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The Challenges of Convergence

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Discussion paper

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SUMMARY

—Every user being able to connect everywhere, anytime, with access to adapted and high-quality content and communication services, in a safe and accessible environment. This is the core vision of a converged setting for media and communication technologies and markets, and it is shared across both industries and governments. While a complete converged environment is still a vision, the reality of convergence is already very much here, and developing rapidly.

Convergence is shaped by the choices made by users, scientists, industry and governments, making it difficult to foresee the details of future developments. However, many challenges can already be seen. The Convergence paper identified 15 concrete challenges at this stage[1]:

1. *Develop a vision to ensure a natural migration to competitive advanced broadband communication networks. Promote incentives to long-term investment whilst ensuring sustainable competition at the access level.*
2. *Achieve an Internal Market for spectrum.*
3. *Remove barriers to developments in fixed-mobile convergence.*
4. *Tackle the problem of online distribution of illegal content.*
5. *Promote the development of new business models through the deployment of Digital Rights Management (DRM) systems.*
6. *Clarify the relationship between the exclusive rights of copyright-holders and certain exceptions that apply for the benefit of users or the public interest.*
7. *Develop a community wide licensing process for digital copyright protected material.*
8. *Create a new level playing field for audiovisual services.*
9. *Promote competition with respect to access to content.*
10. *Favour the development of adapted means of payment.*
11. *Provide the appropriate level of protection for consumers.*
12. *Protect minors and human dignity in a converging environment.*
13. *Keep the digital service market place safe from harm.*
14. *Preserve European citizens' and consumers' privacy.*
15. *Achieve the appropriate level of interoperability at the level of networks, devices and content to create a competitive environment and to ensure consumer acceptance.*

For policy makers, the main challenge is to ensure that the set of legislation and regulations impacting converging sectors complement each other and provide legal certainty. This aims to respond to rapid technological changes in a way that promotes competition, consolidates the internal market and benefits users and citizens. The Convergence paper reviews the various policy issues at stake. The main conclusion is that:

(i) Regulation had been designed with the objective of encouraging investment and innovation, while protecting general interests when needed;

(ii) The current overall regulatory environment is not blocking the emergence of convergence. However, there is a need to adjust it to mitigate emerging bottlenecks and to preserve the general interest.

[1] The challenges are not classified by order of priority but follow the thematic approach of the Convergence paper.

(iii) The work recently undertaken at the EU level in regulatory areas such as eCommunications, audiovisual services and copyright proposes such adjustments;

(iv) And finally, in a longer term perspective, convergence might lead to business models, market structures and usage that might require additional policy actions.

In other terms, convergence is to telecommunications what globalisation is to trade - an issue that will affect everything governments do. Convergence should therefore be discussed with a view to coming to a common understanding of current trends and to address critical questions that are relevant for convergence regarding networks, services and users:

1. How will we migrate towards truly converged next generation broadband networks, which offer abundant bandwidth and seamless integration of both fixed and mobile networks? Given the costs of such networks, what is the likely scenario of competition in infrastructures as a result of the migration to NGN? Is it to be expected that every household and SME in the EU will have access to such a network by 2020? Will it be like the internet is now, with one price or like mobile networks are, with differentiated prices for different services?

2. Will it be possible to offer Video-on-Demand, Television and other content services on a pan-European scale? Will the market nevertheless remain fragmented because of the diversity of new services, different contractual models or demands by governments? Will the demand for interoperability between the growing number of content platforms increase and how will it be met?

3. What rights will consumers have to gain access to and to use digital content? Taking into account current models of open access to Internet content, limited access to protected content on specific platforms or alternative models allowing migrating content between devices and platforms, will these models continue to coexist or will exclusive models predominate?

I. OVERVIEW OF THE CONVERGING ENVIRONMENT

Introduction

The technological landscape has changed significantly during the past decade. New communication technologies, new media, the Internet and devices carrying new functionalities are expected to meet consumers' demand for seamless, simple and user-friendly digital tools providing access to an extended range of services and content.

The i2010 initiative identifies convergence as a main factor for change for the ICT sector and the society at large. **The main objective of the first i2010 pillar, "A single European Information Space", concerns the prospects for strengthening the Single Market and exploiting the industrial opportunities offered by convergence.** i2010 calls for "*policy convergence to move to a consistent system of rules for the electronic sector communications and media sector*". The aim of this paper is to highlight various technological, market and policy/regulatory challenges that arise from the strengthening of the convergence process.

A. From technological to industrial convergence

Traditionally, audio, video, data or voice communication services were accessed through different ICT networking infrastructures and distinct terminal devices. These included PCs connected to Internet, TVs picking up broadcast signals, telephones connected to copper/fibre local loops, or mobile devices connected to wireless networks.

These various networking environments and technologies have also historically been developed on the basis of very different business models, with different players at each level of the value chain. In the context of these models, a service is intimately coupled with a network infrastructure (e.g. a mobile phone call is conveyed primarily over a dedicated mobile infrastructure, a radio station broadcasts audio content, an e-mail is sent over the Internet).

Today's technological convergence drive is radically changing this picture, with the result that progressively, a complete separation is taking place between the underlying networked infrastructure and the services/applications it can deliver to the user be it at home, at work or from a mobile device.

The broad range of industries involved in convergence at the various levels includes IT (hardware and software), consumer electronics, electronic communications, broadcasting and content providers including media, and large internet companies. These industries have different backgrounds, but they are finding themselves competing in new markets as a result of common platforms, networks and services with similar functionalities.

Convergence is bringing about industrial changes both at the horizontal level, whereby traditionally separated industries compete with each other, and at the vertical level, whereby new partnerships emerge bringing about the need for new business models and sometimes trends towards vertical integration.

Convergence is blurring the boundaries between markets and strengthens vertical links. Communication services, delivery devices and media content are increasingly interrelated: economic distortions in one sector may easily spill over to another sector. For example, lack of competition at the access level can reduce demand for complementary products upstream such as computers and content. Similarly, non-availability of content resulting from an inappropriate regime for copyright licensing may result in lower demand for broadband services. Because of such spill-overs, it is essential for the EU to get the right regulatory framework both for services and for content, taking this changing environment into account.

