguished traditional packagers (e.g. broadcast companies, publishers), distributors (e.g. cable and telecom operators) and new packagers (e.g. Web 2.0 companies such as Google).

Traditional packagers follow cross media strategies and user generated content services are one of the many services in their overall service portfolio. *Distributors* tend to target social networking sites in which people already have personal relationships. They give third parties access to these environments and often try to attract users by either focusing on local communities such as small towns and villages, or by focusing on events. *New packagers* implement advanced technical service platforms while aiming at specific target groups providing their members faclities to personalize, enrich and expand the relations in their social network and to publish, market and sell their user generated content (ibid p. 11f).

In the next chapter we go into more detail on the new media business, trying to come up with policy relevant insights. We reflect these media in the context of "open innovation" and ask if Web 2.0 business models imply hidden exploitation of "prosumers". Then we pick up two relevant questions for media businesses on the Web. We reconsider the quest for micropayment systems and the role of Digital Rights Management technologies - now specifically in the context of Web 2.0 services.

5 About Exploitation, Remuneration and Copyright Policies in Web 2.0 Environments

The success of Web 2.0 in general and of user generated content platforms in particular is also a success story of the networked electronic media business. However, this does not mean that all parties involved profit from current business models, nor does it mean that there is no need for further improvements at the infrastructure level and in the regulatory field. We therefore reflect Web 2.0 business models asking if they imply hidden exploitation of "prosumers" and what impact they may have on the labour market in the media sector, especially for small content creators, and small and medium sized production firms. We also reconsider the quest for micro-payment systems and a micropayment infrastructure. Although "free content" and advertising based business models are dominant in Web 2.0 environments new payment schemes may be required, if current schemes fall short of supporting a wide enough variety of content, to support payments to small content creators and person to person payments. Also the role of Digital Rights Management technologies in the context of copyright policies in Web 2.0 environments deserves a renewed discussion. Content identification technologies (a subset of DRM technologies) obviously play an increasing role when it comes to the liabilities of service providers. This is apparent in B2B relations between these service providers and content owners, but also implicit in proposed legislations like the "Création et Internet" law in France. It is again a matter of controversy whether this DRM-technology can accomplish what it is expected to achieve.

5.1 Open Innovation and Hidden Exploitation?

Open innovation in the field of networked electronic media has consequences for media industries, media professionals, and prosumers. The "risk of triple exploitation" based especially on users' content, personal profiles, and data traces may become a main concern of users. Online advertising is likely to influence the demand for and quality of professional journalism. Web 2.0 technologies may have an ambiguous effect on the "creative class" supporting local cooperation but also devaluating the importance of local environments. Secondary media, i.e. automated content production, will turn into a major challenge (and opportunity) for media companies.

5.1.1 Open innovation, open source, and outsourcing

Innovation studies have highlighted that the dynamics of innovation systems have changed. In particular with respect to ICT and media industries concepts like "open innovation" (Chesbrough 2003; Christensen et al. 2005) or "innovation networks" (Weyer 1997) have been proposed. Related concepts have drawn particular attention to the role of the user and "user involvement" (Rohracher 2005). In a user-driven innovation model companies can rely on users of their products and services to do a significant part of the innovation work. Users want products that are customized to their needs. They are willing to tell the manufacturer what they really want and how it should work. Companies can make use of a series of tools, like interactive and internet based technologies, to give their users a voice and to enable them to do innovation work that is useful to the company. In the context of open source and networked electronic media this change is driven even further with emerging collaborative innovation models. A model case in point is the development model of the open source browser Firefox (see Textbox 5 next page).

Textbox 5: Mozilla's open innovation development model

- as explained by Mozilla Corporation -

Mozilla's Firefox browser, with 150 million users, has become a rival of Microsoft's market-leading Internet Explorer. It now holds 15 percent of the browser market in the United States and a higher share elsewhere. The company grew from 25 employees in 2006 to more than 120 in 2008. It constitutes a model of managing innovation beyond corporate borders building on participation and open-source collaboration. 40 percent of the code of Firefox is not from employees.

Sometimes people are hired from within the community; other specialists can't be hired but contribute attracted by the openness of the project. Actually, people can make a contribution without being either employees or members of the volunteer community. The company creates scaffoldings for people to work from. This type of creativity is most visible in the browser's extensions and customization facilities. There are thousands of people doing interesting things without having to ask the company.

The decision-making process is highly distributed and unrelated to employment status, and some of the people who make decisions about code are not employees. It is important to look hard at whether there are areas where to give up some control, because the returns are great. The idea that a single individual is the best decision maker for everything and should have ultimate control works only some of the time. Nevertheless, what ships as Firefox, with the Mozilla name and brand on it - that's going to be a Mozilla decision, even though other things are not.

Source: The information provided is a digest of a larger interview with Mitchell Baker, chairman of Mozilla Corporation by Lenny Mendonca (McKinsey) and Robert Sutton (Stanford University) published in The McKinsey Quarterly in January 2008 (Baker 2008); the interview has been digested before by EurActiv (Thursday 7 February 2008), which drew our attention to the publication.

The changes due to networked computing developments at the level of organisations, especially firms, and labour are associated with three concepts "cloud computing", "software as a service" and "crowdsourcing". They address new models of outsourcing feasible and relevant in networked societies. While cloud computing or utility computing refers to the rise of remote and distributed computing where e.g. companies purchase computing capacity on-demand from third parties, software as a service refers to applications hosted on a remote server which can be used by customers. The provision of these services may be for free or paid for. The importance of these developments is further explained and emphasised in a book by Nicholas Carr (2008) titled "The Big Switch". "Crowdsourcing" a third ingredient of the ongoing shift "is part of a broad and historically significant trend, by which the capitalist firm is targeting consumers for integration into the process of value creation more than ever before, and in completely new ways, such as those now possible via the World Wide Web" (Kleemann et al. 2008, p. 19). These authors stress that "crowdsoucing" in a strict sense requires "intentional mobilization" of work performed by users for commercial purposes (p. 22).

Within this big picture the development of networked electronic media based on user generated content (in the broadest sense) is a very particular case, because in this case it is not a company or firm which decides first to outsource production, brokering and distribution of content, but companies (media companies as well as IT companies) harness the rise of the amateur and user generated content and incorporate this phenomenon in their business strategies.

5.1.2 User involvement in networked electronic media value chains

In the context of networked electronic media and Web 2.0, users can be involved in the value chain – and that is the important point - in many ways, which are listed here without claiming to be exhaustive:

- providing opinion and feedback to companies,
- acting as brokers between supply and demand through rating, recommending, tagging and evaluating content;
- contributing actively to virtual worlds or games, making them more attractive for others (e.g. creation of characters or "assets");
- creating original new content making it available on social networking sites; picture sharing sites etc.;
- self expression and making contacts on social networking sites, showing and demonstrating talents and skills of interest for commercial companies;
- sharing content on P2P networks;
- Uploading e.g. a snippet of a recorded TV programme on UGC-platforms;
- participating in co-operative, distributed production of content (e.g. online encyclopaedias);
- producing data traces analysed by companies.

Seen from the perspective of an amateur who enjoys finding new friends, to participate in virtual communities, to share content with others or co-operate in content production, and to show his or her talent to the world, it might be surprising that the unintended consequences of his or her behaviour lead to a further step in the commercialisation of the Internet. By engaging in user generated content, users get unavoidably more and more involved in commercial value chains. Schroll et al. (2007) therefore look at UGC-platforms as e-commerce platforms involving customers, who offer goods themselves or help to shape services (rating, tagging etc.).

Schroll further explains: "The productivity of the users is manifested in user generated contents and thus becomes a part of the value chain too. Even the mere internet activity without intended 'value creation' results in a clickstream which can be used as a valuable source of market research, user profiling and highly specific ad targeting. The user's social capital in the digital realm of Web 2.0 consists of three value sources: contacts, content contributes and clickstreams. In the participatory environment of Web 2.0 **the risk of 'triple exploitation'** is rising. The platform provider e.g. knows how to use the 'social graph' for viral marketing, how to use the user's contents for free and how to 'wiretap' the user to enable behavioural targeting" (Willi Schroll, expert communication). These platform providers can further "accelerate the number of active participants and the quality and attractiveness of their contributions if they provide services and tools for content production to these prosumers. This is a key element in harnessing the technologies to achieve the successful implementation of the business model on UGC-platforms" (Antonio Moniz, expert communication).

Arikan and Erdoğan (2008) describe the typical Web 2.0 business model highlighting the role of advertising: "Many web services today base their business models on capitalizing on [..] the creative capacity of their users, through sophisticated advertising networks while positioning the user as both the producer and the consumer of content. The service cycle is familiar: service provider facilitates social use, user produces content, content generates traffic, traffic attracts advertising revenue for the service. A similar description can be found in Allen (2008).

Kleemann et al. (2008) understand these new platforms as free access markets: This means that "companies activate markets but charge nothing for entry. Access to these markets is open and free of charge to 'sellers' and 'buyers'. Sometimes market participants culminate their activity in an economic transaction, but more common is the exchange of goods and services – such as information or advice – free of charge. Site owners may be commercial enterprises but they get only derivative income from their sites, prototypically through advertising."

5.1.3 The risk of "exploitation" and the privacy threat

Sooner or later users may feel "exploited" by big companies and might expect remuneration for their voluntary and their indirect contributions. The question is if and how this free labour should be remunerated. Some may argue that the user is already getting compensated by using the service for free in exchange for exposure to advertisement.

Others may hold that micro-advertising could be an adequate answer (cf. also 5.2 on the micropayment issue). For example YouTube shares advertising revenues with users. But the criteria for distribution may be intransparent and the amount of revenue which is channelled to the authors may be regarded as too low. Petersen (2008) for example criticises Google's AdSense micro-advertising scheme which can be implemented on blogs for creating only limited revenue for bloggers: "In the third quarter of 2006, one billion dollars went into Google's AdSense program, out of which 780 million was shared with those implementing AdSense on their blog. The majority of this shared revenue goes to a minority of large sites, and the majority of bloggers earns close to nothing… ".

Arikan and Erdoğan (2008) hold that "in order for the production cycle to sustain itself in the long term, there should be compensation for producing the content as well as using the service for free", and they propose a "User Labor Markup Language" (ULML) to express the metrics of user participation in social web services as a basis for transparent remuneration. Of course this proposal leaves open how the value of a specific contribution might be determined. In any case "unpaid labour" is an issue coming to the fore.

The increased flow of personal information through Web 2.0 applications (clickstreams, personal profiles, behaviour) is used and might be abused for commercial (and surveillance) purposes. Capturing the information flowing across Web 2.0 may support personalized advertising, may support personalisation of content on UGC platforms and may help search engine providers to know more about user needs and to deliver more relevant and meaningful results. However it requires the widespread monitoring and aggregation of a user's online personal and intellectual activities, bringing with it particular externalities, such as threats to informational privacy while online (cf. Zimmer 2008a-b).

The five most popular search engines for example routinely archive a user's search terms, their computer's address, and the unique identifier for their Web browser for 13-18 months. The more personal information is given and the more activities are linked to the identity of a person the higher the risk of abuse. One of the experts hinted at the risk that Search engine providers increasingly archive more than just search terms. "But as they add more and more services to their suites of products (including many Web 2.0-styled products), a larger array of personal information potentially gets swept into their logs of user activities (especially when unified user accounts are required). For example, Yahoo! could potentially cross-reference a users' search terms with their del.icio.us bookmarks or their photos (and comments) on Flickr. Google could do the same with user's activities on YouTube. As more and more Web 2.0 start-ups get swallowed up by the large Web search players, they gain the ability to aggregate even more personal information" (Michael Zimmer; expert communication).

The so called Article 29 Working Group in its opinion on data protection issues related to search engines also points to the fact that most "search engine providers offer other services, such as e-mail, desktop search and advertising on third party websites and services. These services generate user data, which can be correlated and used to enhance existing knowledge about users of the search engine. The user data and possible profiles can also be enriched with data from other sources, such as geolocation data of IP addresses and demographical data" (Article 29 Working Group 2008, p.27). In the light of the European Data Protection Directive the following requirement has been formulated: "Cross-correlation of data originating from different services belonging to the search engine provider may only be performed if consent has been granted by the user for that specific service" (ibid, p. 26).

