Ofcom
OFFICE OF COMMUNICATIONS

What is convergence?

A submission to the Convergence Think Tank by Ofcom

Contents

Section 1

Introduction

1.1 In September 2007, the Secretary of State for Culture, Media and Sport announced the creation of the Convergence Think Tank in conjunction with the Department of Business, Enterprise and Regulatory Reform. Led by Government, and supported by Ofcom and a panel of experts, the Think Tank will examine convergence - its impact on markets, consumers and citizens and potential policy and legislative implications. In order to solicit a wide range of perspectives and stimulate debate, the Think Tank is hosting a series of stakeholder seminars.

1.2 This paper is Ofcom's submission to the first seminar of the Convergence Think Tank. Ofcom has undertaken considerable work on the nature and extent of convergence through its annual Communication Market Reports and other work. This document draws on this work to understand convergence, its drivers, and its implications.

1.3 We highlight here the key themes of convergence in advance of the first seminar in order to provide background information to attendees. It is not intended to be comprehensive, nor to lay out in detail Ofcom's concerns on specific issues that the Think Tank will consider over the year. Its purpose is to assist stakeholder understanding of convergence and promote discussion at the seminar.

1.4 At the outset it is important to ask ourselves what we mean by convergence. It is a word that means different things to different people and one that is often used to express different ideas.

1.5 Ofcom set out its definition of the process of convergence in its Annual Plan 2007/8. It is a technical definition of convergence which recognises the difference between platforms and services[1]. Our definition of convergence is:

"The ability of consumers to obtain multiple services on a single platform or device- or obtain any given service on multiple platforms or devices."

1.6 Convergence is bringing sweeping changes to our communications markets, fuelling new patterns of demand amongst consumers and changing traditional business models. It is already bringing great opportunities to consumers and to business. It is reshaping our communications markets and is at once both an exciting and complicated phenomenon.

1.7 The word convergence has been much used in the last ten years and the "age of convergence" has seen many false dawns. However, today convergence is now a reality. Convergence is all around us – mobile phones with video, radio and the internet, radio over TV platforms and the internet and TV over mobile platforms including digital radio, and the internet- all facilitated by the move to digital technologies.

[1] Platforms are the means of delivering services to consumers. Services are the products and content that are provided over these platforms. Platforms now include digital terrestrial TV, cable, satellite, fixed wireless and fixed and mobile phone lines. Services include TV, radio, mobile TV, internet, messaging, podcasting, vodcasting, VOIP and many others.

1.8 Whilst useful for policy makers, our definition does not describe the consumer experience of convergence. For consumers, the concept is manifested in new devices such as mobile phones with cameras and music players built in, hand held internet devices with audio and video and broadband connected devices acting as the gateway to a multiplicity of services. Convergence is driving a new pattern of consumer demand, built around three key factors: more mobility, more control and more participation in the way people use and enjoy media and communications services. The consumer experience of convergence is addressed in Section 2.

1.9 Convergence also means that companies are no longer operating solely in their historical markets. Today BSkyB provides broadband and BT provides television. Convergence is bringing new and innovative market entrants into our communications markets such as Google, Yahoo and many others. It is also leading to significant changes at every stage from creation of content and services through to delivery. These issues are addressed in Section 3.

1.10 And of course the phenomenon of convergence is global. The communications sector now forms an important part of most economies in the developed world and communications companies increasingly compete on a global, not national, level. Similarly, audiences increasingly consume services from international sources. The global context of convergence is considered further in Section 4.

1.11 Convergence brings great advantages: increased choice, innovation, convenience and lower prices driven by increased competition. However, it can also lead to varying degrees of confusion and anxiety for consumers as the range of products and services becomes more complicated and choosing which best suit one's needs becomes more difficult. It is therefore critical to understand the key changes that are underpinning convergence. These are considered in detail in Section 5.

1.12 Convergence is a powerful force which will transform the conventions of commercial, legislative and regulatory practices over the next few years. As more and more services are affected by convergence, it will have an increased importance in our lives.

1.13 Ofcom is the independent UK communications regulator. Ofcom was established by the Office of Communications Act 2002, largely in anticipation of convergence, to act as a converged regulator for the communications markets. It consolidated the functions of five previous regulators covering telecommunications, broadcasting, radio and spectrum industries, as well as taking on new powers.

Section 2

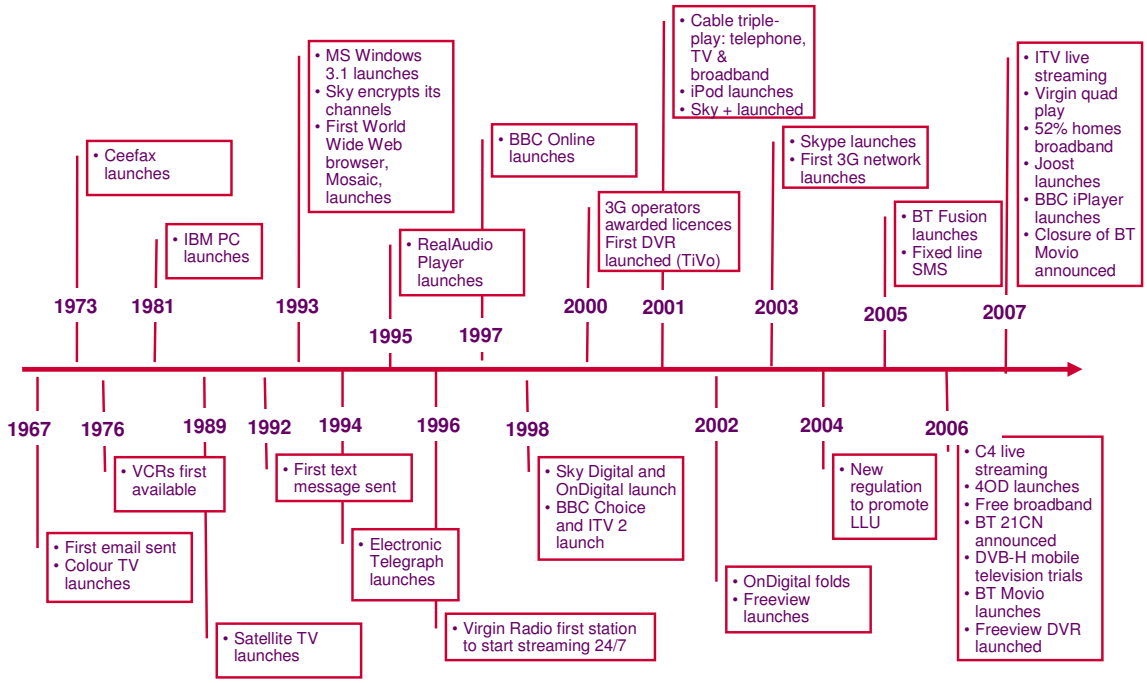
The consumer experience of convergence

Background

2.1 Consumers today are faced with a set of communications services which are profoundly different not just from those of twenty years ago, but even from those of ten years ago.