B. The futures of convergence

In view of the technological evolutions already taking place there are many ways for convergence to develop. While the technological possibilities are the most predictable, the current situation in the market for content, services and related products is unstable. The ultimate outcome depends on the experience that convergence offers to the consumer: ease of access to content, quality of communication tools, possibility to create and share user-generated content. There are several points of departure one can take in assessing the development. Among them are a general societal and globalisation view, a view from the more technical and network development side, a view from the business and economy side and a more user-experience or citizen-oriented view. All scenario aspects listed below explore primarily different models as one might see from the user viewpoint. None of them must be taken as the most likely one by itself, but elements and development trends from these scenarios are likely to persist in one form or another.

1. The Mobile Future: the mobile phones take over

The future is wireless. The mobile phone slowly improves its storage capacity and battery life, facilitates Internet access and takes over its competitors becoming a prime media device for downloading, streaming, storing and playing all kinds of media. This is facilitated by the faculty to use secured solutions for mobile payments for content and services. The use of mobile for payments progressively expands to the purchase of goods and services online, as well as in "real-life".

Voice runs over the Internet Protocol (IP). At home, the media phone plays without any cables, from music to videos. On travel, it allows to listen, view, download and – to some extent – share content. Content is adapted after choice: shorter, more snappy versions for the small screen, full-scale and in-depth shows for the large screens at home. The most popular phones can hook up to a range of different wireless networks seamlessly, offering choice in speed, price and service-level. Phone manufacturers actively use and promote the new generation of web techniques, combining a wide range of data and content sources to create easy-to-use, online applications more adapted to the small-screen user experience.

Example: The Nokia Multimedia N80
In spring 2006, Nokia Launched its N80 multimedia phone. The phone can act as music and video player and storage device, and download via 3G or WiFi connections. It browses the web and contains office application. Notably, it has a WiFi media server (using uPNP), which means any media player, PC or hi-fi equipment using this standard for media networks can navigate and play all media content stored on the phone: For instance, a network media player or one of the many new hifi receivers supporting WiFi media streaming can play music stored on the phone directly whenever the phone is within range. The phone also interacts with a popular Web 2.0 service for pictures.

High hopes for continued growth leads to wide investments in the coming of 4G and in mobile TV. The mobile media market distinguishes itself from the existing Internet media market by being fully paid. However, the content is also locked to the device and it is hard to transfer media to other platforms. For the users, this does not pose much of a problem, as long as they can transfer the content to another mobile phone when they upgrade – which especially young users do frequently. Various streaming and downloading mechanism live side-by-side, with downloading being the more expensive options and streaming acting more like subscription broadcasting.

2. The Way of the Syncing Gadget

Although most devices have wide multimedia functionality, the devices are split by actual user behaviour: One device for listening, another for watching and playing games, a third for reading and chatting. Instead of being always connected, most users connect and sync at regular spots where they have high-speed access to content they wish to carry. Most devices have a host of connection methods people use for syncing: local wireless networks, device-to-device connections with or without cables, 3G, PC-connections using the Internet and more. People buy content through their home computer or media centre, in shops and over wireless connections.

Example: The portable music players and online music stores

The sales of mp3-players have skyrocketed the last couple of years. However, these players have generally little connectivity in themselves: They need to be connected to a PC for syncing of music. Some of the music is bought online using stores like iTunes, Urge, and Napster, whereas much is retrieved from existing bases of music on CDs, recorded from radio or webradio, or from other sources. In actual device sales, most devices sold have only room for a limited number CDs at a time (typical from 15 to 50), meaning syncing with a PC is needed whenever the user wants to change repertoire. Although storage space increases, the use of such devices for movies and television content puts similar limits on the devices for some time ahead. Many mp3-players even require a syncing in order to recharge batteries. This modus operandi is archetypical of syncing gadgets.

The syncing culture can lead to a shift in broadcasting strategy: broadcasters can expect and prepare their transmissions for "podcasting": The user can download their content at one device, and still watch it on another at another time. Live transmission gets even more separated from pre-produced content in market mechanisms. For instance series are now more often marketed outside broadcasting channels than within, whereas live and event-based programming with limited appeal in time are the dominant area of broadcasters. Advertising versus sale strategies have changed accordingly. A series of different business models compete: subscription with free availability to content lives side by side with pay-per-download, and various degrees of freedom of use are sold at different prices. Streaming exists, but is not as big as syncing or downloading – broadcasting and streaming is mostly the domain of live shows and events.

3. Connected homes with networks and intelligent appliances

The home network breaks through when most broadband packages naturally include a wireless home network. Devices typically can and will connect to multiple networks: for instance, a cell phone would use WiFi to share its captured images and stored music seamlessly with the home stereo and TV, but use 3G for normal phone use like voice and email – sometimes Bluetooth or WiFi for routing the call through cheaper landline telephone or VoIP connection. Various models exist for what is the "hub" of this network: the PC, the

all-in-one broadband/IP-TV/VoIP/ storage device or the high powered TV - media player – some even used their mobile phone as the hub. Software applications become increasingly based on or added to by the new generation of interactive web standards, combining both external sources and locally stored content into online applications working across devices for the same content and services.

Simultaneously, lower-speed, power friendly networks for electrical wires or short-range wireless become more commonplace in simple electric appliances, from lights and light switches to heaters, doorbells and alarms, enabling wireless control over basic home equipment. Household appliances using programmes, like washing machines and surveillance cameras, started to utilise these basic networks to "phone home" through the home network for software upgrades, maintenance reports etc, and some even got the option to read RFID (Radio Frequency Identification) tags, for instance on clothes for automatic check on what type of program to use in washing machines.

Example: The Media Center PCs
Most PC manufacturers are now offering media centers: PCs designed like a hi-fi piece to fit under the television in the living room, connecting to the TV and the hi-fi. Such media centers feature very easy-to-use interfaces through remote controls, much like any hi-fi equipment or DVD player. By being full-fledged PCs, they are versatile and can play, record and manage virtually any type of media available, both in physical formats, online or over broadcast. They can also act as servers, giving you access to your own media and broadcast channels from every connected device in the world, be it over the web or on a cell phone, and they can even serve as home centrals for VoIP, home surveillance and intelligent house systems. Several operating systems and interfaces compete on the market.