The low awareness of privacy issues in the younger generation (Fallows 2005), the additional threat of spyware and a lack of consumer rights to change and delete profiles increase the general risk. Advances in Privacy Rights Management (PRM) might turn out to be at least as important as fair Digital Rights Management (see Korba and Kenny 2002 for a proposal to combine PRM and DRM).

5.1.4 Challenges for media professionals and media industries

A more general view on the impact of Web 2.0 on media professionals reveals possible consequences of online advertising to the detriment of quality journalism. This hypothesis is held for example by Nicholas Carr:

> "As user generated content continues to be commercialized, it seems likely that the largest threat posed by social production won't be to big corporations but to individual professionals – to the journalists, editors, photographers, researchers, analysts, librarians, and other information workers … " (Carr 2008, p.142).

The main reason draws on the increasing importance of advertising. Different from ads in e.g. traditional newspapers, on the Internet ads may go together with specific articles depending on the content on the article. Articles which are closer to products and services are more likely to be supported by advertising, while well done articles about nasty realities are less likely to attract advertising and do generate less advertising revenues. "The most successful articles, in economic terms, are the ones that not only draw a lot of readers but deal with subjects that attract high-priced ads. And the most successful of all are those that attract a lot of readers who are inclined to click on the high-priced ads" (p. 154). This link between content and ads may in the long run decrease the demand for talented journalists and a decrease of newspapers' quality. The more newspaper publishers are forced to migrate to the Internet to get a share from advertisers, the more this effect may come true.

We have to add that the trend to substitute knowledge work by programming is a more general one. A recent example is the web-tracking service announced by Google which comes as a competitor to Web-measurement firms, like ComScore or Nielson Online, who largely rely on panels of web users to gather data, which are then extrapolated and used by advertisers determining how to spend their advertising money. Google is said to combine panels and server-based data and to complement its service by ad-effectiveness tools taking into account measures such as search activities and site visits (cf. Steel 2008). Eventually even the advertising business is losing control to Internet technology. This leads to the next observation of an enormous increase of automated media production.

When considering the impact of Web 2.0 on media professionals, it is worth also to take into account the debate on the "creative class", which underlines the importance of local environments for the production of creative content. The term "creative class" was popularised by the former Hirst Professor of Public Policy at George Mason University, Richard Florida in a book of the same title (2002). According to Florida, human creativity is possibly the decisive source of competitive advantage and thus he focuses his attention on a whole "class" of knowledge workers including researchers and others whose main function is to create new ideas, new technology and new creative content. According to Florida, cities are the key economic and social organizing units of the creative age. They promote economies of scale, incubate new technology, and match human capital to opportunities, ideas to places, and innovations to investment. Among the components of infrastructure important for this development are "high-tech poles", i.e. universities, training colleges and companies serving the creative sector's needs (KEA 2006, p. 167).

Recent years have seen a profusion of reports on the creative and cultural industries worldwide, produced by or on behalf of major cities or regions seeking to position themselves as "creative hubs". The local component, including the use of local language, makes the sector overall less susceptible to off-shoring. However, due to the international nature of the markets, not only do "creative hubs" target international markets, but the local markets are exposed to international competition. European "hotspots" exist for example for video games in the North-East of Scotland or the Nordic Countries and for movies in Spain, France, and to a lesser extent in Germany.

The effect of Web 2.0 on "creative hubs" is probably twofold. On the one hand creative cooperation at the local level can be supported, and the fuelling of creative content into global distribution over the Internet becomes easier. Despite the "disappearance" of space and time due to information and communication technologies, favourable environments and infrastructures will still lead to the concentration of creative activities in such cities as London, New York or Paris. On the other hand, although it is maintained that environments still play a major role, the role of the local infrastructures is diminishing through such tools and in the end there might also be a decrease in the importance of location as an environment. This is an issue well worth examining when devising policies seeking to boost local development.

A consequence of Web 2.0 technologies and even more the realization of the semantic web (cf. Chapter 1 on Technologies, especially section 1.2) is a trend towards automated or semi-automatic media production with consequences for the labour market in the media sector. Software programmes can build on the expanding universe of original content, to which user generated content and other content made freely available (e.g. public domain, public sector information) significantly contribute. These programmes are able to bundle and personalize, i.e. select, existing content on the net. Search engines and all other machines which harvest and re-purpose content from the Internet are instances of this development. Secondary media, as we call those media which do not build on proprietary content, have no need for authors.

What they need are first of all programmers – at least until a service is established and operational, but probably beyond this point. In principle personalized radio or TV stations like P2P-Filesharing-Networks or User Generated Content Platforms can operate worldwide offering personalized services without almost any employees to produce, edit and enrich content.

One of the experts we asked to comment on the semantic web gave the following example: "Radio stations on the long tail live on the fiscal fringes of existence. Their main problem is to keep the station going while personnel running the station is not always available and a high quality radio station that defies the taste of the masses (and in sum there seem to be more niche hearers than masses) requires an elaborate programme. Sharing the data for such global-local programmes requires open formats such as those defined by Semantic Web technologies. Core assets are linked data and harvesting data from existing formats" (Steffen Staab, expert communication).

In other words radio stations and TV stations producing content or purchasing content from production companies as well as production companies have to expect hard times and may also tend to include more and more "recycled information" in their portfolio.

5.1.5 Bottom-line

The success of search engines providers and companies maintaining user generated content platforms implies new business models and power relations between media companies, advertisers, technology companies, especially search engine providers, and prosumers which are worth further monitoring and analysis to better understand the social mechanisms at work. Next the impact of these developments on the labour market in the media sector, especially with regard to small content creators, small and medium sized production firms and "creative hubs" are worth further investigation. Last not least consequences of the involvement of prosumers in the value chain of Internet media require further reflection on adequate compensation, fair revenue sharing, and protection of the users' privacy.

5.2 The Quest for (Micro)payments in Web 2.0 Environments

Although "free content" and advertising based business models dominate the World Wide Web today, and as a lot of payment schemes exist, the quest for new payment schemes and a micro-payment infrastructure is not obsolete and may gain renewed importance in the near future, because current schemes do not support a wide enough variety of content, do not support payments to small content creators and person to person payments sufficiently. In the medium term, current interpersonal payment systems may develop towards more cash-like P2P payments. There is a need for policy to monitor these developments, to analyse the low value payment issue from a societal perspective and to reflect again the regulation of prepaid low value payment schemes.

5.2.1 Alternatives to micropayments in Web 2.0 environments

The controversy whether micropayment systems are necessary for content creators and distributors of creative content to flourish was once a kind of evergreen. In the times of Web 2.0 however, attention to the subject is decreasing as a look at prominent e-payment sites (ECB's payment pages, PaidContent.org, pamentnews.com) is able to show. Under the impression of new business models relying on "free content" and indirect revenue streams, and in particular under the impression of the enormous increase of online advertising as a means to generate revenues for content providers, the micropayment question has lost interest. Some analysts have already concluded that the quest for micropayments is irrelevant: "The early Internet dream of nearly frictionless purchases of sub USD 0.75 content has been made irrelevant by free content and the ad-supported revenue growth that powers the best free content sites as well as the growth of search giant Google (Mercator Advisory Group 2007).

However, not long ago ISTAG, the IST Advisory Group of the European Commission stated:

> "[T]here is still some inconvenience as there is no international payment infrastructure for smaller payments. In this field, national borders still matter in Europe, and thus the demand for something like a unified European payment infrastructure for small payments remains. The European content market would gain from this type of infrastructure as well as from the adoption of standards for micro-payments." (ISTAG 2007, p. 22)

And ISTAG gave the recommendation: "Support the development of cross-border micropayment standards and infrastructures" (ibid). EPIS a European Project led by the IPTS of the Commission's JRC in Seville, also observed the "absence of suitable standards for micropayments" (Mateos-Garcia 2007c, p. 18), and the Commission staff working document accompanying the Communication on Creative Content Online in the Single Market also expressed concerns that without easy micropayments the development of digital media on the internet might be hindered (EC 2008c, p. 22).

We tend to think that the demand for dedicated micropayment systems has indeed decreased. Even advanced second generation micropayment schemes (Párhonyi et al. 2005) like Peppercoin or Bitpass have had to cease operation. One reason is that niche products of a prepaid type have been developed. We can think of two-party systems where prepaid cards are bought in shops as in the case of Microsoft with its Xbox Live platform or multiparty schemes issued by a bank like "paysafecard" (which is now active in 10 European countries). A second reason is the increased willingness of traditional payment providers to also process low value payments. Providers of traditional payment instruments, especially credit card companies, and intermediary payment service providers like Click&Buy or Paypal are now capable and willing to process even small payments below 1 Euro. We agree with Gartner's vice president Avivah Litan's assessment that if "demand for micropayments gets big enough, Visa and MasterCard will lower their rates to make single-card transactions more economical" (The Mercury News 2007). In other words, statements about too high transaction costs for micropayments by e.g. credit card companies should be interpreted with caution. Credit card companies like other powerful financial intermediaries should be able to come up with a portfolio of payment instruments including those suitable for micropayments.

The question remains to what level transaction costs for micropayment can come down in an online environment. For one expert "the hope to have a cheap micropayment system seems unrealistic as payments are - to some extent - a fixed costs business. Therefore, it is inevitable that costs for low value payments have to be relatively high" (Malte Krueger, expert communication). Another expert fears that "credit card companies subsidise these low-value payments by charging higher fees for normal-value payments, and by doing so push credit cards into a market that is not their 'natural' market" (Van Hove, expert communications; see for this argument also Van Hove 2007).

David Birch (expert communication) introduces the argument that limited value electronic purse and micropayment schemes could be provided to a wider market had they a lower price. He sees a tension between anti-money laundering (AML) and "know your customer" (KYC) regulation and cheap, simple, and effective pre-paid payment schemes. The negative effects of KYC and AML on transaction costs and the barriers to market entry might be overcome: "Perhaps a rebalancing to allow 'light touch' regulation with exemption from more stringent KYC regulation would mean that limited value electronic purse and micropayment schemes could be provided to a wider market at a lower price.

Subscription models present an alternative to pay-as-you go approaches. The implementation of subscription services makes it possible for customers to subscribe to streams of incremental releases on a periodic basis or to the entire content of a database. However, it has been noted that "the relative lack of success of … subscription services (compared to, for example, the iTunes Music Store download model) might cast doubts on the extent to which this model appeals to customers who prefer to 'own' the content they download" (Mateos-Garcia et al. 2007c, p. 18). The fact that in some cases access to the content acquired through subscription services is lost if the user decides to cancel membership appears as a drawback of this approach. Some content providers now foresee that at the end of subscription part of the content previously used will become the property of the user.

In order to increase the attractiveness of subscription services bundling a broader range of services has been proposed, e.g. bundling "music with other services or devices – be it an ISP subscription, a mobile phone or a portable player. While the music comes virtually 'free' to consumers under this model, record companies and artists get paid out of the sale of services or devices" (IFPI 2008, p. 14).

This strategy of bundling is just one example of the many business models targeting indirect revenue streams. Self-promotion of artists aiming to sell more tickets for their live performances, merchandising once a certain degree of fame has been reached, or simply capturing valuable usage patterns for market research purposes belong to this strategy.

The urgency of micropayment solutions is apparently reduced by web advertising which has developed enormously in many fashions. This should come as no surprise an expert exclaimed: "The idea that the free provision of goods over the internet is somehow 'unnormal' and would be corrected in due course, has been false from the start. For instance, paper-based provision of information has always had a high percentage of financing through advertising. Thus, we can expect that advertisement will remain important also on the Internet" (expert communication, Malte Krueger). The general increase of online advertising stimulated by broadband penetration is very obvious in the following statement:

> "Broadband growth is also stimulating Internet advertising. Broadband users spend more time online than dial-up users do; they buy more products online; and use search engines to visit more Web sites. Broadband users are also converting the Internet into a medium for social networking and entertainment. Advertisers are following users and going online. We project global online advertising to expand at an 18.3 percent compound annual rate to $73 billion in 2011 from $32 billion in 2006. Internet advertising and access spending as a whole will increase to $332 billion in 2011, growing at a 13.4 percent compound annual rate from $177 billion in 2006" (PWC 2007, p. 37).