2.2 Ten years ago the internet could only be accessed via dial-up modems on a computer. Today it can be accessed in a multiplicity of ways including high speed broadband and mobile networks. Ten years ago content was carried to consumers over a specific platform, usually to a defined consumer device. Today, a wide variety of devices are capable of supporting many different media which can connect to at least one (and often more than one) digital communications network. The diagram below sets out some historical developments in relation to convergence.

The UK convergence timeline



2.3 For consumers, convergence is most readily seen in the devices that they can buy in high street stores, for example:

- A mobile phone with music, video and internet and a built in camera;
- A latest generation games console which is also a CD player, DVD player and internet connector with a hard drive capable of storing music and video; or

- An mp3 player which provides music and video and internet capability delivered through wi-fi networks. The storage of such devices has also grown at the same time that the cost has decreased. The first iPod, launched at the end of 2001, had enough storage for around 1,000 songs and cost over £349. Today a 40,000 song unit costs a little over £200.

2.4 Underlying these devices is often convergence of platforms, the means by which products and services are delivered. Increasingly, technological developments mean that multiple services can be delivered to consumers by the same method and with limited extra cost. For example, a company like Virgin is able to use its cable network to deliver voice, broadband, broadcast television and on demand video to the household. Equally, broadcast technology is able to send television, radio and text services to the TV set or to the mobile phone.

2.5 A further tangible consequence of convergence for consumers is the increasing availability of bundled packages of communications services available to them. Although bundling is also seen in unconverged markets, convergence is resulting in bundling becoming central to the strategies of many operators. 'Triple play' refers to broadband, television and fixed line phone services packaged and sold together. 'Quad play' is those services with the addition of mobile phone services. Many consumers now receive more than one service from the same operator, for example:

- BSkyB now offers telephone and internet services alongside its satellite television service.
- BT customers can access television and on demand video through BT Vision as well as telephone and internet services.
- Mobile phone users can subscribe to email and TV services delivered via their handset.

Current position

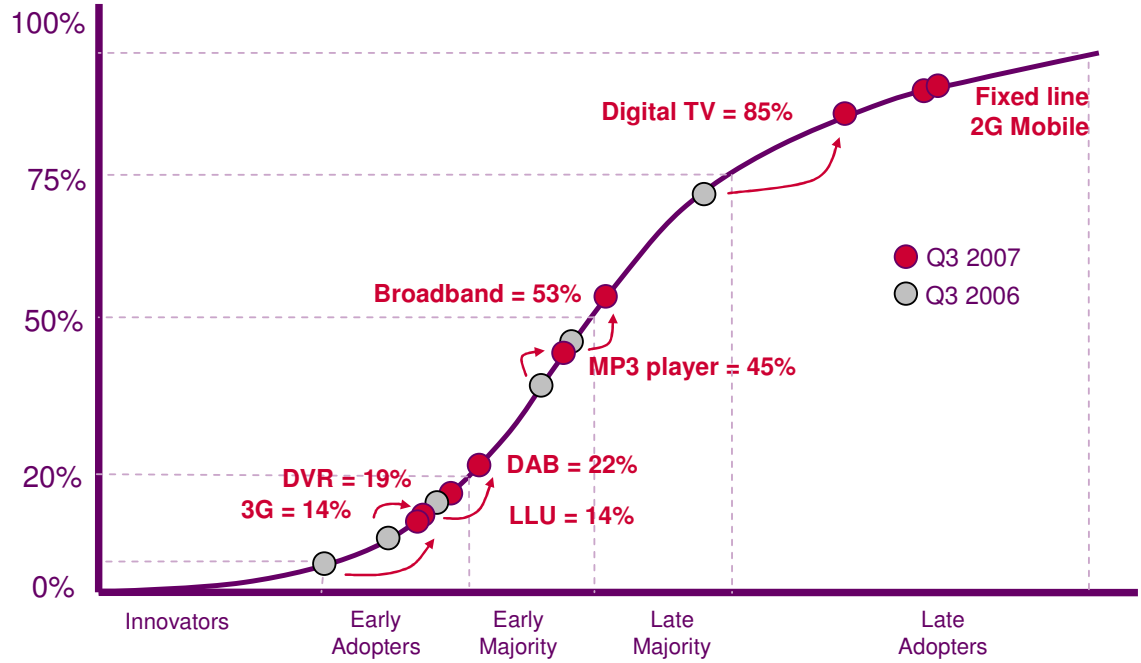
2.6 The availability of digital platforms and services has increased substantially over the last few years. Current levels of availability are set out below.

Digital communications service availability

Platform	2006	Notes
Fixed line	100.0%	
2G mobile	99.8%	Percentage of population living in postal districts where at least one operator reports at least 95% 2G area coverage. Sourced from GSM Association / Europa Technologies
3G mobile	91.4%	Percentage of population living in postal districts where at least one operator reports at least 50% 3G area coverage. Sourced from GSM Association / Europa Technologies.
DSL	99.6%	Percentage of premises able to receive DSL services based on data reported by BT
LLU	72%	Percentage of premises connected to an LLU-enabled exchange
IPTV	15%	Calculated on the assumption that Tiscali TV is now available in London, Stevenage, Birmingham, Newcastle and Edinburgh
Digital cable	45%	Digital cable availability only. Analogue cable is still available in a small number of additional areas.
Digital satellite	98%	
Digital Terrestrial TV	73%	Switchover will increase this to 98.5% by 2012
DAB digital radio	88%	Based on a Digital One estimate. Both the BBC and Digital one have built new transmission masts during 2006/07.

2.7 Take-up of digital devices and services has been rapid. Digital television penetration is over 85% today, 19% of homes now have a digital video recorder (DVR) and 14% of mobile subscribers connect through a 3G mobile network In some cases this take-up has been driven by policy consideration (part of the rapid growth of DTT has been enforced), but voluntary take-up of services like broadband has also been rapid.