II. CHALLENGES OF CONVERGENCE

A. An enabling regulatory framework

The objectives of the various regulations and policies applying to the converging sectors that have been put in place at EU and Member States level can be, for the purposes of this discussion paper, divided into two main categories:

Economic objectives:

- Promotion of competition
- Encouraging investment and innovation
- Completion of internal market
- Maximising ICT contribution to growth
- Promotion of efficient allocation of spectrum
- Protection of Intellectual Property Rights (IPR)

Social and cultural objectives:

- Universal Service Obligations (USO)
- Plurality of media
- Promotion of cultural diversity and national identity
- Consumer protection and privacy
- Protection of minors and human dignity
- Protection against defamation

The **framework for electronic communications** has mainly economic objectives.[2] It aims at the enhancement of competition to improve the quality/price ratio and to stimulate innovation and investment. Its flexibility implies that ex-ante obligations can be rolled back as soon as the market is deemed competitive. On the other hand, **regulation of information society and media services** mainly targets the achievement of general interests involving social and cultural objectives like the protection of consumers, protection of minors and human dignity, cultural diversity and media pluralism[3].

A revision of the Television Without Frontier Directive has been proposed so as to take account of changes brought about by convergence in the audiovisual sector. The e-communications regulatory framework is also being reviewed in order to adapt to the rapid technological change taking place in the market.

The main regulatory challenge for convergence is to ensure that different sector specific regulations complement and provide legal certainty so as to respond to rapid technological changes in a way that promotes competition, consolidates the internal market, favours cultural diversity, and benefit users and citizens.

B. Policy issues for convergence

1. Towards Next-Generation Networks

What do we want with the networks?

- A more seamless experience for all users, requiring less skill to use and less resources necessary to maintain for users. This includes adaptive use of the most suited available connecting technology at any given time and place of usage. Seamlessness includes between wired and wireless options.
- Steadily increasing speed and reliability to allow for new services and usages
- Competition in the market to allow for user choice and innovation as well as competitiveness
- Sound business opportunities and return on investments for operators and investors to ensure continued development
- Openness of use, allowing for innovation and participation

a) The infrastructure challenge

The industry of electronic communications is undergoing a period of change. In the past, fixed telephone lines were used exclusively for voice telecommunications. Cable TV networks and satellite only transmitted television signals. With the development of ADSL and other broadband technologies, these networks can transmit a wider range of services. Traditional telecommunication operators and broadcasters are moving into each other's market by offering a bundle of voice, data and image services. "Triple-play" and "multi-play" offers are the first step towards a long-term evolution that is expected to lead to the

[2] With the exception of the Universal Service Directive (2002/22/EC) and the Privacy Directive (2002/58/EC)
[3] Application of the country of origin principle combined with EU-minimum standards also has a major economical impact, since it gives the legal certainty needed for content service providers to offer their services all over Europe.

consolidation of access platforms, allowing users to seamlessly access content and services through a variety of fixed and wireless networks.

Convergence is pushing towards an environment that requires new investment in infrastructure able to support the delivery of rich services, applications and content. Investment needs to take place both in the core networks as well as the access level. From this point of view, the main regulatory challenge concerns the adequacy of rules in providing sufficient incentives for long-term investment to take place. Factors to be taken into account are the migration to IP networks, the need for more capacity for the final user, the importance of sustainable competition at the access level, the demand for availability of content on fixed and mobile platforms and of the development of new business models for the delivery of advanced services. Policy should aim at the creation of a favourable environment for investment to take place. This means legal certainty and sustainable competition.

Challenge 1*: Develop a vision to ensure a natural migration to competitive advanced broadband communication networks. Promote incentives to long-term investment whilst ensuring sustainable competition at the access level.*

The new regulatory framework already tackles convergence for electronic communications. The same principles apply regardless of which kind of existing or potentially new technology is involved. Obligations may be imposed on all kind of operators providing communication services and enjoying significant market power in specified markets. Regulation must be withdrawn once there is effective competition in a specific market. Deployment of new services will create emerging markets and may be exempt from ex-ante regulation. In general, the strengthening of convergence implies a paradigm shift towards more advanced broadband networks able to provide multimedia services.

Currently, the Access Directive[4] recognises that there may be a trade-off between short-term competition through mandated access and long-term competition through investment: "The imposition by NRAs of mandated access that increases competition in the short term should not reduce incentives for competitors to invest in alternative facilities that will secure more competition in the long term". Regulators must find the balance between facilitating competitors' use of the infrastructure and the need to offer sufficient commercial incentives to the incumbents to invest. They must also take into account that their action does not make traditional investment obsolete. The emergence of triple-play services has surely put pressure on the unbundling of the local loop, but fibre deployments may make central offices obsolete and call for alternative business models.

b) Next Generation Networks

The so-called Next Generation Networks (NGN) -based packet-routed networks, mostly using Internet Protocol (IP)- are progressively replacing conventional circuit-switched networks, yielding a significant change to the way networks are built and how services are being delivered. Many identify NGNs with ultra high-speed access to the end user premises, primarily though optical fibre. However, it will still take some time before legacy networks are completely replaced by new infrastructure. Therefore the term Next Generation Networks

[4] Directive 2002/19/EC

also refers to a system where different networks (PSTN, IP, ATM) are combined and exploited in more efficient ways.

This conceptual difference is significant, because some think that the regulatory approach to be applied may change according to each model. Some operators see a 'technological break' in NGNs, involving new architectures, new protocols and new types of access, and claim therefore that any regulatory intervention would negatively affect the uptake of new networks. Other operators, on the contrary, believe that NGN are the result of an evolutionary process – many operators would have been delivery converged services over IP networks since a while ago, and that regulatory intervention is still needed in order to guarantee effective competition through non-discriminatory access.