In the context of micropayments, relevant methods are: "pay-per-pageview banners" (Yahoo!), "pay-per-click" text ads (Google), "pay-per-transaction" (Amazon), "pay for inclusion in search results", "pay for listing in information services", "pay per post" (product placement), "pay-per-connection on social network sites" like MySpace (cf. Anderson 2008). "All of these approaches" as Chris Anderson points out "are based on the principle that free offerings build audiences with distinct interests and expressed needs that advertisers will pay to reach" (ibid.) In other words, in many cases ads function as a viable alternative to micropayments.

5.2.2 Signs of a renewed interest in micropayments in Web 2.0 environments

Dave Birch, director of Consult Hyperion, admitted in his statement (expert communication) that many new content businesses have simply abandoned the idea of using payments at all focusing on various advertising-supported and advertising-related business models, which are "clearly dominant at present". This, however, does not necessarily mean "that these business models will continue to be dominant in the future. They may not, in the long run, support a wide enough variety of content to continue the process of innovation and experimentation that has formed the online environment that we know today." Therefore, a resurgence of interest in more sophisticated micropayment schemes in the future should not be excluded (expert communication; cf. also Birch 2008).

Greg Golebiewski of Znak, a more recent micropayment scheme, holds that the demand for micropayment schemes in the "premium content" would be evident. In his opinion quality, reliability, exclusivity, anonymity, privacy, and ad-free content are values for which people are willing to pay if an easy-to-use system were in place. He thinks of copyrighted art, exclusive interviews, research reports, individualized advice, reviews and online testing, news portals, popular weblogs of political or non-profit organizations, lots of entertainment portals, interactive game portals, and some of the social network sites (cf. Golebiewski 2008). We see the argument, but as long as we miss widespread deployment of payment schemes of this kind, the argument remains somehow weak.

Martin Springer, an expert engaged in the Digital Media Project (led by Leonardo Chiariglione) agreed that the demand for dedicated micropayment systems has decreased, but drew attention to the point that "small and independent creators would benefit more from a micropayment infrastructure implemented like the World Wide Web based on Open Standards and Open Source" (expert communication). He can imagine a "framework for paying creators directly". At present the de facto interests of major economic players however would not support such an approach:

> This type of micro payment infrastructure however can neither count on network operators, nor Web 2.0 services, nor intermediaries. Network operators (e.g. Deutsche Telekom) and major providers of Web2.0 services (e.g. YouTube) control the access to the networks. For them flat-rates for services, proprietary subscriber management and billing systems, and advertising for content are viable business models. Intermediaries, like collective rights management societies won't like it, because a framework for paying creators directly would make them redundant, and also major labels, large studios, and major service providers won't like it, because at the moment it's them who collect the money and redistribute it to the Rights-holders. If consumers and creators could negotiate the rights directly, the middlemen would lose their power. Therefore I think that the powerful interests to bring this about are just the interests of consumers and (small and independent) creators. If you like, it's the same interests that brought about the WWW as an alternative to CompuServe and AOL (Martin Springer, expert communication).

Obviously, some would still prefer a good micropayment system to micro-advertising. The demand from creators, consumers, and premium content providers however is apparently not strong enough today, to allow a take off of micropayment schemes. This however does not exclude that this vision may revive sooner or later.

5.2.3 How new micropayment systems might emerge

Those assuming that a new micropayment infrastructure is feasible, have to answer at least the following three questions:

- How will the new system or infrastructure avoid the drawback of earlier micro-payment schemes, namely the high "mental transaction costs" (Shirky 2003) and the "huge psychological gap between 'almost zero' and 'zero'" (Anderson 2008)?
- How can we be sure that this new payment infrastructure will be cost efficient, and who is going to pay for the infrastructure?
- Where are the points of departure in current practices and along which paths can we imagine the emergence of new payment systems?

There are three answers to the last question: One potential answer is that web users are increasingly also the content providers and, as such, they are obviously less willing to give their contributions for nothing (see also Chapter 5.1.on exploitation).

One starting point to make tiny payments attractive could be a playful type of electronic cash for donations, as a gift, as a way to say thanks for great content, as a simulation of real cash in virtual worlds. "Linden Dollars", the currency of "Second Life" might be taken as an example – even if the most common way to purchase Linden Dollars is via credit cards or a Paypal account. It's a phenomenon in its own right resembling early attempts to create true electronic cash. What makes visions of "private money" unlikely to come true, however, is the risk of being cracked. In addition when these payment instruments become economically important, central banks and banking oversight usually intervene turning the fun into a banking or ELMI-business.

Another option may start from current electronic interpersonal low value payment systems and lead to – given further innovations - new types of pre-paid electronic accounts (perceived as electronic cash). Assuming a "'light touch' regulation" (see above) it might become "profitable to provide inexpensive pre-paid accounts to the general public with zero transaction costs. If this could be delivered in a simple implementation (almost certainly involving mobile phones) then it might make a 'one euro, one click' low-end transaction viable over the Internet and mobile channels. The goal would be to have one pre-paid account that I could use to send my brother the 50 euros I owe him by using a menu on my phone or an SMS or something, but also to be able to send the person who wrote the great blog I am reading a Euro by clicking on a button or something" (Birch 2008).

A third option starts from the assumption that producers of user generated content become increasingly aware of their role in the value chain of media and Internet companies and may ask for a fair share of revenues for their contributions.

5.2.4 Bottom-line

It is true that there is a lack of interoperability, of cross-border standards, and of a common infrastructure for dedicated micropayment schemes. It is also true that the quest for micropayments has lost momentum for various reasons: first because providers of traditional payment instruments and payment aggregators are capable and willing to process even small payments, second because of subscription models, third because business strategies relying on indirect revenue streams have become more widespread, and especially because online advertising has developed as an efficient revenue generating mechanism for some content providers.

While current business models may benefit network operators, web 2.0 platform providers, search engines, distributors like iTunes and other intermediaries of digital content, there are doubts that these are models for all content producers and distributors. The assumed demand of prosumers on UGC-platforms, professional content creators and premium content providers altogether is still insufficient to alter the current situation. This may change when creative users start to ask for payment for their contributions, when shortcomings of ad-supported business models (e.g. privacy risks) become more apparent, when technological innovations and a more lightweight regulation of prepaid payment schemes may bring about more cost-efficient and more user-friendly micropayment solutions for P2P, P2C, and B2C low value payments.

Policy might reconsider regulation of prepaid payment schemes, should analyse more deeply the legitimate, societal (?) demand for an interoperable micropayment infrastructure and more cash-like payment schemes on open networks, address the issue of interoperability of payment and billing schemes offered on converging networks, and monitor innovations in the field.

5.3 Digital Rights Management Technology and Copyright Policies in Web 2.0 Environments

Forensic DRM technologies identifying content, tracking and tracing are gaining importance on Web 2.0: first as a supportive technical mechanism within business models which sell "DRM-free" content but want to control circulation of copies and curb infringement of copyright; second as a means intended to avoid uploading of unauthorized copies. Also mere access providers are expected to apply this type of forensic DRM technologies for "filtering".

As Web 2.0 facilities are enabling and encouraging everyone connected to the Internet to engage in content production and dissemination and to re-combine and re-configure existing media content, some current copyright provisions are under pressure. Copyright policies should stimulate creativity and innovation instead of stifling it. Hence proposals to go for a wider spectrum of legitimate "transformative uses" are under discussion. At the same time the de facto empowerment of creators on Web 2.0 has created a demand for convenient mechanisms to express rights to be granted and those to be denied in this environment. The Creative Commons approach is pertinent in this context.

5.3.1 Introduction

Management and exploitation of intellectual property rights (IPR) has always been an essential issue in modern market societies, but with digital technologies, digital media, and in particular networked electronic media the whole "copyright system" has come under pressure and the established rules and institutions may no longer work well in the new environment. The "copyright system" refers to rules and regulations with respect to access and use of content. The rules may be legally coded, may stem from codes of conducts, from customs and practices etc. and are backed and enforced (or disputed) by institutions and organisations such as legislation, collecting societies, courts, industrial associations, NGOs etc. No doubt, as one expert said, "a new balance needs to be struck between the need of society and individuals to get free access to the information and being allowed to use it without limitations and for creators to have their works protected" (Niels Rump, expert communication).

Digital-Rights-Management technologies in this context can be understood as computer technologies supporting copyright policies. They are new technological elements introduced in the "copyright system". Understanding DRM technologies as supportive to copyright policies enables us to ask if the technologies contribute efficiently to the balance mentioned above or if they strengthen unilateralism (cf. Böhle 2006). In this way we also avoid undue criticism of DRM-technology, which is often just criticism of the exploitation strategies of major industry players. A narrow criticism of this kind dismisses the potential of DRM-technologies to empower the original creator and artist. It may well be in the self-interest of artists and creative users to control usages of their works to a certain extent (IVIR 2006, chapter 6).

This policy-oriented approach to DRM technologies does not say much about DRM technologies. We deliberately talk here of "DRM technologies" and not of "DRM systems". This openness with respect to what DRM technologies are has some advantages over more specific definitions, especially when it comes to discussing DRM in Web 2.0 environments: This way DRM technologies are not restricted to a particular class of DRM technology, namely Technical Protection Measures (TPM) aimed to *enforce* rights and to *protect* content from unauthorized access and use.

This approach opens a broad spectrum of DRM technologies serving copyright policies. Paolo Nesi, coordinator of the FP6 project AXMEDIS, compared the copyright system with the traffic system. As we have traffic signs, speed bumpers, and sometimes policemen who give us a warning or a ticket, we may have a series of technical and non-technical measures in the copyright system (Paolo Nesi, expert communication).

At one end of the spectrum of technical DRM measures, we position encryption based TPM, and at the other end we find what Paolo Nesi terms "gentle or educational DRM" Gentle DRM (GDRM) corresponds to the signals on the street simply informing about the rules without actually enforcing them. In this analogy, technologies like fingerprinting, watermarking, monitoring correspond more or less to the policeman (expert communication). We feel that the expression of rights in a computer readable way (think of meta data and markup languages, e.g. ODRL, XrML, ccREL) should already be regarded as DRM technology. Following Limonard and Esmeijer DRM technologies increasingly rely on metadata (2007, p. 89).

Attempts to "protect" content by means of Technical Protection Measures (TPM) have often led to a negative balance of value considerations caused by restrictive conditions of use or by violation of established rights harming consumers and citizens. A lack of acceptability of protected digital content was the consequence meaning a notable setback to the success of creative industries in the digital environment. These concerns can be found in the results of consumer surveys on DRM (e.g. INDICARE 2005, TU Darmstadt/Spiegel Online survey quoted in Online Musikmarkt 2007, Olswang 2007, Wiggin and EMR 2008), in statements of consumer organisations and civil rights NGOs (e.g. BEUC, Transatlantic Consumer Dialogue, EFF) and in the scientific literature (e.g. INDICARE 2005, Gasser and Ernst 2006; Kuhlen 2008, 157-164, Helberger 2005, 2006, Bizer et al. 2005, Screen Digest et al. 2007, Böhle and Orwat 2006). We will not go into further detail here, but move on to the more specific role of DRM technologies in Web 2.0 environments.

5.3.2 Concept and applications of forensic DRM in Web 2.0 environments

Since restrictive DRM technologies have often failed to facilitate viable business models for digital content in the B2C segment, there is a search for unobtrusive, convenient, reasonably priced services with modest and acceptable restrictions imposed by DRM systems. The current debate about DRM is taking place in particular under the impression of a move by major music labels to abandon encryption based strong DRM and the growing importance of user generated content platforms and social networking sites to which users upload audiovisual content. (Note that in the following quotes "DRM" and "DRM-free" refer to strong, encryption based DRM technologies not to DRM technologies in a broader sense.)

The question whether the music industry can prosper without strong DRM was introduced into the discourse on media industries by ICT-companies not long ago. Rob Glaser, chief executive of RealNetworks which runs the Rhapsody subscription service said in the context of the MIDEM music conference in Cannes last year that in fact DRM might be abandoned: "It will happen between next year and five years from now, but it is more likely to be in one to two years" (Shannon 2007). Steve Jobs, the CEO of the most successful music-platform for DRM-protected content, iTunes, suggested media companies should reconsider the use of DRM, because in sum "… DRMs haven't worked, and may never work, to halt music piracy" (Jobs 2007). Since then the EMI Group PLC and successively all the other major labels have started talks with several online retailers about the possibility of selling their entire digital music catalogues in unprotected MP3 format. Today "DRM-free" music is commonplace.