Digital communications technologies take-up, 2005 and 2006



Source: Ofcom research and operator data

Notes: 1) All figures relate to the end of Q3 2007 except for 3G which is Q2 2007, and LLU and 2G mobile, which are Q1 2007. 2) All figures are measured as a proportion of individuals except for 3G, which represents the proportion of mobile subscribers, LLU which represents the proportion of premises in unbundled areas that are unbundled, and DTV, which represents the proportion of homes with a digital television reception device on the main set.

2.8 Bundled services are popular with consumers as well. While bundling different services together for consumers is not a necessarily a sign of convergence, in this case the impetus has come from shared functionality. Bundles are now increasingly prevalent. 40% of households (up from 29% a year ago) now take more than one communications service from the same provider and a majority of broadband customers take it as part of a bundle. Almost all companies now offer multiple bundled services.

Bundling service offers from major broadband suppliers, June 2007

	AOL	Be (O2)	BSkyB	BT	Orange	Pipex	PlusNet	TalkTalk	Tesco	Tiscali	Toucan	Virgin Media	Vodafone
Fixed and broadband	Y		Y	Y		Y	Y	Y	Y	Y	Y	Y	Y
Broadband, fixed and TV			Y	Y						Y		Y	
Broadband, fixed, TV and mobile				Y								Y	
Broadband and mobile				Y	Y				Y		Y	Y	Y
Broadband, mobile and TV				Y								Y	
Broadband, fixed and mobile				Y					Y		Y	Y	Y
Fixed and mobile				Y					Y		Y	Y	Y
Fixed and TV			Y	Y						Y		Y	
Fixed, TV and mobile				Y								Y	

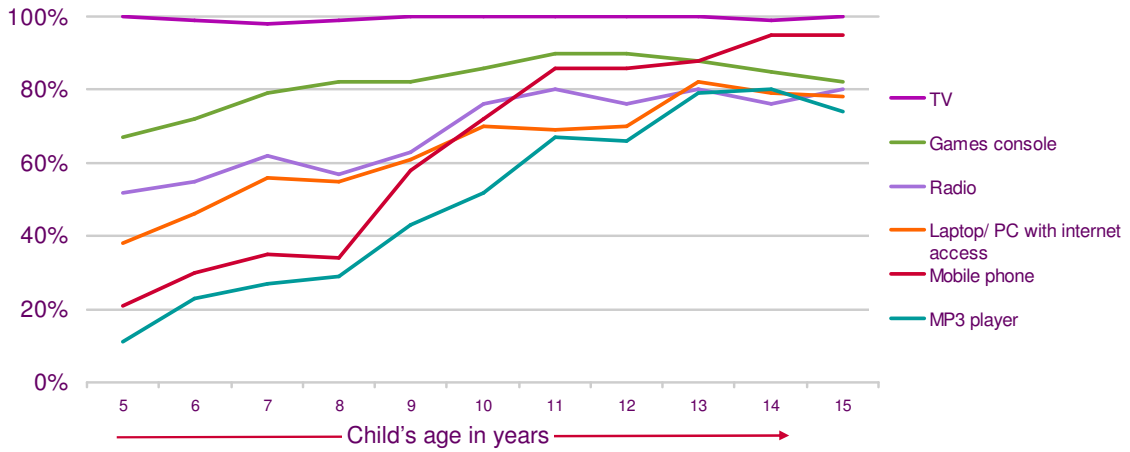
Note: Highlighted box denotes that the combination of services requires the purchase of additional services

Young people and the media

2.9 A startling sign of the degree of change is provided by how young people are engaging with media.

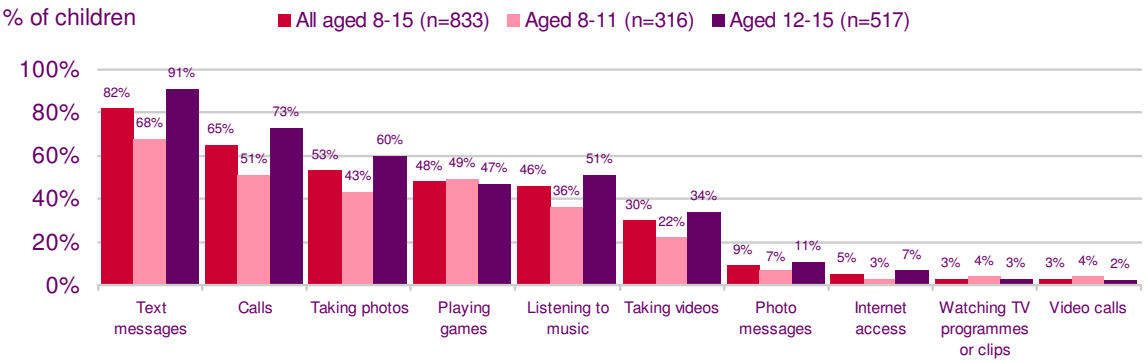
2.10 From the age of 12, two thirds of children use all the main media devices: TV, games console, radio, computer, mobile phone and MP3. From seven, over half use PCs, games consoles, television and radio.

Proportion of children who use media devices at home by age



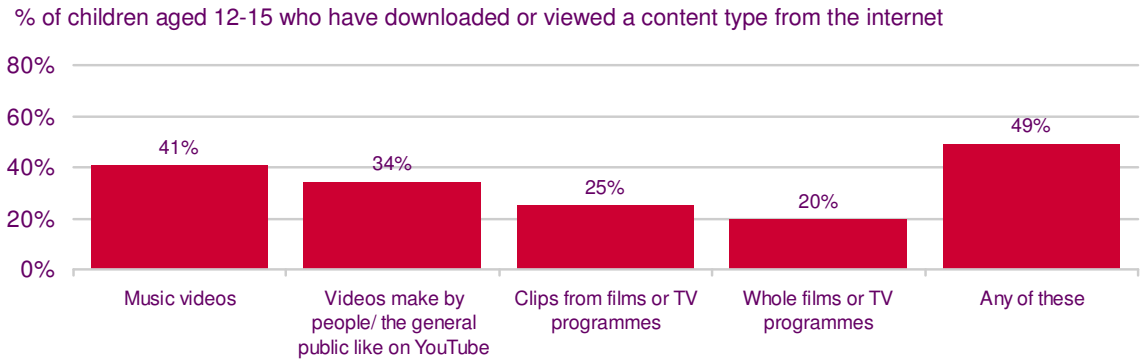
2.11 When children use their mobile phones, it is for more than voice calls or text messaging. For the majority of children, the mobile phone is not just a communications tool, it is a multi-media device.