The complete migration to NGN will take time, and is driven by two major factors:

(i) Operators' aim to rationalise legacy and new infrastructure so as to reduce deployment (CAPEX) and operating expenditure (OPEX) and improve balance sheets;
(ii) Operators' need to recover losses from the declines in fixed-voice revenues through the supply of innovative multi-media services;

At the backbone level, the migration towards Next Generation Networks (NGN) has already started, as evidenced by BT's plans for the 21st Century Network and by KPN's "All IP World".[5]

c) Fibre deployment

NGN may refer both to the core network and to the local access. Most attention in the current regulatory debate is given to the upgrade of access technologies to achieve higher performance through Fibre to the Home (FTTH), Fibre to the Node (FTTN) and Very fast DSL (VDSL), truly capable of providing a wide array of large bandwidth-hungry services, facilitating the upload of rich user-generated content. These access technologies are generally considered more advanced than current wireless and fixed offerings because of the high bandwidth they offer. Wireless technologies cannot yet provide abundant bandwidth. Deployment of ADSL2+ requires an incremental investment that does not go beyond the exchange. Moreover, ADSL2+ is not symmetrical and limits the uploading of content and therefore the opportunities for interactivity.

Next generation broadband access networks require fibre deployment beyond the exchange, an expensive investment because of the amount of civil works involved. There is a transitional period during which investment in fibre is a cost without appreciable return. As a result, fibre will be deployed as long-term investment. The high sunk costs involved in the deployment of fibre, that only a very limited number of entrants could face, make many

[5] In March 2005 KPN announced its intention to move its entire network to IP. In 2006 KPN begun roll out, expected to be completed by 2009. KPN will replace junction boxes and connect the new ones with fibre. The copper wire will remain in the ground between the junction box and the houses and users should be able to have access at speeds of up to 30Mbps. This example showcases NGN as a combination of legacy and new networks.

analysts wonder whether building dual fibre lines would not be a waste of resources, with complex regulatory implications.

In France, for example, it is estimated that 10 billion Euro are needed to cover 40% of population living in urban areas and another 30 billion to cover the remaining 60% living in rural areas.[6] Furthermore, the current models of fibre deployment in the EU often take the form of public/private partnerships, where the public sector supports open access fibre rings to be managed by a private entity. Fibre rings can then be accessed by any service provider.

In deployment models where investment in fibre stops at an intermediate point between the local exchange and customer premises, and that legacy network and/or wireless technologies will be used as the terminating element in the local access chain.

What seems to be clear in all cases is that besides the high levels of investment required, with its associated financial risks, NGN will bring a re-design of network architectures with significant impact in the current interconnection system.

Finally, in an NGN world, operators are also distributors of digital content, services and applications. Their competitive position will have an impact on the content industry. The "net neutrality debate" in the USA highlights operators' propensity to enter into preferential distribution agreements with some content providers and enhance profitability. This type of agreements in a world of limited distribution channels may be problematic and the issue needs to be subject to wider discussions.

d) Towards an efficient management of spectrum

The convergence of wireless offers is key to the achievement of seamless access to the Internet. WLAN, WiFi, UMTS also help introduce competition in local markets. These networks are packet-switched broadband networks, and may also carry VoIP. Sales of home WLAN devices are rapid and interest in new technologies such as WiMax is increasing. The future launch of DVB-H will further extend the variety of services available on mobiles.

The advent of digital television is expected to bring important changes to electronic communication markets, through the introduction of digital television and radio and the development of new services that can be delivered over the Internet. The advent of digital television is expected to contribute to the "digital dividend", or the availability of spectrum that was used in the analogue world.

The relative importance of radio spectrum as a production factor for electronic communications services and networks, such as mobile, wireless and satellite communications, TV and radio broadcasting, transport, radio location and the GPS/Galileo satellite system, has increased dramatically during the last decade and this trend is expected to continue. Although spectrum is traditionally regarded as a national resource, national borders are increasingly irrelevant to wireless electronic services. Many operators and equipment manufacturers behave globally. Compensation for different standards for global devices often leads to increased cost and decreased performance of equipment, for instance by increasing the number of receivers in each mobile device.

[6] http://www.telecom.gouv.fr/index.php

The long term policy goal should be to develop approaches ensuring that spectrum issues related to the growing and evolving variety of radio systems comply with the overall policy goal to develop the European Union internal market and European competitiveness, by ensuring an innovation-friendly and coherent regulatory environment which facilitates rapid access to spectrum for new technologies and leads to the provision of a wide variety of wireless electronic communications services and networks.

The convergence trend and the increasing use of digital technologies are putting pressure on spectrum management policies as radio access networks increasingly compete with each other. For those bands used to deliver electronic communications services to the consumer, it is important that spectrum regulation also keeps pace with this trend and provides coherent authorisation conditions, whilst ensuring the effective and efficient use and allowing the operation of radio systems free from harmful interference.

At present, in the EU, different conditions exist to access radio resources, for example, between mobile operators and broadcasters, while electronic services provided by these operators increasingly overlap. The current divergences in usage constraints and barriers between uses create tensions between rights holders and discrepancies in demand for spectrum and its commercial valuation. The gap between market needs and regulation impairs the efficient use of spectrum and hampers the development of a genuine internal market while the inefficiency in spectrum use creates costs and reduces the take-up of innovative services, to the detriment of consumers and the wider economy.

Challenge 2: ***Achieve an Internal Market for spectrum***

Technological neutrality is already a general principle of the current regulatory framework for electronic communications. Applied to spectrum policy, technology and service neutrality are important to increase flexibility. These principles require that spectrum rights holders are allowed to choose the radio network and access technology to use and the service to deploy in a given spectrum band in most circumstances.

Spectrum tradability adds to technology and service neutrality, by ensuring a high level of fluidity of radio resources, reducing the costs of usage rights. To achieve this, it is crucial to establish a mechanism by which tradable bands are identified jointly by all Member States, so that tradability can be applied commonly throughout the EU.

In general, implementation of spectrum policy through mechanisms that yield results agreed by all Member States will deliver a coordinated approach that will ultimately facilitate the emergence of pan-European services.

Challenges for spectrum policy are currently being examined in the context of the ongoing review of the regulatory framework for electronic communications.