This does not automatically mean that "DRM-free" content to be paid for will automatically sell much better. Users' preferences may change unexpectedly. In times when there were no signs that major labels would be willing to license their content without DRM, surveys said that users were willing to pay considerably more for DRM-free content, while two years later the willingness to pay more for DRM-free content has decreased considerably (cf. INDICARE 2005, p. 26, 29; Online Musikmarkt 8.2.2007; Olswang study 2007; Rosenblatt 2007, 2008).

What we observe in digital content markets is consequently a shift from DRM-technology as "containment" of content to forensic DRM, i.e. methods to identify, track, and trace the content and/or the owner of the content. The word "forensic" usually refers to criminalistic methods helping to provide prosecution evidence. Digital watermarks and acoustic fingerprints are maybe the most prominent technologies in forensic DRM, but not the only ones (for a short introduction see Textbox 6).

Textbox 6: Forensic DRM / identification technologies

Digital watermarks or watermarking respectively "refers to the imperceptible, robust and secure embedding of a given amount of information (which is called watermark) in a digital multimedia (User centered media). Watermarks can be used for different purposes that may include information about the copyright owner, the distributor, to identify the purchaser of content. "The applications of watermarking range from copyright protection, labelling, monitoring, tamper proofing to conditional access". Watermarks can be placed during production or distribution. Watermarking could be used to encode all types of information but it is not designed to directly regulate the use or non-use of content (enforcement).

Fingerprints in computer science are unique identifiers of original data. Fingerprints (typically hash codes) of files are generated from the binary data contained in a file. While a hash code identifies a particular file, an acoustic fingerprint identifies an audio recording. An acoustic fingerprint is very different from a hash code. An acoustic fingerprint is a unique code generated from an audio waveform. A robust acoustic fingerprint will be based on the perceptual characteristics of the audio. If two files sound identical to a human listener, even though their binary data differs, their acoustic fingerprints should match. Depending upon the particular algorithm, acoustic fingerprints can be used to automatically categorize or identify an audio sample A robust acoustic fingerprint will allow a recording to be identified after it has gone through such compression, even if the audio quality has been reduced significantly. Robust acoustic fingerprints are also immune to analogue transmission artefacts, enabling radio broadcasts to be identified.

Another approach is the "**Light Weight DRM**" (LWDRM) developed by Fraunhofer back in 2003. In this system a user registers with a certification authority (CA) for a digital signature, which it then embedded in files when the user makes copies. This binds the user's identity to the file in a way that is virtually impossible to alter or erase.

Sources: http://en.wikipedia.org/wiki/Acoustic_fingerprint
http://en.wikipedia.org/wiki/Digital_watermarking
DRM Watch Staff (2003)

There are further identification technologies: Sometimes, metadata is included in purchased music which records information such as the purchaser's name, account information, or email address. This information is not embedded in the played audio or video data, like a watermark, but is kept separate, but within the file or stream. As an example, metadata is used in media purchased from Apple's iTunes Store for DRM-free as well as DRM-restricted versions of their music or videos. This information is included as MPEG standard metadata (Breen 2007).

Despite the advantages of forensic DRM, the privacy risk is very visible. As an observer comments: "If a move to watermarking is made, and if that move ever comes to include embedding personally identifiable information in music for the purposes of suing citizens, then the decision to drop DRM won't be nearly as enlightened as we all hope that it is. There may be a place for watermarking in the music business, but not if it's meant to ratchet up the fight against file sharing by making it easier to sue people" (Fisher 2008).

5.3.3 Liability of service providers and forensic DRM

We distinguish two basic types of service providers in the area of digital content on the Internet: Internet Service Providers (ISP) who provide first of all access – also to websites of P2P services, and Host services, which provide first of all content of third parties. Platforms for User Generated Content belong to this type. They can be distinguished from online shops providing third party content (e.g. for music iTunes, for e-books ciando). The distinction between these services is not as clear as it may appear at first glance.

The essential question was once whether host services are to be treated as publishers, and thus liable for content on their servers, or similar to Internet Service Providers (OECD 2007a, p. 49f). But in reality things are more complicated as the lawyer Laurence Kaye (2007) states: "As the world of 'intermediaries' becomes more diverse - from ISP's and web hosts to social networks, virtual worlds and other online platforms - rules about intermediary liability will cease to be 'one size fits all' and will become increasingly granular, reflecting their different role." (Kaye 2007).

Despite the diversity there seems to be a common trend - due to increased pressure on these intermediaries - to implement identification technologies. The expectation is obviously that these measures will help to reduce copyright infringement. At least one empirical study supports the presumed rationale. The EMR/Wiggin study about illegal downloading and file-swapping showed that 70% of respondents would stop downloading unauthorized content if they were contacted by their ISP (even though 68% agreed that "it's very unlikely I will be caught") (cf. Wiggin and EMR 2008, Rosenblatt 2008).

In the words of Kaye: "the combined weight of Court cases and self-regulatory 'softlaw' such as industry codes and statements of principle makes it more likely that all intermediaries will need to use filtering technologies and the like to benefit from legal immunity" (2007). In the same vein a paper produced by the "User Centric Media Cluster of FP6 projects", coordinated by the Networked Media Unit of the DG Information Society and Media, states that "one of the main issues in the discussion on liability is the effort service providers make to ban copyright infringement and (repeating) infringers. This requires either moderating before publication or banning copyright infringers after notification by copyrights holders. The first option requires a major effort; the second one requires a strong identity management (EC 2007c, p. 45f). Nevertheless the liability debate with respect to ISP and with respect to hosting services follow different paths, and as Natali Helberger explained "the extent to which intermediaries can/should be held responsible for filtering is far from concluded" (expert communication).

On the liability of ISP

The restricted immunity of service providers and the shift from passive to active immunity in the context of legislation and jurisdiction in Europe are explained in the words of Kaye (2007) in Textbox 7 (next page). This information may serve as background information, when we turn to the French approach and its implications.

Textbox 7: Liabilities of ISP in Europe as seen by Laurence Kaye

From passive to active immunity for service providers

The Belgian ruling in SABAM v Scarlet is a sign of the times for ISP intermediaries. The Belgian court decided that Scarlet (now known as Tiscali) should put into place technological measures to identify infringing content distributed peer to peer via its service. This effectively placed the burden on Tiscali to vet third party content - a burden from which it had assumed (along with many other ISPs) it was exempted by virtue of the E-Commerce Directive or the Copyright Directive. The Belgian court decided that it was not inconsistent with either Directive to oblige ISPs to use such technological measures. Now not all Courts will follow this decision, but it is a sign of the times.

[…]

And intermediaries still in the firing line, even if immune from claims against them

The current exemptions in Europe for intermediaries for 'mere conduit', 'caching' and 'hosting' are in the E-Commerce Directive and there is a 'copyright-specific' exemption for ISP's in the Copyright Directive. As we've just noticed, the current trend - at least from the content owners' perspective - is to interpret these rules as requiring a more active role from the intermediary. Due to doubts about the scope of current rules, ISP immunity for carrying illegal peer to peer traffic is being reviewed.

But even if the immunity applies, those current rules still allow rights owners to seek injunctions against intermediaries as a way of getting at the infringer, even though the ISP is immune from damages claims. It's worth quoting the E-Commerce Directive on the point: *"The limitation of liability of intermediary service providers established in this Directive do not affect the possibility of injunctions of different kinds; such injunctions can in particular consist of orders by courts...requiring the termination or prevention of any infringement, including removal of illegal information or the disabling of access to it."* (Recital (45).

Another issue is how the issue of liability fits with privacy rules. The E-Commerce Directive nobly states that its implementation should be made in full compliance with the Data Protection Directive*, "...in particular as regards the liability of intermediaries."*

Source: Kaye 2007

Regarding ISP liability the French approach is very controversial. France is in the process of enacting an "Internet and Creation law" that will require ISPs to implement technologies for detecting potential misuse of copyrighted works through technologies like fingerprinting and watermarking. It comes with a graduated response approach or "three strikes" scheme.

A newly-created independent authority, entitled HADOPI (Haute Autorité pour la diffusion des oeuvres et la protection des droits sur Internet), is to be responsible for issuing warnings and potentially cutting Internet subscriptions in cases of infringements. At the request of rights holder, HADOPI will have the power to demand from ISPs the identity of copyright-infringing computer users, followed afterwards by a three-step process. A warning by email will be first sent, and in case the infringements persist, the warning will be sent by registered letter. For the third infringement, HADOPI will be entitled to cut the Internet access of the user for three up to 12 months. This period may be shortened to one to three months if the infringer commits to stop the alleged illicit downloading (EDRI 2008).

The European Parliament urged governments not to authorise shut-off of internet access in cases of suspected copyright piracy. The subject of the vote, an own-initiative report on promoting European cultural industries by French Socialist Parliament Member (MEP) Guy Bono, "has stirred up a hornet's nest of debate over the liability of internet service providers for online infringement" (EDRI 2008). While the report was adopted with great majority (by 586 votes in favour to 36 against), the vote on amendment 22 to request member states not to authorise shut-off as part of the graduated response to fight copyright violations was less clear. 314 votes in favour and 297 votes against the amendment demonstrate the ongoing unresolved political conflict in this matter, a conflict very likely also between European Commission and European Parliament.

The strongest arguments against this approach are the disproportionality of a shut off, and the inaccuracy of the technology employed to identify copyright infringements. Cory Doctorow, one of the experts we talked to, nicely explains what a shut-off could mean: "In the past week, I've only used the internet to contact my employers around the world, my MP in the UK, to participate in a European Commission expert proceeding, to find out why my infant daughter has broken out in tiny pink polka-dots, to communicate with a government whistle-blower who wants to know if I can help publish evidence of official corruption, to provide references for one former student (and follow-up advice to another), book my plane tickets, access my banking records, navigate the new Home Office immigration rules governing my visa, wire money to help pay for the headstone for my great uncle's grave in Russia, and to send several Father's Day cards (and receive some of my own)" (Doctorow 2008; by the way the "European Commission expert proceeding" probably was confused with this STOA project). The French consumer organisation UFC-Que Choisir pointed out that cutting of Internet access is not only affecting the suspect, but potentially the whole family (cf. L'UFC-Que Choisir 2008).

Tech savvy analysts from DRM Watch warned that current techniques used by anti-piracy service providers "are flawed and can lead to significant numbers of false positives. Better techniques are needed before it is reasonable to enshrine this type of approach into law" (DRM Watch Staff 2008). They substantiate thei assertion with findings from a recent empirical study by the University of Washington (Piatek et al. 2008). False positives is also one of the main concerns of Cory Doctorow (expert communication; see also Doctorow 2007).

On the liability of UGC platforms

The discussion and procedure with respect to User Generated Content Platforms is less fierce than the ISP controversy. The threat of law suits has urged many UGC services to implement state of the art filtering technologies with the goal of eliminating infringing content on their services and of blocking infringing uploads before they are made available to the public. The story of YouTube is one of the best examples how actual or threatened law suits have led to the implementation of identification technologies (see Textbox 8 next page).

Recently we have seen more types of non-binding agreements between media industries and Web 2.0 industries. *The User Generated Content Principles* (2007) endorsed by film and television content owners on the one hand and video-sharing websites on the other hand are expressing inter-industry accommodations. Shortly after "*Fair Use Principles for User Generated Video Content*" (EFF 2007) have been endorsed jointly by research organisations and civil rights NGOs, namely the Electronic Frontier Foundation, the Center for Social Media, School of Communications, American University, Program on Information Justice and Intellectual Property, Washington College of Law, American University, Public Knowledge, Berkman Center for Internet and Society at Harvard Law School, and ACLU of Northern California.