Children's use of their mobile phone for various activities



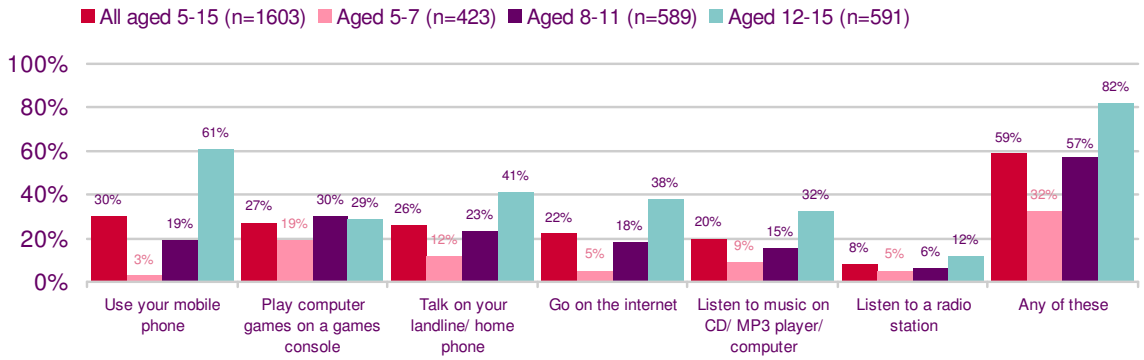
2.12 Almost half of all children are also using the internet to watch and download audio-visual content, including music videos, clips and whole films or TV programmes.

Content downloading and watching among young people



2.13 As well as making more sophisticated use of devices, young people are increasingly using multiple services simultaneously. Whilst watching TV, a majority of children aged 5-15 have used other devices, particularly their mobile phones.

Media activities sometime or often carried out whilst watching TV

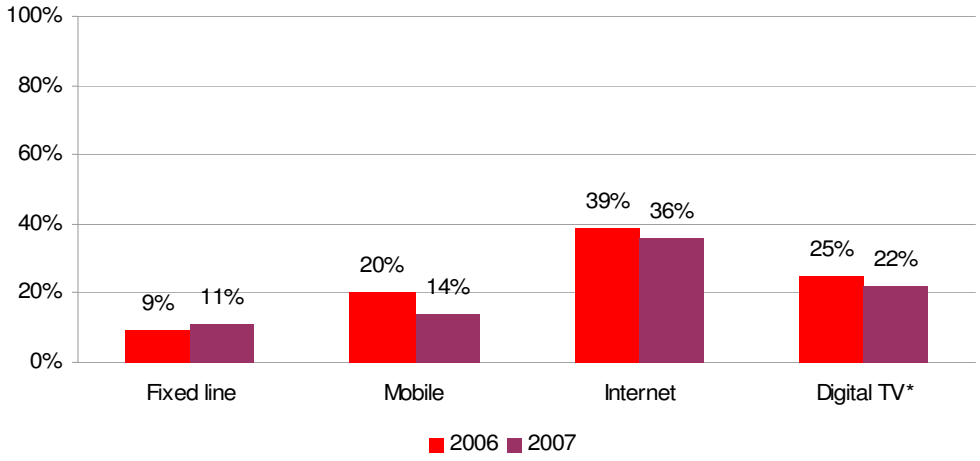


2.14 Young people now expect to receive multiple services from one device. They are used to using multiple products. They are at home on mobile and internet devices and they are comfortable performing multiple media activities at once.

Understanding and use of media

2.15 Although for many consumers convergence is a reality; others still think of their services separately and tend not to make use of different services on different platforms. Some sections of the population do not make use of services, especially the internet.

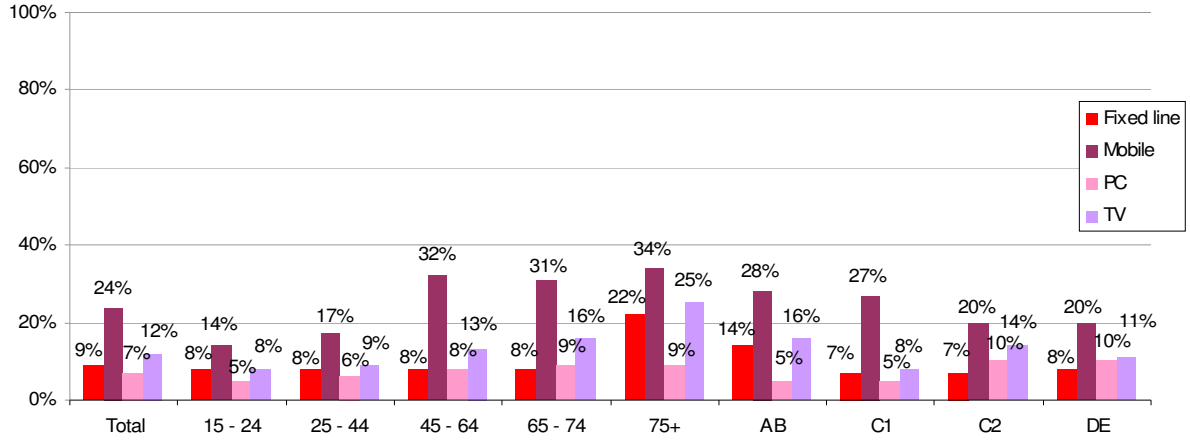
Non-ownership of communications services



2.16 This is in part driven by voluntary choice, especially where some services are similar For example, in Q1 2007 9% of consumers no longer had fixed telephones, preferring to use their mobiles only. Only 7% used only a fixed line telephone. However, for others, this is involuntary. Many have difficulties using a number of new services and involuntary non-ownership is primarily due to affordability.

2.17 And while young people have fewest problems with the use of services, older consumers are likely to struggle disproportionately.

Difficulties using various communications services by age and socio-economic group



2.18 Although some of the elements of difficulty are likely to fade away with time; the rapid pace of change suggests that new elements of unfamiliarity are likely to emerge. Many consumers will adapt rapidly and effectively to the opportunities of the market, but a proportion will continue to struggle.