Challenge 3*: Remove barriers to developments in fixed-mobile convergence*

In the long term, fixed-mobile convergence appears as a major challenge for telecom operators: Operators owning both types of network can acquire more value by making applications ubiquitous and easy to use. Results will of course also depend on the competitive

pressure, both from mobile only operators and from entrants in the wire line market extending their triple-play services. To face these challenges, some players are expected to specialise in services while others will concentrate on the network. The importance of fixed and mobile compatibility is evidenced by the strategy of most incumbent fixed operators: years after separating mobile telephony divisions from the core company, they once again start relationships with mobile operators.

Current fixed-mobile strategies by major operators' focus on offering consumers a single environment where the difference between the fixed and the mobile networks should not be perceived. Operators bet on consumers preferring a single contact number and a single handset with unified messaging and multimedia features. However it is not clear yet what consumers' reaction will be, and issues such as pricing or privacy have been raised.

One aspect of the promise of fixed-mobile convergence is the evolution of WLAN and its integration into fixed and mobile networks. Mobile operators currently face the challenge of a mobile WLAN that allows VoIP, giving fixed carriers a chance to get some business back from mobile operators. This raises questions on the future of the traditional mobile operator business, as well as on the role of the WLAN technology in the future.

2. Ensuring a high level of innovation, content creation and distribution through IPRs

What do we want with the content in a converged environment?

- easier and more seamless access, the anywhere-anytime availability access to adapted content
- increased production and increased availability of content
- steadily increased quality of knowledge and cultural content
- openness to participate in both knowledge and culture, both as a contributor and user
- monetization possibilities to foster innovation and business as well as professional and artistic diversity and growth
- cultural heritage and knowledge keeping for the present and future generations
- strengthening the role of content, knowledge and communication as the foundation of European democracy

Convergence of high speed broadband networks, audio visual media and electronic devices is creating new delivery channels for traditional content and is opening the path to the development of interactive content and services. "Born-digital"-content and combined creations, from karaoke videos to mash-up content applications and Web 2.0, are creating all new forms of content as well as new complexities of both delivery channels and right issues. While innovation is offering promising opportunities for the distribution and creation of content, the wide availability of digital content is opening new technological perspectives.

In view of the growing interdependency between technological innovation and content creation, one of the major challenges is to ensure that IPRs best play their roles of promoting both innovation and creation. While a high level of protection is the very basis for innovation and creativity, in the long term, it may be necessary to closely monitor the impact that protection of artistic creation might have on technological innovation, and reciprocally. Proper room and protection must also be allowed for cumulative, collaborative and combined creations, as well as user-created content.

Challenge 1: ***Tackle the problem of online distribution of illegal content.***

Securing access to digital content remains one of the major challenges of convergence. With the move into the digital age, the possibility to simply copy or share copyright protected works, results in the alarming development of digital piracy. The uptake of legitimate services passes by tackling the problem of digital piracy and the development of attractive distribution means and business models for digital content.

Enforcement of copyright is a major challenge in the online environment, and proper assessment of the impact of online piracy in the different Member States is needed to monitor progress in this field. Another major challenge is to provide the appropriate level of enforcement for copyright without preventing the development of innovative technologies and business models, or new forms of creative processes. The case of P2P networks – one of the most promising technology and model for distribution of content – illustrates the need to find the appropriate balance between copyright protection and promotion of innovation. While it is crucial to prevent the use of this technology for illegal purposes, and to make sure that technology providers do not illegitimately benefit from such a use, it is necessary not to outlaw the technology in itself. Failing to do so could lead to a clear disincentive for innovation in new technologies for content distribution, which could in turn have a negative impact on the content sector. Likewise, combined creations represent both an enormous potential for creativity and new content, while at the same time creating significant copyright issues.

Challenge 2: ***Promote the development of new business models notably through the deployment of DRM systems.***

DRM is a key enabling technology, offering a possible alternative for certain right holders to enforce and manage their rights in the digital environment. It has the potential to support the shift from traditional to innovative distribution models, adapted to consumers' demand and needs in a converging environment.

However, the development of DRM is raising a series of issues that need to be addressed to ensure their full acceptance by consumers and the players involved in the distribution of digital content. A major effect of DRM is a paradigm shift from a usage of copyright protected works governed by law, to a usage governed by contractual agreements. Among the main challenges for the coming years will be the need to:

- Ensure a non discriminatory access (cost and access terms) to DRM solutions in order to preserve a competitive market for digital content distribution. The multiplication of patent pools on DRM technologies, the licensing terms for these technologies or the refusal to license them, illustrate how the protection of technological innovation may affect copyright protection and distribution of content.
- Examine the potential fields for standardisation activities and/or development of open standards in order to favour the interoperability between DRM systems.
- Ensure that technological protection measures (including DRMs) are taken into account when determining the application of private copying levies (PCL) to media storage. The application of PCL to media storage illustrates the increasing interdependency existing

between technological innovation and artistic creation. It constitutes a test round in the confrontation between these two converging environments.

Challenge 3: ***Clarify the relationship between the exclusive rights of copyright-holders and certain exceptions that apply for the benefit of users or public interest.***

Convergence is raising challenges in respect of archiving and public lending of copyright protected material[7]. Libraries and archives are using the new information technologies to provide better level of services. However, the traditional model of libraries services based on authorised lending of the physical items own by libraries or archives is not easily translatable to the online environment.

At the same time, creating digital copies for conservation purposes can be compromised by problems of rights clearance. Multimedia formats, such as broadcast archives, frequently have multiple rights associated to them: amongst others performance rights, music, composer, broadcaster rights, each of which may vary over time and place. The need to clear the rights with all the right holders can be an insurmountable hurdle[8]. Furthermore, the introduction of technological protection measures (TPM) raises another issue in relation to preservation, since TPM are precisely designed to prevent copying and migration of a work form one format to another. Beyond the archiving of copyright protected works, the legal conditions in which the digitized or digital copies of these works may be made available to the public, remains one of the main issues to be addressed. As for the copyright exceptions to the public interest, the challenge will be to find the appropriate balance between different interests, one the one hand those of rights holders to control the exploitation of their works and on the other possible public interest issues arising from electronic access, archiving and indexing of content.