Textbox 8: A short history of YouTube

YouTube, LLC	**Subsidiary of Google, founded February 2005, available in 12 languages**
First half of 2006:	YouTube grows into the no.1 video sharing site with an estimated 100 million views per month. Hosting costs rise exponentially. 70.000 videos are uploaded each day.
August 2006	Copyright: George Lucas demands that YouTube remove the Star Wars material made by fans. YouTube removes all material created by fans.
September 2006	Copyright: YouTube announces deal with Warner to settle potential copyright disputes, a requirement for Google to buy YouTube. Universal and Sony sign deals later.
October 2006	▪ Google acquires YouTube for 1.65 Billion U.S. dollars. ▪ YouTube announces development of acoustic fingerprinting technology to fight copyright infringement.
November 2006:	Copyright: MySpace repeatedly bans embedded links to copyright infringing videos from YouTube from user profiles. At this stage, an estimated 40% of all YouTube clips are accessed via MySpace profiles instead of the YouTube website.
November 2006:	YouTube announces deal with Verizon mobiles. After this, other deals follow with Vodafone in Europe and the iPhone.
January 2007:	▪ YouTube is searchable with Google Search increasing usage ▪ Also, users share in advertisement revenue for popular videos.
February 2007	Copyright: YouTube removes a home video of baby dancing to a song by Prince after complaints from Universal. This is the basis for civil rights association EFF to sue Universal for ignoring so-called 'fair use' of their copyrighted material.
March 2007:	▪ YouTube signs content deal with the BBC to display short video segments of programs. During 2007, several premium content owners such as the NBA make similar deals. ▪ Copyright: Viacom sues YouTube for 1 billion dollars because of "massive intentional copyright infringement". This action by Viacom is a response to postponing the implementation of fingerprinting technology and the inability of YouTube to permanently ban users who have repeatedly uploaded copyrighted material.
May 2007	A popular singer with more than 40 million downloads in 11 months gets a contract with a commercial label
July 2007	▪ YouTube announces it will unveil "FBI-quality video-fingerprinting technology" in September. ▪ EU launches a YouTube channel
July 2007:	YouTube launches its mobile site. It is available via a web interface at m.YouTube.com or via YouTube's Mobile Java Application.
August 2007:	Copyright: International Premier sports league consortium joins Viacom in a trial.
October 2007	Copyright: Japanese Society for Rights of Authors, Composers and Publishers (JASRAC) files copyright complaint regarding Japanese media on YouTube. Thousands of Japanese owned media are removed.
January 2008	▪ YouTube content will be broadcast via TV by Information TV 2 on. The channel will air video sharing content from the YouTube website. ▪ Nearly 79 million users watched over 3 billion videos on YouTube (Yen 2008).

Legend: The information provided is based on Limonard and Esmeijer (2007) with omissions and additions

These principles acknowledge respect of copyright as their starting point: "Copyright owners are within their rights to pursue nontransformative verbatim copying of their copyrighted materials online. However, where copyrighted materials are employed for purposes of comment, criticism, reporting, parody, satire, or scholarship, or as the raw material for other kinds of creative and transformative works, the resulting work will likely fall within the bounds of fair use" (cf. EFF 2007). This group of scientific organisations and NGOs also acknowledges the use of identification technologies against copyright infringements, but they demand that filters must incorporate protections for Fair Use: "If a service provider chooses to implement such filters, precautions should be taken to ensure that fair uses are not mistakenly caught in them" (ibid.).

The main caveat is that "filters" intended as automatic processes are risky technologies and can conflict with fair use provisions. Natali Helberger said that "even forensic DRM does not solve the problem that certain uses under copyright law are perfectly legal – I tend to have not too much faith in automated solutions". The Citizen Media project comes to the same conclusion and consequently asks for human intervention: "Human moderation and judgement, either by the service provider or a third party, will stay necessary to make a distinction between illegal and legal use. This is the only way to determine to what extent UGC falls into the category of fair use (U.S.) or the exceptions defined in most European countries, such as parody. Human moderation is not only necessary to ban copied material. It also gives the service provider the chance to get acquainted with the UGC, to add metadata, mark a content file as 'suspicious' in case copyright infringement is not that obvious, or implement a fingerprinting technology (Limonard and Esmeijer 2007, p. 90).

Cory Doctorow again draws attention to the risk of false positives as discussed above. He is further very sceptical that these technologies can work efficiently, because it is so easy for pirates to produce *false negatives*, i.e. files which are not detected as copyright infringing. Filters would not be able to spot every transformation, re-encoding, downsampling, and re-edit of those works and in case there is one format or encoding the system can not interpret, every pirate would use it for encoding and evade the filter, meaning that the system would generate an unacceptable level of false negatives. In other words, "all the money spent on the system would be for naught because it would fail to catch a significant proportion of pirates" (Doctorow 2007).

The Citizen Media project has contributed a very interesting idea to this debate. It starts from the observation that control over copyrights is difficult in long tail environments, and that full control over content is impossible because of time, effort and money necessary to enforce copyright policies for these large amounts of content. The idea is to leave content with only a small audience uncontrolled and to define a threshold when it is worth controlling: "Only when the copyrighted material reaches a critical level of public exposure, it becomes feasible from a business as well as user point of view to enforce copyright regulation" (Limonard and Esmeijer 2007, p. 95). The figure taken from the same publication visualizes the idea of the threshold (copyright interface), which should work for amateur content moving up the long tail as well as for content from media companies travelling down the tail.

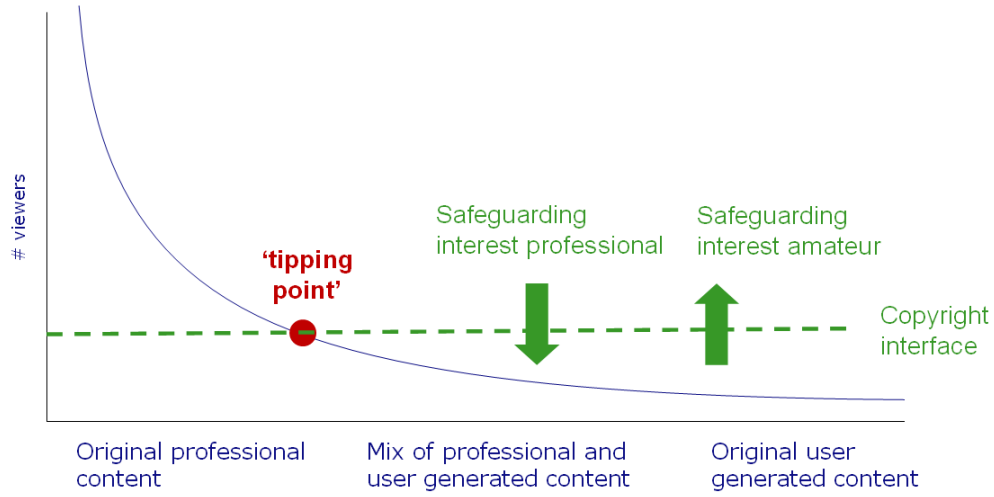


Figure 11: Copyright interface between semi-private and semi-public sphere
Source: Limonard and Esmeijer 2007, p. 95

5.3.4 Transformative uses and copyright

A more general question still pending, which is important for UGC-platforms too, is whether present copyright rules are not stifling creativity. "While new technologies encourage larger audiences to copy, exchange, re-use or mix content, traditional copyrights have become a hindrance to creativity as well as a major source of illegal activities" (cf. Mateos-Garcia et al. 2007b, p. 36).

Consumption of content – and particularly that of music and audio-visual content – is something very social, which results in the demand for sharing and recommending features (cf. INDICARE 2005, p. 31) and even more as Lilley (2006, p. 5) has pointed out: mixing and modding "are creative acts …, although they are sometimes acts designed more for self-expression or as elements in a cultural conversation within a small group than as mass market entertainment products". If sharing, recommending, and transformative uses are regarded as indispensable uses of networked digital media then law makers are challenged.

The success of Web 2.0 – also in terms of business - has to do with the growing importance of "transformative uses" (mash-up, remix, aggregate, embed, syndicate etc.) of digital content. Odlyzko (2007) expects that "[T]he big growth is likely to come in social uses of broadband, in which people engage in a variety of still-to-be-conceived activities that combine their home videos with professional content (something to which today's YouTube is likely just a primitive precursor). Ease of access and transformative use will be key to enabling such applications, and DRM will be an obstruction". Assuming that the DRM question is more relaxed when turning to forensic DRM, the legal challenge remains pressing.

The legal concerns currently centre on how the copyright law on derivative works could stifle some of the creativity that digital technology enables. EU Commissioner Viviane Reding stated at the Youth Forum at the ITU Telecom World conference in Hong Kong, December 2006" that "[On the other hand] it is clear that our system of intellectual property protection has not kept pace with progress. Content production based on the reuse of existing materials – such as sampling or mash-ups - is also creative and should not be penalised per se" (Reding 2006). The Gowers review of intellectual property in the United Kingdom suggested amending applicable EU copyright law to allow for an exception for creative, transformative or derivative work, within the parameters of the Berne three-step test and to broaden the list of exceptions to copyright for the purpose of caricature, parody and pastiche (HM Treasury 2006).

Recently the European Commission has issued a Green paper "Copyright in the Knowledge Economy" (EC 2008k), containing this very topic and the following problem statement:

> The Directive does not currently contain an exception which would allow the use of existing copyright protected content for creating new or derivative works. The obligation to clear rights before any transformative content can be made available can be perceived as a barrier to innovation in that it blocks new, potentially valuable works from being disseminated. However, before any exception for transformative works can be introduced, one would need to carefully determine the conditions under which a transformative use would be allowed, so as not to conflict with the economic interests of the rightsholders of the original work. There have been calls for the acceptance of an exception for transformative, user-created content. In particular, the Gowers Review recommended that an exception be created for "creative, transformative or derivative works"40, within the parameters of the Berne Convention three-step test. The Review acknowledges that this would be contrary to the Directive and accordingly calls for its amendment. The objective of allowing such an exception would be to favour innovative uses of works and to stimulate the production of added value

Inviting feedback the European Commission subsequently posed two questions:

1. Should there be more precise rules regarding what acts end users can or cannot do when making use of materials protected by copyright? and
2. Should an exception for user-created content be introduced into the Directive?

An import hint how transformative uses might be managed by applying Creative Commons Licences comes from the User Centric Media Cluster of FP6 projects. Their diagnosis and recommendation reads as follows:

> Nobody can predict the future. However, if in the short term the situation is not adapted, the current copyright system may fall apart for some segments of user centric media due to various reasons. At first, countermeasures are continuously bypassed by technology and secondly the growth of creative commons is significant. Creative Commons are based on the core principles of copyright law concerning the integrity of a piece of work, the acknowledgement of the author, the discouragement of copyright infringement etc. The system of creative commons only, but very importantly, introduces an alternative and more open way of protecting copyrights and grants more possibilities for free use and reuse of copyright protected materials (EC (ed.) 2007c, p. 43).

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List of Abbreviations

Definitions of the terms listed here can be found in the Glossary at the end of this report (ANNEX 4).