A new pattern of consumer demand

2.19 Despite some difficulties suffered by some users, it is clear that most consumers want more control, more mobility and the ability to participate.

2.20 The possibilities for personal control are being driven by new technologies such as PVRs (currently adopted by 19% of the population), video on demand, local storage and downloading. As a result, control over timing and choice is being transferred from scheduler to viewer, from company to consumer.

2.21 Consumers also want more mobility, with the flexibility and freedoms that it brings. 80% of consumers have mobile phones, with voice and messaging services on the move and this mobility has extended to music and video. The growth of mobile internet has given many the ability to access content and services as they would in their own home while on the move. It is telling that 16-24 year olds would rather give up any other communications device in preference to their mobile phone, a switch from every older group.

2.22 Viewers and listeners are also becoming less and less content to be passive recipients of communications services. They want to be able to participate, to be part of the service, to help determine the outcomes or generate the content themselves. And equipping consumers with the means to upload content has led to a revolution in the ability of us all to participate and contribute. Today individuals and citizens:

- write over 110 million blogs;
- upload video to You Tube or Current TV; and
- interact with others online in worlds such as Second Life and social networking sites, such as Facebook, which today has 59 million active users and adds 2 million new users every month

2.23 These three simple desires for control, mobility and participation are at the heart of the evolution of our communications markets and the demand for convergence.

Section 3

Impact on market structures of convergence

Market changes we are seeing

3.1 Convergence has already had a significant impact on the structure and make up of the UK's communications markets and that impact is likely to intensify over the next few years.

3.2 Convergence is breaking down the barriers between market segments and the companies that operate in them. Immediately, this is likely to drive up competition as companies enter new segments (often with sizeable investment) behind them, bringing to consumers the benefits of healthy competition

3.3 However, the longer term consequences are less clear. We may see an increase in competition driven by open access to markets and the ability to compete in a number of related markets; alternatively, a smaller number of full-service companies may be able to dominate a number of market segments, reducing competition in the long term.

3.4 Convergence is already challenging traditional business models and companies are having to respond by expanding their product portfolios and expertise to satisfy consumer demand for more converged services and devices:

3.5 In addition, companies from historically different parts of the communications market are coming together to form alliances to take advantage of converging markets. This includes acquisitions, product bundling, content deals, packaging, distribution and navigation. The table below sets out a selection of company deals and partnerships from just the last 12 months.

Company deals and partnerships

Date	Participants	Deal
Dec 2007	EMI UK, BiBC	EMI signs a deal with BiBC to make its latest music videos available through BiBC's digital store, www.boxoffice365.com
Nov 2007	Netflix, NBC Universal	Netflix and NBC announce an agreement through which current episodes of *Heroes* can be watched online by Netflix subscribers the day after the network airing.
Oct 2007	3, Skype	Skype and 3 to launch a handsest that lets customers make Skype to Skype calls and send Skype instant messages from their mobile phone to other Skype users
Sep 2007	Tiscali, Setanta	Tiscali UK signs a distribution agreement with Setanta Sports to offer three of its premium sports channels on Tiscali TV to its subscribers
Aug 2007	Nokia, Microsoft	Nokia installs Microsoft's new content access technology into certain handset series. The two companies also agree to collaborate in efforts to improve consumer access to and experience of digital content
Aug 2007	3, Google	3 UK offers Google Search and Google Maps on the Planet 3 mobile portal
July 2007	BSkyB, Amstrad	Sky and Amstrad announce the terms of a recommended cash offer to be made by Sky Digital Supplies for Amstrad
July 2007	The Football League, Virgin Media	Virgin puts Football League match highlights on its broadband and mobile platforms
June 2007	EMI Music, HMV	HMV offers EMI's DRM-free catalogue for download
June 2007	BSkyB, Tiscali	Tiscali to add the full set of Sky basic channels to its line-up
Apr 2007	ITN, 3, Rhythm New Media	ITN launches free news and entertainment content on 3's video service, with advertising delivered by Rhythm New Media
Mar 2007	Bebo, Orange	Bebo and Orange launch a social networking service on the Orange network
Mar 2007	Channel 4, BSkyB, Emap, UTV, UBC Media Group, Carphone Warehouse	The 4Digital Group, led by majority shareholder Channel 4 Radio, submits a bid for the new DAB national radio multiplex licence. The licence was awarded to the group in July 2007
Feb 2007	EMI, Last.fm	EMI makes its artists' music available to Last.fm users
Dec 2006	BSkyB, Google	Sky and Google agree to collaborate on Video, Communications and Search and Advertising on Sky's broadband services

3.6 The changes provide both significant opportunity and disruption and all participants are having to adapt to the market developments we are seeing, recognising the erosion of traditional industry boundaries and the introduction of new, innovative and powerful market entrants.

The value chain of convergence

3.7 To understand these developments further, it is important to understand the value chain of convergence. We set out below a simple illustration of what the value chain for convergence might look like.

The value chain

Examples:

Content and voice	Packaging	Distribution	Device	Navigation
BBC	BBC	Arqiva	Dell	BBC
ITV	ITV	3	Pure Digital	Freeview
GCap	GCap	Digital One	Panasonic	Google
Sky	Sky	Sky	Sky	Sky
Virgin	Virgin	Virgin	Virgin	Virgin
BT	BT	BT	BT	BT
Warner Music	Apple	The Cloud	Apple	Apple
Disney	Joost	Vodafone	Microsoft	IPC Media
EMI	Tiscali		Motorola	Teletext
Endemol			Nintendo	Yahoo!
Sony			Nokia	MySpace
Shed Productions			Samsung	
Talkback Thames			Sony	
Universal Music				

3.8 The impact of convergence has already been seen in certain key areas:

- **Content and voice and packaging** – where similar content is now packaged for distribution to the TV, computer and mobile phone. An abundance of content is generated by users, and new questions are being raised about how best to manage rights.

- **Distribution** – where some network types are now able to transmit multiple forms of content; for example 3G mobile, DAB and internet technologies can all carry voice, data and audiovisual content.

- **Devices** – because many devices are now capable of receiving multiple wireless signal types, for example some mobile phone handsets can receive a combination of 2G, 3G, Bluetooth, WiFi and DVB-H.