Challenge 4: ***Develop a community wide licensing process for digital copyright protected material.***

A major market change resulting from convergence is the faculty for information society and media service providers to make their services available at European or even global level. From a technical view point and in line with the eCommerce and TVWF (Television Without Frontiers) Directives, nothing prevents a digital content service provider to make its services available in the internal market. However, as a result of copyright territorially, it will have to obtain the right to do so in each Member State. The costs incurred, may have a detrimental effect on the exploitation of a vast majority of works outside their national markets. In this context, community wide licensing processes have the potential to favour the development of pan-European content services, and the circulation of European works in a Single Information Space.

The Commission has diagnosed a deficit regarding pan-European licensing of online music rights and has already started to work on the issue with a recommendation[9], encouraging the

[7] COM(2005) 465 final
[8] COM(2004) 171 final
[9] Commission Recommendation on collective cross-border management of copyright and related rights for legitimate online music services (2005/737/EC), 18 May 2005.

collecting societies to change their licensing practises, and inviting Member States to take the steps, where necessary, to promote a regulatory environment adapted to the management of copyright for the provision of legitimate online music services. While assessing the result of this recommendation in the coming years, the Commission will consider the need for further action.

3. Creating a competitive environment for new information society and media services

What do we want with competitiveness in a converged environment?

- competition that leads to more rapid development, increased growth and increased accessibility
- higher competitiveness in Europe
- more consumer choice as well as lower costs

Challenge 1: *Create a new level playing field for audiovisual services*

New platforms such as digital TV or television over IP make interactive audiovisual services possible. The current legal framework differentiates between traditional broadcasting falling under the TV without Frontiers Directive and the on-demand or interactive audiovisual services, which are in the scope of the eCommerce Directive. Creating a level playing field for audiovisual services requires neutrality between platforms and within platforms. This will enable content service providers to compete on an equal footing, ensure regulatory consistency and strengthen legal security. In the context of the ongoing revision of the TVWF Directive, the solution proposed is to establish a comprehensive framework for all forms of electronic delivery of audiovisual content - including such content when delivered in a "non-linear" way - with the establishment of two different tiers of obligations:

- a basic tier of obligations, in particular protection of minors and human dignity, and identification of commercial content would apply to all audiovisual content services;
- a subset of these services, "linear" audiovisual services, based on scheduled programmes, would be subject to a second tier of obligations similar to those of the present Directive, simplified and modernised.

The proposal aims at creating a basic of harmonised rules for the provision of any audiovisual content, while applying different regimes depending on the way the audiovisual content is delivered.

In relation to the distribution of audiovisual services, many Member States require certain television or radio channels to be carried over certain networks. These **must-carry obligations** are traditionally applicable to cable television networks, and do not comply with the technological neutrality principle since they only apply to certain delivery modes.

Must-carry obligations are covered by Article 31 of the Universal Service Directive and justified by the need to guarantee a pluralistic offer of radio and television on networks that are used by significant number of end-users. The must–carry obligations seem justified for the cable networks originally set up by public authorities. However, the must-carry obligations can have a considerable impact on network operators, since they restrict the operators' ability

to use their own capacity freely and in a competitive way. This impact is all the more important since competition, in particular on broadband, has moved many cable operators from "mere" radio and television markets to the triple play, where they compete with internet access providers and other networks (e.g. 3G mobile networks or fixed telecommunications networks using DSL technologies).

Must-carry obligations may be still necessary, because traditional platforms (cable, satellite and terrestrial broadcasting networks) continue to be the principal means to receive radio and television broadcasts. However, the emergence of new technologies calls for a timely review of the necessity to maintain must-carry obligations.

In the long term the creation of a level playing field for audiovisual services may justify the extension of must-carry obligations to others networks if a significant number of end users were to use such networks as their principal means to receive radio and television broadcasts. However, since the capacity of NGN has the potential to guarantee a pluralistic offer by allowing access to a wide range of television or radio channels, the extension of the must-carry obligation may not be necessary. A distinction between fixed and mobile access to radio and television broadcast could also justify the application of must-carry obligations to mobile networks used as principal mean to receive radio and television broadcast on mobile devices. Hence, with the view to ensure a pluralistic offer of content services in a converging environment, any evolution of must-carry obligations will have to take into account the use of digital technologies among the different layers of the population.

Challenge 2*: Promote competition with respect to access to content*

Access to content is currently considered an obstacle by some of the entrants for two main reasons. First, their customers' base may not be considered large enough by content providers who tend to sell rights at a fixed rate and strike exclusive deals only with those who can provide large audiences. Second, in many countries the rights to broadcast premium content such as football have migrated to pay TV supplier or public TV broadcasters, and the potential for the exercise of market power is cause for concern.

The Internet has expanded the opportunities for streaming these broadcasts, and mobile phones offer a significant increase in the range of locations where premium content can be viewed. However, for the majority of service providers access to content is still a bottleneck for several reasons:

- Because of scarcity and exclusivity clauses, prices are excessive and financial risk is high;
- Since online content is still a nascent market, some right holders tend to protect existing revenues stream by preventing content to be distributed by alternative means;
- There is a tendency for content producers and content delivery companies to enter into long-term exclusive contracts increasing the risk of foreclosure;
- On the delivery side, there is a new chicken-and-egg problem: to gain market share new entrants need premium content, but to access content they need market share.

As a result, the market for premium content is suffering some significant market failures with the result that in most countries it is dominant pay-TV operators that have access to content.

With changes in broadcasting market and audience behaviour, convergence is representing a major challenge for public service broadcasting. Since audience demand may evolve toward access to public service broadcasting on mobile devices or access to interactive services, public broadcasters will have to adapt their services if they do not want to become "a relic of the analogue age"[10]. The BBC has already started its move in the digital age, by making its radio programme available for streaming, and working on the Interactive Media Player, which would give people access to visual as well as audio content, and is experimenting with making content available to download, not just to stream. By making their content available on fixed or mobile platforms, public services broadcasters may directly compete with private companies trying to exploit the new opportunities offered by convergence.