1seg	One segment (of a frequency band)
2G	Second Generation Mobile Network
3G	Third Generation Mobile Network
ACAP	Automated Content Access Protocol
AJAX	Asynchronous Javascript and XML
API	Application Programming Interface
ARPU	Average Revenue Per User
CC	Creative Commons
ccREL	Creative Commons Rights Expression Language
cdma	Code Division Multiple Access
CORDIS	Community Research and Development Information Service
DDL	Direct Download Links
DG	Directorate-General
DMB	Digital Multimedia Broadcast
DOI	Digital Object Identifier
DRM	Digital Rights Management
DSL	Digital Subscriber Line
DVB	Digital Video Broadcasting
DVR	Digital Video Recorder
eBook	Electronic Book
EC	European Communication
ECC	European Communication Council
EFF	Electronic Frontier Foundation
EITO	European Information Technology Observatory
ELMI	Electronic Money Institute
ENISA	European Network and Information Security Agency
EoIP	Everything over Internet Protocol
EU	European Union
EUROSTAT	Statistical Office of the European Communities
EV-DO	Evolution Data Only
FP7	The Seventh Framework Programme
FTTH	Fibre To The Home

GB	Gigabyte
GPS	Global Positioning System
GSM	Global System for Mobile Communication
HTML	Hypertext Markup Language
ICT	Information and Communication Technologies
IETF	Internet Engineering Task Force
IFPI	International Federation of the Phonographic Industry
IP	Internet Protocol
IPR	Intellectual Property Rights
IPTV	Internet Protocol Television
ISO	International Organization for Standardization
ISTAG	Information Society Technologies Advisory Group
ITU	International Telecommunication Union
IVIR	Institute for Information Law
iTV	Interactive Television
Mbps	Megabits per second
MIC	Ministry of International Affairs and Communication
MIT	Massachusetts Institute of Technology
MMOG	Massively Multiplayer Online Game
MMORPG	Massively Multiplayer Online Role Playing Game
MMS	Multimedia Messaging System
MPEG	Moving Pictures Experts Group
MUD	Multiple User Domain
NBIC	Nanotechnology, Biotechnology, Information technology and Cognitive science
NEM	Networked Electronic Media
NGN	Next Generation Network
NGO	Non-Governmental Organization
NSF	National Science Foundation
OA	Open Access
ODRL	Open Digital Rights Language
OECD	Organisation for Economic Co-Operation and Development
OMA	Open Mobile Alliance
P2P	Peer to Peer
PC	Personal Computer

PDA	Personal Digital Assistant
PDC	Personal Digital Cellular
PDF	Portable Document Format
PHS	Personal Handyphone System
PVR	Personal Video Recorder
PWC	PricewaterhouseCoopers
QR	Quick Response
R&D	Research and Development
RDF	Resource Description Framework
RFID	Radio Frequency Identification
RIAA	Recording Industry Association of America
RSS	Really Simple Syndication | Rich Site Summary
SME	Small and Medium Enterprises
SMS	Short Message Service
SMTP	Simple Mail Transfer Protocol
SNA	Social Network Analysis
SNS	Social Networking Service / Social Networking Site
TCP/IP	Transmission Control Protocol/Internet Protocol
TIA	Telecommunications Industry Association
TPM	Technical Protection Measures
UCC	User Created Content
UGC	User Generated Content
UMTS	Universal Mobile Telecommunications System
US	United States
VOD	Video on Demand
VoIP	Voice over IP
WAP	Wireless Application Protocol
W3C	World Wide Web Consortium
Wi-Fi	Wireless fidelity
Wimax	Worldwide Interoperability for Microwave Access
WLL	Wireless Local Loop
WoW	World of Warcraft
XML	Extensible Markup Language
XrML	eXtensible rights Markup Language

ANNEX 1: List of Experts who Contributed to this Report

This information about the experts just aims to give some indications about their background relevant in the context of the present STOA study. The information is provided to our best knowledge, but in any case is incomplete and selective and without guarantee that any item is still correct.

Name		Organisation/Position	Country
BARON	Sandra	BCC-Baron Coaching&Consulting (Mobile Internet Consultant)	D
BILLICH	Christopher	INFINITA INC., Vice President, Overseas Business Development	JP
BIRCH	Dave	Director, Consult Hyperion	UK
DE LESTRÉ	Tanguy	Mobile Monday Brussels	BE
DOCTOROW	Cory	Author, journalist, co-editor of the blog Boing Boing, till 2006 European Affairs Coordinator for the Electronic Frontier Foundation (EFF).	US
FASOL	Gerhard	CEO Eurotechnology Japan	Japan
FEIGENBAUM	Lee	Vice president of technology and standards Cambridge Semantics; active member of the W3C Semantic Web standards community,	US
GODSCHALK	Hugo	Senior Consultant and managing partner at PaySys Consultancy; Director of EPCA (European Payments Consulting Association)	D
HALL	Wendy	Professor of Computer Science at School of Electronics and Computer Science; University of Southampton; Vice-President of the ACM	UK
HELBERGER	Natali	Assistant professor at the Institute for Information Law, University of Amsterdam; One main focus of her research are the implications from the changing role of the user for information law.	NL
KAFNO	Paul	Managing Director of HD Thames, an independent UK TV production company that also develops digital technology for the creative industries.	UK
KANDA	Yusuke	CEO ACCESS Systems Europe	F
KANGAS	Sonja	Finnish Youth Research Network, former researcher at the Finnish Technology Research Centre VTT.	FI
KATAGIRI	Yoshihiro	Permanent Delegation of Japan to the OECD, First Secretary	JP
KATZ	Eddan	Electronic Frontier Foundation, International Affairs Director, Europe	US
KRUEGER	Malte	Payment consultant and acting professor at the "Institut für Wirtschaftspolitik und Wirtschaftsforschung", Universität Karlsruhe (TH)	D

Name	**Organisation/Position**	**Country**	D
LIMONARD	Sander	Consultant and researcher at TNO Information- and Communication Technology involved in the Citizen Media project and a current project on user generated content by the i2010 initiative	NL
LOOK	Hugh Evison	Consultant at Rightscom Limited, specialised in digital media and the creative industries, led the Publishing Watch study, and was involved in a recent study on convergence for DG Information Society.	UK
MACKENROTH	Frank	Partner with PriceWaterhouseCoopers, where he heads the competence centre for entertainment and Media. He is also part of the global entertainment and media network of PwC	D
MONIZ	Antonio	Professor of sociology at Universidade Nova de Lisboa, involved in the FP6 project WORKS (Work Organisation and Restructuring in the Knowledge Society)	PT
NESI	Paolo	Full Professor at the University of Florence, coordinated AXMEDIS (Automated Production of cross media content for multichannel distribution) an Integrated Project within FP6,	IT
RUMP	Niels	Senior Consultant at Rigthscom Limited with more than 10 years experience in the area of digital rights management (DRM)	UK
SCHROLL	Willi	Senior Foresight Consultant; Z_punkt GmbH The Foresight Company	D
SPRINGER	Martin	independent contributor to DMP – Digital Media Project	D
STAAB	Steffen	Professor for Databases & Information Systems, Head of Research Group "ISWeb - Information Systems and Semantic Web", University of Koblenz-Landau	D
VAN HOVE	Leo	Associate Professor of Economics at Vrije Universiteit Brussel (Free University of Brussels)	BE
ZIMMER	Michael	Assistant Professor at the School of Information Studies; University of Wisconsin-Milwaukee; editor of the special issue of Firstmonday on "Critical Perspectives on Web 2.0"	US

ANNEX 2: Timeline of Policy Relevant Events

Some recent policy-relevant dates related to ICT and media industries (Jan. – July 2008)

Date	Event / Measure	Comment/Content
16.7.2008	European Commission: Copyright in the Knowledge Economy. Green Paper. COM(2008) 466 final (Brussels, 16.7.2008	The purpose of the Green Paper is to foster a debate on how knowledge for research, science and education can best be disseminated in the online environment. The Green Paper aims to set out a number of issues connected with the role of copyright in the "knowledge economy" and intends to launch a consultation on these issues. Comments can be delivered till 30.11.08
16.7.2008	European Commission: Antitrust decision on collective societies	The decision is about allowing music authors (composers and lyricists) to choose which collecting society manages their copyright. The decision is also about helping cross-border music broadcasting over the internet, by cable and by satellite by making it easier for users to obtain licences from a single collecting society of their choice.
16.7.2008	European Commission: Proposal on copyright extension for music performers	With this proposal, the Commission aims to extend the term of copyright for performers to 95 years.
Started in June 2008	European Commission: Public Consultation on Age Verification, Cross Media Rating and Social Networking	The gathered information will be fed into this year's Safer Internet Forum 2008, which will be dedicated to the topics of the consultation. The Public Consultation is open till 31.7.2008
17.-18.6.	OECD Ministerial Meeting: The Future of the Internet Economy, Seoul, Korea The Seoul Declaration for the Future of the Internet Economy	The declaration was signed by the member nations of the OECD, as well as the European Community and observer countries Chile, Egypt, Estonia, India, Indonesia, Israel, Latvia, Senegal and Slovenia; it contains several statements relevant for media industries, e.g. the commitment to "Encourage new collaborative Internet-based models and social networks for the creation, distribution and use of digital content that fully recognise the rights of creators and the interests of users.
22.04.2008	Communication on the protection of consumers, and in particular minors, in respect to the use of video games COM(2008) 207 final	The Internet offers new forms of media consumption and new opportunities for cultural diversity, including video games, but it can also be a means for spreading illegal and, particularly for minors, harmful content. This creates specific challenges in terms of protecting young people. PEGI On-line [Pan European Games Information age rating system] is proposed as an appropriate measure.

Date	Event / Measure	Comment/Content
17.4.08	Communication - Preparing Europe's digital future. i2010 - Mid-term review COM/2008/0199 final + Commission Staff Working Document (Vol. 1-3) accompanying the Communication	The following issues are becoming strategic for competitiveness and ICT take-up in Europe: - Europe needs to shift up a gear to lead the transition to next-generation networks while not slacking off in its efforts to overcome the digital divide. - further steps are needed to create a Single Market for the digital economy. - Greater efforts are needed to pool resources by coordinating ICT research and innovation efforts. - Safeguards need to evolve to match technology and market developments, without stifling the huge opportunities that online social and economic activity offers.
4.4.2008	Article 29 Working Party: Opinion 1/2008 on data protection issues related to search engines	In the opinion of the data protection experts a balance has to be struck between the legitimate business needs of search engine providers and the protection of the personal data of internet users in accordance with the Data Protection Directive (95/46/EC)
10.4.2008	European Parliament resolution on cultural industries in Europe The own-initiative report had been tabled for consideration in plenary by Guy Bono (PES, FR) on behalf of the Committee on Culture and Education.	The report was adopted by 586 votes in favour to 36 against, with amendments. Voting on Amendment 22 was 314 to 297. It requests member states not to authorise shut-off as part of the graduated response to fight copyright violations. The Resolution is welcomed by the Commission and will feed into a Green Paper on cultural and creative industries, which the Commission plans to publish in 2009. In the resolution MEPs call on the Commission and Member States among others to: - to set as their priorities, policies based not only on entrepreneurial innovation, but on the innovation of cultural actions and creative economies, - to rethink the critical issue of intellectual property from the cultural and economic point of view and to seek solutions that are equitable to large and small stakeholders … and that guarantee fair, effective remuneration to all categories of right holders, real choice for consumers, and cultural diversity. On this point, Parliament draws attention to the fact that criminalising consumers who are not seeking to make a profit is not the right solution to combat digital piracy.

Date	Event / Measure	Comment/Content
31.3 - 2.4.	The Future Of The Internet. Perspectives emerging from R&D in Europe,	Conference organized under the Slovenian Presidency with the support of the European Commission
29.2.2008	End of the Public Consultation on Creative Content Online in the Single Market – 2008	Cf. entry of 03.03.2008
29.01.2008	Judgment of the Court of Justice in Case C-275/06 Productores de Música de España (Promusicae) v Telefónica de España SAU	Community law does not require the Member States, in order to ensure the effective protection of copyright, to lay down an obligation to disclose personal data in the context of civil proceedings.
22.01.2008	Workshop on the "Future Media Internet", Brussels	The workshop was jointly organized by three Networks of Excellence with the support of the European Commission. It aimed to create a discussion forum in which industry, academia and administration presented their views on the *Future Media Internet*, a vision to come true in 5 to 10 years when the mass media business structure and the shape of the Internet will be fundamentally different from today.
03.01.2008	Communication on Creative Content Online in the Single Market - COM/2007/0836 final + Staff Working Paper accompanying the Communication + Launch of a Public Consultation on Creative Content Online in the Single Market	This Communication addresses a first set of challenges central to the uptake of online content services in Europe; it launched a focused public consultation in preparation for the adoption of a Recommendation on Creative Content Online and is creating a stakeholders' discussion and cooperation platform (the "Content Online Platform"). Topics addressed in the consultation are among others - Digital Rights Management - Multi-territory rights licensing - Legal offers and piracy

ANNEX 3: Overview of Influential Studies Analyzed for the Report

The report draws on many sources. There are, however, a few sources which can be regarded as important reference points framing the European debate: These are highlighted here.

- In October 2006 an influential study (KEA European Affairs 2006) was published, commissioned by Directorate-General for Education and Culture on *The Economy of Culture* performed by a consortium headed by KEA European Affairs, a Brussels based consultancy which set up a consortium including the German consultancy MKW Wirtschaftsforschung and Media Group, a unit of Turku School of Economics.

- At the beginning of 2007 another important study (Screen Digest et al. 2007) was published, which had been commissioned by DG Information Society and Media, on *Interactive Content and Convergence: Implications for the Information Society.* This was carried out by three consultancies (Screen Digest, Goldmedia, Rightscom) and a law firm (CMS Hasche Sigle) and involved contributions from 179 stakeholders.