3.9 Some companies – BT or Virgin – are increasingly active throughout the value chain; others – like Apple – have focussed on some key elements which allow them to deliver convergent services to the consumer, but not to invest across the market.

3.10 At the heart of the changes we are seeing is a move amongst certain key industry players to ensure that they can provide all media services to their consumers - to establish their brand as one capable of providing all your communications needs. The consequence of this is that, with multiple companies providing multiple products, competition for services is replaced by competition for consumers.

Technological advances are continuing to drive convergence

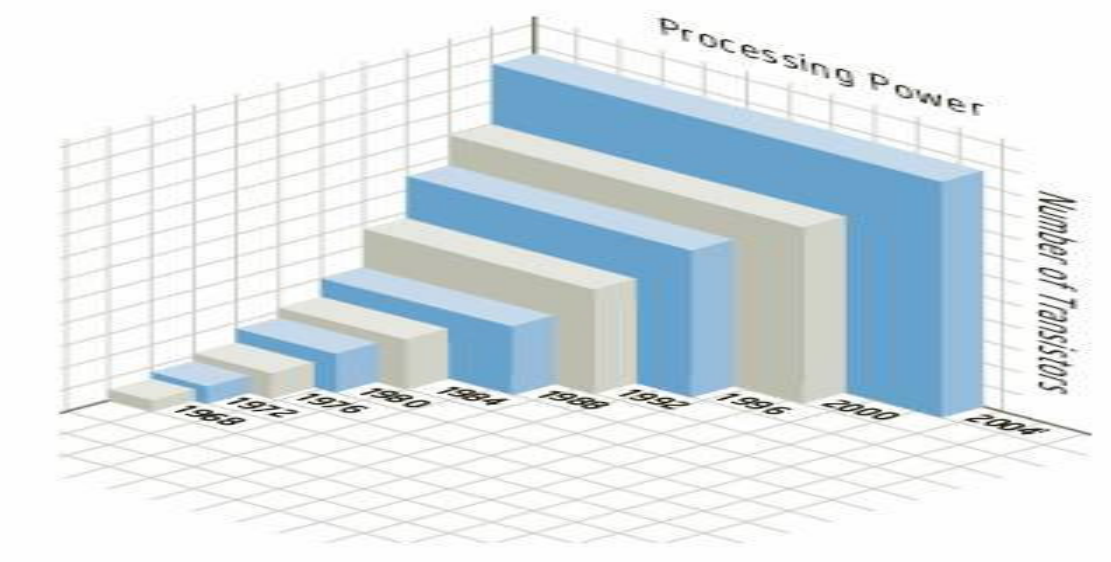
3.11 Convergence is being driven by technological developments which are delivering new opportunities for producing devices and services at affordable prices.

3.12 The critical technologies underpinning and driving convergence are IP networks, increased processing power and improvements in both compression and storage technologies. These technologies are making available high speed devices with a great degree of functionality that can make use of multiple networks.

3.13 The adoption of IP based technologies across converged networks has only just begun to take place and is providing a critical relationship between devices, services and platforms. Providing a common standard accepted by device manufacturers and network operators alike allows cheaper delivery of existing services and the developments of new and innovative ones.

3.14 Continuing developments in processor technologies (often described as 'Moore's Law') is also playing a key role, enabling low-cost multi-function devices. This gives the flexibility to provide an increasing proportion of functionality through software, which is more flexible than function-specific hardware. The diagram below shows the continuing growth in processing power.

Processor trends over time



Source: Intel

3.15 In addition, the last few years have seen significant improvements in storage and compression technologies, allowing consumers more control and mobility from their devices than ever before. Google has stated that given the current trends in local storage (capacity increases and falling real prices) it is conceivable that by 2015, consumers will be able to carry a music player in their pockets with the capacity to hold all music ever written.[2]

3.16 Further innovation will undoubtedly continue to drive and underpin the development of convergence, fuelling consumer enthusiasm for converged services, including the provision of both existing services faster and cheaper and the provision of new and innovative services.

[2] http://www.macworld.co.uk/digitallifestyle/news/index.cfm?newsid=19932

Section 4

The global context of convergence

4.1 The impact of convergence is not unique to the UK. Indeed, one of the consequences of the centrality of the internet to convergence is the globalisation of markets. Consumers are using communications services in new and different ways across the world and it is important that developments in the UK are understood in an international context.

Comparative position of the UK

4.2 In November 2007 Ofcom published its second International Communications Market Report, considering the levels of availability, adoption and use of communications services in seven major countries (UK, France, Germany, Italy, the US, Canada and Spain). This report shows that the developments in the UK are common across the world and that the UK is at the vanguard of many of those communications developments, particularly in Europe. This section sets out some key findings from that report, which is available in full at http://www.ofcom.org.uk/research/cm/icmr07/icmr07.pdf

4.3 The communications sector now forms an important part of most economies in the developed world. In 2006, the global communications market generated estimated revenues of around £870 billion with 78% of this coming from telecoms. In revenue terms, the UK's communications sector at £36.8 billion as a whole is the second largest in Europe, behind Germany (£41.8 billion). However, the television industry in the UK is the largest in Europe.

4.4 The UK is also at the forefront of several developments in digital take-up. The UK has one of the highest levels of Digital TV penetration (85%) and broadband (53%) in the world.

4.5 In spectrum, the UK's move towards spectrum liberalisation is being studied in interest by other countries. Spectrum liberalisation is a key enabler of the deployment of new and innovative services in a rapidly changing market.

4.6 Whilst there are many positives, there is also no room for complacency. For example:

- The US leads the world in the sale of audio-visual content. Its online TV and video industry generated two and a half times as the next biggest market, the UK.
- Over 75% of mobile phone users in the UK, France, Germany and Italy send SMS messages. By contrast 63% of internet users in Japan use their mobile phone to access the internet (compared to 36% in the UK) and 57% use it to send and receive emails (compared to 10% in UK)
- With 2.8 billion people (42% of the world's population) and rapidly rising income levels, Brazil, Russia, India and China are becoming global economic powerhouses with fast expanding communications services.
- At the end of 2006, there were over 30 times as many IPTV subscribers in France as in the UK, despite the fact that a service was launched earlier in the UK (HomeChoice in 2000 as opposed to Free and France Telecom in 2003)

- France and Japan also dwarfed the UK in terms of VoIP subscribers (excluding PC to PC calls). At the end of 2006, in both countries over 10% of the population subscribed to a VoIP service, whereas in the UK, this figure is 1.2%.