Challenge 3: ***Favour the development of adapted means of payment.***

Adapted means of payment such as micro payments, pre-paid payment cards or mobile payments are crucial for the development of new information society and media services. Initial expectations on the growth of the e-Money market have proven to be optimistic. The lack of low cost micro payment systems as well as limited penetration of credit card is an obstacle to the take up of new services and to the development of innovative business models. Few e-Money licenses have been granted and there have been some problems of interpretation of the e-Money Directive. In particular, there was considerable uncertainty about how the Directive should be applied to mobile network operators.

In some circumstances the issuance of pre-paid mobile payments can fall under the application of the e-Money directive and mobile operators have been confronted with the application of the Directive for these payments. While governed by the e-Money Directive, when low value payment services or low risks are associated with the payments, the burden associated with the requirements of the directive can become disproportionate and limit the availability of the services.

Through guidance published in 2005 regarding the application of the e-Money directive to mobile payments it was clarified that only those mobile operators, whose payment services transfer monetary value directly from the handset to the merchant, would fall within the scope of the Directive. For these few services, the waiver possibilities foreseen in the directive be applied. The e-Money Directive is up for review and remedies to the issues it is raising should be addressed in a report to be published in 2006.

4. A secure environment for European citizens and consumers

What do we want with security in a converged environment?

- ensuring the safety of the European citizens in an online environment
- ensuring trust, which again is the foundation of increased use of services and economic positive effects
- ensure privacy and protection of the personal sphere for the citizens
- stimulate transparency, interoperability and consumer choice
- safeguard human dignity in an online environment
- avoid fear-based development and behaviour leading to economic negative effects as well as negative effects for individual citizens, social groups and democratic values

[10] Review of the BBC's royal Charter: A strong BBC, independent of government, March 2005.

European citizens and consumers can derive a wide range of benefits from convergence, going from easier access to a great variety of information, to a greater capacity to create and develop their own content. However, many people are still reluctant to use information society and media services, due to concerns regarding the safety of their children, the integrity and stability of their computers or the abuse of their personal data.

Technological and business developments resulting from convergence, such as, Internet access on mobile phone, RFID, DRM or location-based services raise a number of new concerns regarding protection of minors, consumers or human dignity, security and privacy. All these issues need to be addressed in order to provide consumers with the level of protection they are entitled to expect from any environment.

Challenge 1: ***Provide the appropriate level of protection for consumers.***

As for consumer protection, all the EU rules protecting consumer rights apply to information society as well as audiovisual services. However, the development of new consumption modes as well new marketing or advertising practices resulting from convergence raise new concerns regarding consumer protection, and in some cases specific consumer protection measures may be necessary. This could be the case to ensure consumer information on the use of TPM or DRM and on the way it affects the usability of content[11]. New services, charge plans and business models raise issues about complexity, contracts/EULAs and price transparency. Development of transactions on mobile phone could also give rise to specific concerns regarding information provided to consumers, or the faculty for minors to make payments. These examples raise the issue of the extent to which the current eCommerce Directive is adequately covering the issues of forthcoming mCommerce developments. A related and important issue is the effectiveness of remedies for consumers in a new and often complex environment.

Increasing access to content and services lead to a potential increase in consumers' exposure to advertising. While advertising in itself is not an issue, ICT based advertising practices could raise specific concerns. Advertising in digital media, as well as new forms of advertising such as advertising techniques based on consumer' profiling or location are raising concerns.

As a first step, to take into account the developments taking place in audiovisual media services, the proposed revision of the Television Without Frontiers (TVWF) Directive provide for clear rules on product placement, allowing the development of this advertising technique, while ensuring adequate level of information to consumers.

Challenge 2: ***Protect minors and human dignity in a converging environment***

Protection of minors in the digital environment is a real concern, since minors are heavy and active users of online content and services. There are challenges to face regarding unwanted access to unsuitable, extreme, adult or harmful content and to risky communications. The

[11] European Consumer law group; Copyright law and consumer protection, ECLG/035/05 – February 2005

convergence expands the area of attention: mobile internet communications and content create new risks that may need to be addressed.

In the context of the TVWF revision, the objective is to establish a comprehensive framework for all forms of electronic delivery of audiovisual content. The proposed revision of the directive introduces a basic tier of obligations for all audiovisual services, including obligations in term of protection of minors.

One of the main challenges in term of protection of minors and of human dignity is the enforcement and extra-territoriality: if we are not able to enforce the EU regulation for content coming from outside the EU then we should work on alternative or complementary solutions on the model of the Safer Internet action plan. Another challenge is for the regulatory framework to protect minors and consumers without hindering the development of emerging technologies or services.

Challenge 3: ***Keep the digital service market place safe from harm***

Securing network infrastructures and services is also a major concern for economic players. With the development of new services and increased numbers of business transactions carried out over NGNs, information society and media service providers' losses resulting from security breaches could become considerably higher. The infrastructure of NGN/IP networks is packet based and multilayered, with open, distributed architecture and no embedded security mechanisms. However, these networks are used for the transmission of high-profit services such as voice, e-commerce or financial transactions.

In a technological environment that is constantly evolving, with the development of new services and content delivery platforms, the main challenge is to be able to identify any new security and network resilience issue, in order to give it the appropriate technical or regulatory remedy.

Challenge 4: ***Preserve European citizens and consumers' privacy.***

Technological developments also raise important concerns in respect of privacy. Concerns have already been expressed by the Commission in respect of data protection issues related to RFID, and the Article 29 Data protection Working party has been consulted on these issues[12].

Special concerns have also been expressed regarding monitoring of content and services use by technologies like DRMs[13]. As regards the development of DRM, new technologies to identify and/or trace users are being established at the level of exchange of information as well as at platform level (i.e. verification of hardware/software). The legitimate purpose followed by right holders to prevent misuse of protected information often results in the tracing of users and the monitoring of their preferences. Furthermore, some of the contractual

[12] Article 29 Data protection working party: Working document on data protection issues related to RFID technologies, January 19, 2005.

[13] Article 29 Data protection working party: Working document on data protection related to IPR, January 18, 2005.

agreement governing the use of digital material includes provision asking consumers to renounce to their rights to privacy.

New combined creations, especially mash-ups, also raises privacy issues as they might combine a wide range of existing personal data from various into new tools, leading to the processing of these data for new purposes. The issues are enhanced by the ease of use and creation of these tools.