- In 2007 the EPIS (European Perspectives on Information Society) project investigated *Perspectives on the Creative Content Sector* producing a series of useful deliverables (Mateos-Garcia et al. 2007a-c; Maghiros et al. 2007, Rader et al. 2007). *EPIS* is planned as a multiannual project run by the Institute for Prospective Technological Studies (IPTS) of the European Commission's Joint Research Centre on behalf of DG Information Society and Media. For the study of the creative content sector IPTS established a project team of Fraunhofer-ISI, ITAS (Institute for Technology Assessment and Systems Analysis), SPRU (Science and Technology Policy Research at the University of Sussex), and ARC systems research, all members of the European Techno-Economic Policy Support Network (ETEPS network), which consists of 19 members from 15 EU member states and 19 associated members worldwide and aims "to provide intellectual services for carrying out techno-economic and policy-related studies in the context of EU policy-making".

  In the mean time, the IPTS has carried out a project called ERoSC (The socio-economic impact of emerging social computing applications), the results of which are forthcoming and could not be taken into account in this report. Readers of this report may nevertheless be interested in those findings. Announced are four reports:

  - Pascu, C. (2008): An empirical analysis into the adoption of Social Computing", IPTS Report. European Commission (forthcoming)
  - Ala-Mutka, K. (2008): Social Computing: the case of collaborative content. IPTS Report. European Commission (forthcoming)
  - Cachia, R. (2008): Social Computing: the case Social networking. IPTS Report. European Commission (forthcoming)
  - Punie, Y. (Ed.) (2008): The Socio-Economic Impact of Social Computing: Proceedings of a validation and policy options workshop IPTS, Seville, 26-27 February 2008. IPTS Report. European Commission (forthcoming)

- Further important sources are the documents of the European Technology Platform Networked and Electronic Media (NEM) which addresses the convergence of media, communications, consumer electronics, and IT. In particular the *NEM Strategic Research Agenda* (NEM 2007a) and the *NEM Vision document* (NEM 2007b), which includes key challenges that the sector will have to face towards 2015, deserve mention.

- Next, the Networked Media Systems Unit of Directorate General Information Society and Media arranged for the cooperation across projects of experts from FP6 and FP7 projects on "The Future Media Internet" leading to interesting documents. Recently a *Position paper on the Future Media Internet* was published to reflect he opinion of representatives of 15 ongoing FP6 & FP7 EU funded projects (EC 2008e). Another report on the *Future Media Internet* reflects the outcome of two workshops organised by DG Information Society and Media on 26-27 November, 2007 and on 22 January, 2008 (EC 2008f); further a White paper was published in 2007 on the *Networked Media of the Future* by the Networked Media Task Force (NM-TF) and authored by members of three Networks of Excellence in the area of Networked Media, namely VISNET-II, INTERMEDIA and CONTENT (Rodríguez-Roselló 2007a). In November 2007 a report was published on *User Centric Media - Future and Challenges in European Research* encompassing contributions from 11 European Research projects funded under the 6th EU Research and Development Framework Programme (EC 2007c). Particularly useful in our context was a report of the CitizenMedia project by Limonard and Esmeijer (2007) on *Business requirements and potential bottlenecks for successful new citizen media applications.*
- The report of ISTAG, the Information Society Technologies Advisory Group, *New Business Sectors in Information and Communication Technologies*. *The Content Sector as a Case Study* (ISTAG 2007) was another useful source.
- Although it is not an EU effort, the work of OECD's Information, Computer and Communications Policy Committee (ICCP), and more specifically the work of its Working Party on the Information Economy (WPIE) is worth highlighting (OECD 2005, 2007a-d, 2008a-b). Since 2007 at the latest, this group has been investigating User-Created Content very carefully (OECD 2007a; 2008a).

ANNEX 4: Glossary

Contains definitions from within the report and adds further definitions from Internet sources, mostly the English edition of Wikipedia, which are edited for the purpose of this glossary.

1seg	One segment (of a frequency band)	Also the name of a mobile terrestrial digital audio/video and data broadcasting service in Japan and Brazil. The terrestrial digital broadcast system used in Japan, is designed so that each channel is divided into 13 segments, with a further segment separating it from the next channel. An HDTV broadcast signal occupies 12 segments, leaving the remaining (13th) segment for mobile receivers, hence the name, "1seg".
2G	Second Generation Mobile Network	Launched in 1991 to replace the first generation of mobile telephone networks. 2G introduced novel features including digital encryption of phone conversations, more efficient use of the spectrum to allow for greater mobile phone penetration levels, and data services for mobile telephony starting with SMS text messages.
3G	Third Generation Mobile Network	There has been a gradual transition from so-called 2G networks to 3G. The features added include Wireless Application Protocol (WAP) access, Multimedia Messaging Service (MMS, e.g. photos), Internet communication services such as E-mail and World Wide Web access, video and other multimedia. Data are transmitted in "packets" instead of continuously. In addition to its greater speed, 3G is more secure than 2G.
ACAP	Automated Content Access Protocol	ACAP is a proposed method of providing machine-readable permissions information for content. This will allow automated processes (such as search-engine web crawling) to be compliant with publishers' policies without the need for human interpretation of legal terms. ACAP was developed by the publishing industry with technical partners (including search engines).
ADSL	Asymmetric Digital Subscriber Line	See DSL
AJAX	Asynchronous Javascript and XML	Group of interrelated web development techniques used for creating interactive web applications or rich Internet applications. With Ajax, web applications can retrieve data from the server asynchronously in the background without interfering with the display and behaviour of the existing page.

API	Application Programming Interface	An application programming interface (API) is a set of functions, procedures, methods, classes or protocols that an operating system, library or service provides to support requests made by computer programmes. Some companies protect information on their APIs from the general public, e.g. to ensure quality control and potential license revenue. Others make their APIs freely available to enable software writing for platforms.
blog	Contraction of "web log"	Web site, usually maintained by an individual with regular entries of commentary, descriptions of events, or other material such as graphics or video. Many blogs provide commentary or news on a particular subject; others function as more personal online diaries.
CC	Creative Commons	*Creative Commons (CC)* is a non-profit organization devoted to expanding the range of creative works available for others to build upon legally and to share. The organization has released several copyright licenses known as Creative Commons licenses. These licenses allow creators to communicate which rights they reserve, and which rights they waive for the benefit of other creators.
cdma	Code Division Multiple Access	Code division multiple access (CDMA) is a channel access method utilized by various radio communication technologies. An underlying concept is the idea of allowing several transmitters to send information simultaneously over a single communication channel allowing several users to share a bandwidth of frequencies ("multiplexing.").
DDL	Direct Download Links	A hyperlink that points to a location within the Internet where the user can download a file.
DMB	Digital Multimedia Broadcast	Sometimes known as "mobile TV", this is a digital radio transmission system for sending multimedia (radio, TV, and data) to mobile devices such as mobile phones.

DOI	Digital Object Identifier	The International DOI Foundation (IDF) defines DOI name as "a digital identifier for any object of intellectual property". A typical use of a DOI is to give a scholarly paper or article a unique identifying number that anyone can use to obtain information about the publication's location on a digital network.
DRM	Digital Rights Management	Control technologies used by hardware manufacturers, publishers and copyright holders to limit usage of digital media or devices. Whereas copy protection only attempts to prohibit unauthorized copies of media or files, digital rights management allows the issuer of the media or file to control in detail what can and can not be done with a single instance.
DSL	Digital Subscriber Line	DSL or xDSL, is a family of technologies that provides digital data transmission over the wires of a local telephone network. DSL can be used at the same time and on the same telephone line with regular telephone, as it uses high frequency, while regular telephone uses low frequency.
DC	Dublin Core	Standard for cross-domain information resource description. It provides a simple and standardised set of conventions for describing things online in ways that make them easier to find. Dublin Core is widely used to describe digital materials such as video, sound, image, text, and composite media like web pages.
DVB	Digital Video Broadcasting	Digital Video Broadcasting (DVB) is a suite of internationally accepted open standards for digital television. They are published by a Joint Technical Committee (JTC) of the European Telecommunications Standards Institute (ETSI), European Committee for Electrotechnical Standardization (CENELEC) and European Broadcasting Union (EBU). The interaction of the DVB sub-standards is described in the DVB Cookbook.

DVR	Digital Video Recorder	A digital video recorder (DVR) is a device that records video in a digital format to a disk drive or other memory medium within a device. The term includes stand-alone set-top boxes, portable media players and software for personal computers.
e-book	Electronic Book	An e-book (for electronic book: also ebook) is the digital media equivalent of a conventional printed book. Such documents are usually read on personal computers, or on dedicated hardware devices. Some cell phones can also be used to read ebooks.
ELMI	Electronic Money Institute	As defined in Directive 2000/46/EC of the European Parliament and of the Council of 18 September 2000 'electronic money institution' shall mean an undertaking or any other legal person, other than a credit institution which issues means of payment in the form of electronic money.
ENISA	European Network and Information Security Agency	The European Network and Information Security Agency (ENISA) is an agency of the European Union. Located in Heraklion, Crete (Greece). The objective of ENISA is to improve network and information security in the European Union.
EoIP	Everything over Internet Protocol	"Everything" here refers to the previously separated services of broadcasting (radio, TV), data transmission and telephony which now are all possible over the Internet.
EV-DO	Evolution Data Only	Evolution-Data only is a telecommunications standard for the wireless transmission of data through radio signals, typically for broadband Internet access. It uses multiplexing techniques to maximize both individual user's throughput and the overall system throughput.
FTTH	Fibre To The Home	Network architecture that uses optical fibre to replace all or part of the usual copper local loop used for telecommunications, in particular the "last mile" to the home.
GB	Gigabyte	A gigabyte is a unit of information or computer storage meaning either exactly 1000^3, or 10^9 or approximately 1024^3, or 2^{30} bytes.

Glocal	Glocal (contraction of global and local)	The term "glocal" refers to the individual, group, division, unit, organisation, service and community which is willing and is able to "think globally and act locally," e.g. a global news service with fine-tuned local editions.
GPS	Global Positioning System	The Global Positioning System (GPS) is currently the only fully functional Global Navigation Satellite System. The GPS uses a constellation of between 24 and 32 Medium Earth Orbit satellites that transmit precise microwave signals that enable GPS receivers to determine their location, speed, direction, and time. GPS was developed by the United States Department of Defense, and is managed by the United States Air Force. Similar satellite navigation systems include the Russian GLONASS (incomplete as of 2008), the European Galileo positioning system, the proposed COMPASS navigation system of China, and IRNSS of India.
GSM	Global System for Mobile Communication	GSM (Global System for Mobile communications: originally from Groupe Spécial Mobile) is the most popular standard for mobile phones in the world. It is, estimated that 82% of the global mobile market uses the standard in more than 212 countries and territories. Consumers benefit from the ability to roam and switch carriers without switching phones and network. Operators can choose equipment from any of the many vendors implementing GSM. GSM differs from its predecessors in that both signalling and speech channels are digital, and thus is considered a *second generation* (2G) mobile phone system.
HTML	Hypertext Markup Language	The predominant markup language for Web pages. It provides a means to describe the structure of text-based information in a document — by denoting certain text as links, headings, paragraphs, lists, and so on — and to supplement that text with interactive forms, embedded *images*, and other objects.

IETF	Internet Engineering Task Force	The Internet Engineering Task Force develops and promotes Internet standards, dealing in particular with standards of the TCP/IP and Internet protocol suite. It is an open standards organization, with no formal membership or membership requirements. All participants and leaders are volunteers, though their work is usually funded by their employers or sponsors.
IP	Internet Protocol	The computer networking protocol used on the Internet
IPTV	Internet Protocol Television	System where a digital television service is delivered using Internet Protocol over a network infrastructure, which may include delivery by a broadband connection.
IRC	Internet Relay Chat	IRC is a form of real-time Internet chat or synchronous conferencing. It is mainly designed for group communication in discussion forums called channels, but also allows one-to-one communication via private message, as well as chat and data transfers via Direct Client-to-Client.
iTV	Interactive Television	Interactive television represents a continuum from low interactivity (TV on/off, volume, changing channels) to moderate interactivity (simple movies on demand without player controls) and high interactivity in which, for example, an audience member affects the program being watched. The most obvious example of this would be any kind of real-time voting on the screen, in which audience votes create decisions that are reflected in how the show continues. To be truly interactive, the viewer must be able to alter the viewing experience (e. g choose which angle to watch a football match), or return information to the broadcaster. This "return path" or "back channel" can be by telephone, mobile SMS (text messages), radio, digital subscriber lines (ADSL) or cable.
LMS	Learning Management System	Software for delivering, tracking and managing training. LMSs range from simple systems for managing training records to software for distributing courses over the Internet and offering features for online collaboration.