- Three mobile operators in Italy have launched broadcast mobile TV services, which collectively have approximately 800,000 subscribers. By contrast the one broadcast mobile TV service which had been launched in the UK was closed 2007.

- High speed broadband services provided through next generation access networks are becoming increasingly established in some countries such as Japan (where 36% broadband subscribers used fibre to the home technology). Similar technologies are now starting to be rolled out by UK operators. For example, Virgin Media rolling out a 50 Mb/s service to 70% of its network, and BT has announced its intention to deploy fibre to new build homes. At the same time, BT is investing further in its current access network to deliver up to 10Mbps to 50% of UK homes.

Impact of international markets

4.7 As a result, communications is now a competitive global market place and, as many developed economies increasingly come to rely on knowledge as a key driver of their growth; communications markets will become even more competitive.

4.8 Some of the key communications markets will also operate internationally. Consumers can already access content and services from around the world through online providers. Developments in technology mean that the volume, quality and variety of these services available from international markets are only likely to increase.

4.9 Immediately, this exposes consumers to content and services created under other regulatory regimes, or none at all. It also means that UK consumers are open to much more extensive competition for audience attention, and that UK providers are able to compete for international audiences.

- UK audiences increasingly have greater access to foreign produced content. In the last year, Virgin, BT Vision and Tiscali have all announced content deals with international producers and packagers. The most common video-hosting site is also American (YouTube), reaching 33% of all UK internet users. As of January 2008, the four most frequently viewed channels of all time on YouTube were all professional American content producers.

- UK content is also being made available to foreign audiences: in May 2007, BBC Hindi announced that its news content would be available to users of MSN India's Hindi Portal. Similarly in August 2007 the Chinese web portal Sina started offering its users direct access to BBC Learning English content. In October 2007 ITN announced it would provide its content on the Joost platform, and also launched its own channel on YouTube.

4.10 These changes are likely to mean that the UK will require a progressive and forward looking policy and regulatory framework to encourage innovation and investment and to respond to the impact of international competition

Section 5

Key changes underpinning convergence

5.1 It is important to understand what the key changes are that underpin convergence. We believe that there are six key factors which are underpinning and contributing to convergence:

- The increasing importance of wireless services.
- Increasing competition between platforms.
- Increased competitive pressure on traditional suppliers.
- Evolving attitudes to communications services.
- Services and technologies becoming more complex.
- Traditional business models being challenged.

The importance of wireless services

5.2 The importance of wireless services in a converged world will continue to grow and it is likely that wireless platforms and services will be the main focus for innovation over the next few years.

5.3 Many of the new ways of communicating that have emerged in the last five years are wireless-based. We have seen the rollout of 3G and Wi-Fi networks, and the emergence of new wireless services, such as mobile TV, mobile music downloads, Wi-Fi phones and services to enable parents to check.

5.4 The growth in wireless platforms is being driven by a number of factors:

- consumers placing a high value on mobility;
- technological advances making mobile devices more user-friendly;
- new ways of compressing data (meaning that pictures and video clips can be sent more quickly);
- mobile devices becoming smaller, able to store more data and having increased processing power; and
- the development of wireless technologies has benefited from global economies of scale.

5.5 The increased importance of wireless platforms and services has obvious implications for the use of radio spectrum and how it is regulated. Ofcom has set out in its Annual Plans our proposals for how we will meet this challenge over the next few years through spectrum awards, spectrum liberalisation and encouraging spectrum trading.

Increasing competition between platforms

5.6 We are seeing increasing competition between platforms. This is partly because the emergence of new wireless networks means that the number of platforms has increased. But there are other reasons for growing competition:

- Fixed phone, cable and wireless networks increasingly use Internet Protocol (IP) technology. This means they can increasingly support the same services as one another.
- The functionality of a device can be expanded at relatively low cost. A good example is the fact that many mobile phones are no longer simply phones: they can be used to play games, take pictures and listen to music, as well as to make calls or send texts. Multimedia 3G phones are now within the reach of the bulk of the population.
- The economies of scale which result from manufacturing equipment for a global market create an incentive to produce devices that are compatible with a wide range of platforms and services.

5.7 For the consumer this means more services available on each platform, and any given service being delivered by multiple platforms. For example, broadband internet access is available today via cable, fixed wireless, a landline or over mobile phone networks. Television can be delivered via analogue and digital terrestrial, satellite, cable and broadband (through a variety of mobile and fixed technologies), all in competition with one another.

5.8 A further factor driving competition between platforms is the increasing ability of new distribution platforms to deliver high quality digital content and services to the mass market. Until recently, the size of video files has constrained the ability to deliver audio visual content. But higher bandwidth access networks and dramatic reductions in the cost of local storage are changing this. The divide between the PC and the TV is closing, and in a number of homes the PC has become displaced the TV at the centre of the living room.

5.9 New devices are being developed that will seamlessly access different platforms to provide services to consumers without the need for cumbersome manual switching. For example mobile handsets that switch between fixed, mobile and wifi networks. And as the distinction between platforms at the consumer end becomes more blurred, legislative and regulatory frameworks need to be adapted to take account of this.

Traditional suppliers are facing increased competitive pressure

5.10 Linked to increasing competition between platforms is the fact that suppliers who have traditionally held a strong market position are subject to growing competitive pressure across all the communications industries.

5.11 Technological changes have driven many of these changes. Traditional infrastructure providers make use of their network to deliver content and services; service providers find they need to invest in infrastructure to reach their customers.

5.12 In part, this is also a result of the success of regulation. For example, the broadband market is becoming increasingly competitive as regulation helps enable significant new players to enter the market and offer innovative services, often bundling broadband with other services such as fixed and mobile voice calls.

5.13 However, this increased competition is also contributing to the fact that some of the ways in which public outcomes have been achieved in the past are being challenged. As the market changes it will develop in new and exciting ways, but may not deliver social benefits that we have come to expect. Increased competition has critical consequences for how we achieve desirable public outcomes that the market will not deliver.

5.14 For example, most people would agree that access to a telephone is needed in order to be included in society. This public outcome is achieved by obliging BT to provide all homes with a fixed phone line, even where this is not economically viable.

5.15 Similarly, most people would agree that public service programming, such as accurate and impartial news, should be widely available. This public outcome has historically been achieved by placing obligations on TV and radio broadcasters in return for privileged access to scarce spectrum. In a converged world, delivering social benefits in this way is unlikely to continue to be possible.