In respect of privacy the main challenge will be to make sure that the legal framework on data protection is appropriate to address new privacy concerns resulting from technological developments such as DRM, RFID or location-based services.

5. Ensuring the appropriate level of interoperability

While leading to an increased complexity of the technological environment, convergence strengthens the requirements for interoperability at the level of networks, devices, content and services. For example successful proliferation of mobile content requires co-ordinated development of networks, handsets, operational and usage restriction systems, and content formats. In order to ensure a positive user experience, the handset's physical features as well as the operating system and software tools necessary to run protected or non protected content applications must all work together.

Challenge: ***Achieve the appropriate level of interoperability at the level of networks, devices and content, in order to create a competitive environment and to ensure consumer acceptance.***

With convergence, the marketplace has fundamentally changed: the monolithic world of the past has been replaced by a heterogeneous technology development and standards environment and new complex relationships have arisen between networks and business models as well as contractual and strategic business relationships, often at global level, between all key players. Consortia or fora standardisation become a common practice in this sector and some of these standards have reached large market acceptance, challenging the role of the formal European Standardisation Organisations. In order to respond to new market requirements, the standardisation structures have to be flexible and able to evolve quickly.

Interoperability depends on standardisation but standardisation cannot be the only answer. The lack of common standards in a converged area is an inhibitor to its development. The competing standards can also raise concerns (see the case of DVB-H - the European technology and standard which supports the emergence of converged broadcasting-mobile services - vs. DMB - the Korean extension of the Eureka 147 standard developed in Europe).

Standardisation is essential but is not sufficient to achieve network interconnection and interoperability of services. The way forward is to establish interfaces that provide the minimum set of required protocols and tools to achieve the purpose of interoperability. For interoperability a minimum set of interfaces must be known, either through open standards or by disclosing proprietary interfaces. Interoperability needs intense "field tests" to make sure specifications are interpreted and implemented unambiguously.

The openness of networks requires the use of standardised and interoperable solutions and interfaces. Further NGN deployment will result in a variety of architectures and protocols, which creates interoperability issues. In this context, international standardisation bodies (ETSI, IETF….) play an important role by setting the specifications of protocols and by establishing a common general architecture and technological blocks of NGN.

Within the value chain, delivery devices most closely map the conventional concept of convergence. They include end user devices such as PCs and mobile phones. Most of these devices need to connect to some form of infrastructure to enable them to receive and deliver compelling content and services (exceptions are DVD and CD players).

Another area of convergence concerns platforms to download music. However, DRM and storage capacity issues are holding back the development of devices. On the other hand, the continuous decline in the costs of digital storage and display technologies implies that new opportunities coming up all the time.

The technical specificities of each platform, as well as the lack of interoperability between content formats designed to allow the access or to protect content (DRM) are creating situations where content and services have to be specifically encoded for each platforms. Addressing the issue of DRM systems interoperability is crucial for consumer acceptance and the creation of a competitive market for digital content.

III. CONCLUSION AND FURTHER ISSUES

Many challenges and developments connected to convergence can already be seen or reasonably safely predicted. There will be challenges for infrastructure, for innovation, content and management of rights, and there will be challenges connected to competition and business environment, to security, consumer issues and interoperability.

Convergence will go beyond the consumer market for innovative online services. It will affect **businesses** and the economy at large. Convergence creates an opportunity for firms to simplify and merge the current set of infrastructures and applications, and so reduce operational complexity and maintenance costs. With convergence, new patterns of work and delivery of services will emerge through eWork and nomadic work. The future stage of convergence with the "Internet of Things" can radically change B2B and B2C markets, bring the two closer and blur the clear differences between consumer and business activities. These changes combined with the new opportunities offered by utility computing and new web service architectures will require that policy makers devote greater attention to the business environment, in particular to the structural obstacles on the markets of labour, products and services in order to foster innovation in these new business processes. Structural rigidities on the markets of labour, products and services are already perceived as obstacles to a faster take up of eBusiness solutions in the EU and the issue might become more acute with the emerging technologies and their disruptive effects on business processes.

Other and possibly larger developments in society and modes of information technology might create additional, unforeseen challenges. The recent rise of **user-generated content,** including as a basis for large-scale business activities, is a notable example. One of these developments is connected to cumulative innovation and combined creations: the nexus

where **Web 2.0**, service oriented architectures, user generated content, mash-ups and new types of software-content applications live. In the fringes of this development we also find the rise of social networking through technology, of the formation and monetization of new and real social groupings and arenas online. The possibility of significant developments happening outside the scope of the established analytical and policy frameworks should not be underestimated.

Copyright and ownership issues will become increasingly complicated, since any given interactive media or application can host an almost endless number of sources, applications and related copyrights within it. It is clear that widespread adoption and use of combined creations will further challenge the management of rights. The reliance on external sources and applications may make many companies reluctant to allow such practices, but the obvious benefits might still mean that the mix-and-mash-up software applications are seen as a new dominant paradigm within a few years.

Security, privacy, quality and reliability also might suffer with home-grown systems: these applications emphasize and deepen the known challenges through their mixed nature and their reliance of external sources and applications. Business-critical software might be deployed without the involvement or knowledge of the ICT-staff, creating management, security and rights issues. For the established IT-services industry, it might lead to significant changes, in particular in relation with the slow "democratisation" of software development. The merging of data and application leads to a whole range of possible challenges in areas such as cultural heritage, archiving, interoperability, standards and administration guidelines.

The next stage of convergence will be the emergence of the **"Internet of Things"**, expanding the internet to "machine-to-machine" communications. RFID technology which is enabling these developments is expected to develop into a mass market within the next ten years. These developments will make the new addressing system of IPv6 necessary. They will also raise a number of technical issues such as interoperability, the adoption of standards and spectrum availability, but also public interest issues, including data protection and security.

The i2010 initiative identifies convergence as a main factor for change for the ICT-sector and the society at large. To achieve the objectives set forth in the i2010 strategy the challenges arising from the continuous changes of the technological landscape, while day-to-day decisions are made by consumers and researchers, by businesses and by governments, need to be closely analysed and acted upon.