LOM	Learning Object Metadata	Used to describe a learning object and similar digital resources used to support learning. The purpose of learning object metadata is to support the reusability of learning objects, to aid discoverability, and to facilitate their interoperability, usually in the context of online learning management systems (LMS).
Mashup	Mashup	A digital media file containing any or all of text, graphics, audio, video, and animation, which recombines and modifies existing digital works to create a derivative work.
Mbps	Megabits per second	A megabit per second is a unit of data transfer rate equal to 1,000,000 bits per second. Because there are 8 bits in a byte, a transfer speed of 8 megabits per second is equivalent to 1,000,000 *bytes* per second.
MMOG	Massively Multiplayer Online Game	A massively multiplayer online game is a video game which is capable of supporting hundreds or thousands of players simultaneously. By necessity, they are played on the Internet, but not necessarily restricted to personal computers, since most of the newer game consoles can also access the Internet.
MMORPG	Massively Multiplayer Online Role Playing Game	A massively multiplayer online role-playing game is a genre of computer role-playing games in which a large number of players interact with one another in a virtual world. Players assume the role of a fictional character (often in a fantasy world), and take control over many of that character's actions.
MMS	Multimedia Messaging System	Multimedia Messaging Service is a cellular telephone standard for sending messages that include multimedia objects (images, audio, video, rich text). MMS is an extension of the SMS standard.
Modding	Modding	Slang expression derived from the verb "modify". The term can refer to the act of modifying a piece of hardware or software or anything else for that matter, to perform a function not originally conceived or intended by the designer.

MP3	More precisely: MPEG-1 Audio Layer 3	A digital audio encoding format specified by the moving pictures expert group (MPEG) and using a form of lossy data compression. It is a common audio format for consumer audio storage, as well as a de facto standard encoding for the transfer and playback of music on digital audio players. MP3 is the most popular format for digital compression of audio files and is frequently employed as a generic term in connection with players and devices for the digital reproduction of sound.
MPEG	Moving Pictures Experts Group	Formed by the ISO to set standards for audio and video compression and transmission. Its members come from various industries, universities, and research institutions.
MUD	Multiple User Domain	A MUD (Multi-User Dungeon, Domain or Dimension) is a multi-player computer game that combines elements of role-playing games, hack and slash style computer games and social chat rooms. Typical MUDs are text-driven, where players read descriptions of rooms, objects, events, other characters, and computer-controlled creatures or non-player characters in a virtual world. Players interact with each other and the world by typing commands that resemble a natural language.
Multiplexing	Multiplexing	A process where multiple analogue message signals or digital data streams are combined into one signal over a shared medium, thus sharing an expensive resource.
NBIC	Nanotechnology, Biotechnology, Information technology and Cognitive science	NBIC refers to a concept for the convergence of key technologies and was first presented as a successor to the US-based National Nanotechnology Initiative at a joint workshop of the National Science Foundation and the Department of Commerce in 2001.

NEM	Networked Electronic Media	The Networked and Electronic Media initiative is one of the European Industrial Initiatives, or European Technology Platforms. The NEM addresses the convergence of media, communications, consumer electronics, and IT in Europe.
NGN	Next Generation Network	Broad term to describe some key architectural evolutions in telecommunication core and access networks that will be deployed over the next 5-10 years. The general idea behind NGN is that one network transports all information and services (voice, data, and all sorts of media such as video) by encapsulating these into packets.
OA	Open Access	Free, immediate, permanent, full-text, online access, for any user, web-wide, to digital scientific and scholarly material, primarily research articles published in peer-reviewed journals. OA means that any individual user, anywhere, who has access to the Internet, may link, read, download, store, print-off, use, and data-mine the digital content of that article.
ODRL	Open Digital Rights Language	Rights Expression Language (REL) used in Digital Rights Management systems and open content management systems.
OMA	Open Mobile Alliance	Standards body which develops open standards for the mobile phone industry. Members include traditional wireless industry players such as equipment and mobile systems manufacturers, mobile operators, and also software vendors.
OWL	Web Ontology Language	A knowledge representation language for authoring, publishing and sharing "ontologies". Ontologies can be understood as controlled vocabulary for specific domains. Different from thesauri, however, ontologies are able to express many more relations between items of content and indicate how relations shall be processed.

P2P	Peer to Peer	Computer network using the cumulative bandwidth of network participants rather than conventional centralized resources where a relatively low number of servers provide the core value to a service or application. P2P networks are typically used for connecting nodes via largely ad hoc connections for such purposes as sharing content files containing audio, video, data or anything in digital format, and passing real-time data, such as telephony traffic.
PDA	Personal Digital Assistant	Handheld computer also known as a palmtop computer. Newer PDAs also have both colour screens and audio capabilities, enabling them to be used as mobile phones, web browsers, or portable media players. Many PDAs can access the Internet, intranets or extranets via Wi-Fi, or Wireless Wide-Area Networks (WWANs). Recent PDAs frequently employ touch screen technology.
PDC	Personal Digital Cellular	2G mobile phone standard developed and used exclusively in Japan
PDF	Portable Document Format	File format created by Adobe Systems in 1993 for document exchange. PDF is used for representing two-dimensional documents in a manner independent of the application software, hardware, and operating system. PDF is an open standard that was officially published on July 1, 2008 by the ISO as ISO 32000-1:2008.
PHS	Personal Handyphone System	Mobile network system operating in the 1880–1930 MHz frequency band, used mainly in Asia.
Podcast	Combines (i)-Pod and Broadcast or narrowcast	Series of audio or video digital-media files which is distributed over the Internet by syndicated download, through Web feeds, to portable media players and personal computers.

prosumer	prosumer	Compound of either the word "professional" or "producer" with the word "consumer". The business sector sees the prosumer (professional–consumer) as a market segment, whereas economists see the prosumer (producer–consumer) as having greater independence from the mainstream economy. Another interpretation is that the consumer with a passive role, moves into an active role as the individual gets more involved in the process.
RDF	Resource Description Framework	A basic format for content description. A piece of data or content, a resource, is identified by a unique name called a Universal Resource Identifier (URI, e.g. a URL), and a statement about the resource in form of subject -predicate-object (RDF triples) expressing a relationship between the subject and the object. These triples can be interchanged and processed automatically.
RFID	Radio Frequency Identification	Radio-frequency identification (RFID) is an automatic identification method, relying on storing and remotely retrieving data using devices called RFID tags or transponders. The technology requires some extent of cooperation of an RFID reader and an RFID tag.
RSS	Really Simple Syndication, Rich Site Summary	Family of Web feed formats used to publish frequently updated works – such as blog entries, news headlines, audio, and video – in a standardized format. Web feeds benefit publishers by letting them syndicate content automatically. They benefit readers who want to subscribe to timely updates from favoured websites or to aggregate feeds from many sites into one place.
Semantic Web	Semantic web	Evolving extension of the World Wide Web in which the semantics (meanings) of information and services on the web is defined, making it possible for the web to understand and satisfy the requests of people and machines to use the web content. The notion builds on the vision of the Web as a universal medium for data, information, and knowledge exchange.

SMS	Short Message Service	Communications protocol allowing the interchange of short text messages between mobile telephone devices. SMS text messaging is said to be the most widely used data application in the world.
SMTP	Simple Mail Transfer Protocol	Internet standard for electronic mail (e-mail) transmission across Internet Protocol (IP) networks.
SNA	Social Network Analysis	Social network analysis views social relationships in terms of *nodes* and *ties*. Nodes are the individual actors within the networks, and ties are the relationships between the actors. There can be many kinds of ties between the nodes.
SNS	Social Networking Service / Social Networking Site	Service focused on building online communities of people who share interests and activities, or who are interested in exploring the interests and activities of others. Most social network services are web based and provide a variety of ways for users to interact, such as e-mail and instant messaging services.
SOA	Service-Oriented Architecture	Programming paradigm that separates functions into distinct units, or services which developers make accessible over a network in order that users can combine and reuse them in the production of business applications
SOAP	Simple Object Access Protocol	Protocol specification for exchanging structured information in the implementation of Web Services in computer networks.
TCP/IP	Transmission Control Protocol/Internet Protocol	Set of communications protocols used for the Internet and other similar networks. It is named from two of its most important protocols: the Transmission Control Protocol (TCP) and the Internet Protocol (IP), which were the first two networking protocols defined in this standard.
TPM	Technical Protection Measures	Technology for preventing the unauthorised reproduction of normally copyrighted software, movies, music, and other media
UCC	User Created Content	Publicly available media content created and/or produced by end-users. We witness an ever growing share of media building on the creativity of users and user created content.

UGC	User Generated Content	The expression "user generated content" is broader than the term “user created content” and used to address many activities in which users might be involved: making publicly available original creative work, linking to a site, giving feedback on content, annotating content with keywords, filesharing on P2P networks, uploading a snippet of a recorded TV programme, changing a given piece of content by adding some text or sound, creating a personal profile on a social networking site, and even includes the involuntary production of commercially exploited data traces.
UMTS	Universal Mobile Telecommunications System	One of the third-generation cell phone technologies, which is also being developed into a 4G technology. It is viewed as the European answer to the ITU requirements for 3G cellular radio systems.
VOD	Video on Demand	Allows users to select and watch/listen to video or audio content on demand. VOD systems either stream content through a set-top box, allowing viewing in real time, or download it to a device such as a computer, digital video recorder, personal video recorder or portable media player for viewing at any time. The majority of cable- and telco-based television providers offer both VOD streaming, such as pay-per-view, whereby a user buys or selects a movie or television program and it begins to play on the television set almost instantaneously, or downloading to a DVR rented from the provider, for viewing in the future.
VoIP	Voice over IP	General term for a family of transmission technologies for delivery of voice communications over the Internet or other packet-switched networks.

WAP	Wireless Application Protocol	Open international standard for application layer network communications in a wireless communication environment. Its main use is to enable access to the Internet (HTTP) from a mobile phone or PDA. A WAP browser provides all of the basic services of a computer based web browser but simplified to operate within the restrictions of a mobile phone. WAP sites are written in (Wireless Markup Language).
W3C	World Wide Web Consortium	Main international standards organization for the World Wide Web (abbreviated WWW or W3). It is arranged as a consortium where member organizations maintain full-time staff for the purpose of working together in the development of standards for the World Wide Web. As of February 2008, the W3C had 434 members.
Web 2.0	Web 2.0	Web 2.0 is shorthand for recent trends in Web technologies, overall changes in the way people communicate via Internet plus a changing networked media landscape with new business models. Of course Web 2.0 builds on and adds to functionalities and services already in place before 2005 such as search services, instant messaging, P2P-filesharing, e-mail.
Wi-Fi	Wireless fidelity	Trade name for wireless technology used in home networks, mobile phones, video games and other electronic devices that require some form of wireless networking capability.
wiki	"Wiki" is a Hawaiian word for "fast".	A wiki is a page or collection of Web pages designed to enable anyone who accesses it to contribute or modify content, using a simplified markup language. Wikis are often used to create collaborative websites and to power community websites. The collaborative encyclopaedia Wikipedia is one of the best-known wikis.

Wimax	Worldwide Interoperability for Microwave Access	Telecommunications technology that provides for the wireless transmission of data using a variety of transmission modes, from point-to-point links to portable internet access. The technology provides up to 2 Mb/sec symmetric broadband speed without the need for cables. Wimax enables the delivery of last mile wireless broadband access as an alternative to cable and DSL and High Speed Packet Access.
WLL	Wireless Local Loop	Term for the use of a wireless communications link as the "last mile / first mile" connection for delivering conventional telephone service and/or broadband Internet to telecommunications customers.
XML	Extensible Markup Language	General-purpose specification for creating custom markup languages. It is classified as an extensible language, because it allows the user to define the mark-up elements. XML's purpose is to aid information systems in sharing structured data, especially via the Internet, to encode documents, and to serialize data.
XrML	eXtensible rights Markup Language	A Rights Expression Language (REL) owned by Microsoft, Thomson and Time-Warner. XrML is based on XML and describes rights, fees and conditions together with message integrity and entity authentication information.