5.16 Historically, communications platforms, such as fixed phone lines or TV, were either available everywhere at a uniform price or not available at all. Increasingly, platforms do not display these characteristics and companies only wish to roll out platforms where it is profitable to do so.

Society's evolving attitudes to communications services

5.17 Society's attitudes to communications services are changing. The choice, range and availability of services is much more complicated. Today, the consumer experience is different for different individuals.

5.18 This diversity is reflected in society as a whole. This is evident in many ways: for example in terms of income distribution or ethnic origin. In communications, people display a greater variety than before in their use of, and attitude towards communications services – some consumers enthusiastically embrace new technology, others used it where it was useful to them, while others feel alienated by it.

5.19 Alongside this, the importance of communications services in our daily lives is growing. Participating fully in society increasingly requires access to communications services and an ability to use them. Initiatives such as E-Government require users to have broadband internet access.

5.20 This is not new, but the complexity of converged markets means that the complexity in addressing the wide range of consumer attitudes to communications services is greatly increased and questions of access and availability need to be assessed further. Otherwise, some sections of the population could be locked out from an increasing number and range of services

Services and technologies are becoming more complex

5.21 The growing complexity and rapid pace of change is manifest in a number of specific ways.

5.22 Each service is individually more complex. For example, choosing a broadband supplier involves comparing download speed, contention ratios, capacity caps, anti-virus and filtering software and other factors.

5.23 Secondly, bundling of services adds an additional layer of complexity. Bundling simplifies the purchase process for consumers, and may allow richer services to be developed. However, comparing bundles of sophisticated services is a complex task for some consumers and adds a further layer of difficulty in ensuring that consumers are able to make informed choices over individual products and services.

5.24 Thirdly, use of communications services is becoming more complex. Whilst technology is enabling people to exert greater control over their media experience than ever before, such technology is only useful if a majority of people understand how to use it and believe that it provides, of itself, a reasonable level of protection. This puts a premium on effective navigation and protection tools.

5.25 This increased service and technology complexity makes it very hard for many consumers to make well-informed service comparisons in a converged world. This makes it harder for them to switch services effectively and more susceptible to scams designed to exploit consumer confusion. Over time, the consumer experience may become less complex as companies develop solutions to make the process easier for them. However, the underlying technology is unlikely to become simpler, and ease of consumer use may mask complex questions of competition, for example access to infrastructure and services by third parties.

5.26 This has important consequences for effective competition and raises important questions about how we empower and educate consumers whilst ensuring they remain adequately protected.

Traditional business models are being challenged

5.27 As a result there are increasing challenges to traditional business models arising from changes in technology, services, and industry structure. Convergence brings associated major changes in industry structure and behaviour.

5.28 The major players in existing markets will seek to exploit their potential, and preserve their established market positions, by expanding their range of activities. Providers such as BT, BSkyB, the BBC and the mobile operators are increasingly moving into each other's territory, sometimes by entry, and sometimes via alliances and mergers.

5.29 Lower barriers to entry mean that new and innovative companies can enter markets quickly and forcefully and rapidly gain market share. Google, YouTube, Facebook and many others have already achieved this.

5.30 A further consequence of this is that where the market power lies in the value chain may shift. This has important consequences for how existing and future regulation is focussed. For example, content may rise in importance as the same material is often packaged for distribution to the TV, computer and mobile phone.

Section 6

Summary

6.1 Trends in convergence are playing an increasingly important part in the lives of consumers in the UK. Many of the trends that are likely to be important over the next decade have begun; others are likely to emerge suddenly in new areas.

6.2 These changes have the potential to play a major positive role in people's lives, and in many cases they are already doing so: consumers are benefiting from being able to use mobile phones to make calls, text messages and download data; to access content or to get the same voice service cheaper through the internet.

6.3 Many of these trends are not yet mature, and it is not yet possible to forecast how some of the newest services will evolve. Equally, there are some consumers who struggle with existing services and are not receiving the full benefits of these new services. Many are already finding them complex and difficult to use. The ever increasing pace of change is likely to increase both the potential benefits to consumers and the risk that some will be left behind.

6.4 Convergence is making markets increasingly complex and competitive, meaning that much of the infrastructure by which services are delivered may change substantially in the near future, possibly leading to new bottlenecks developing at different parts of the value chain and making existing regulation obsolete.

6.5 The rapid proliferation of services is likely to lead to large consumer benefits, but these will be unevenly understood and some consumers are likely to be increasingly vulnerable as technology changes.

6.6 Consumers may increasingly need to be empowered to protect themselves in a more complex, converged world.

6.7 Providers of public service content are increasingly unable to deliver social outcomes. The existing regime in television and radio is unlikely to be appropriate for a converged world. If social value can be delivered by such output, then a new way of securing it may well be needed.

6.8 Given these changes, the existing regulatory framework may not to be appropriate for the converging world. A converged world may need different structures to deal with the challenges for consumers and citizens. In a world where change has been rapid and is likely to become increasingly so, legislative and regulatory flexibility will be critical. Today's institutional and legislative arrangements will need to change to ensure that flexibility.

Section 7

Glossary of communications terms

1G First Generation Cellular Mobile Wireless. The first generation of cellular wireless was based on analogue technology. The systems were designed only to carry voice services.

2G Second generation of mobile telephony systems. Uses digital transmission to support voice, low-speed data communications, and short messaging services.

2.5G In mobile telephony, 2.5G protocols extend 2G systems to provide additional features such as packet-switched connections (GPRS) and higher-speed data communications.

3G Third generation of mobile systems. Provides high-speed data transmission and supports multimedia applications such as full-motion video, video-conferencing and internet access, alongside conventional voice services.

3.5G Refers to evolutionary upgrades to 3G services starting in 2005-2006 that provide significantly enhanced performance. High Speed Downlink Packet Access is widely expected to become the most popular 3.5G technology (see HSDPA).

3GPP Third Generation Partnership Project. The 3GPP was formed in December 1998 as a collaboration agreement bringing together a number of telecommunication standards bodies, referred to as Organizational Partners. The original aim of the 3GPP was to produce globally applicable technical specifications for third-generation mobile systems based on evolved GSM core networks and the radio access technology UTRA (Universal Terrestrial Radio Access).

3G LTE Aims to achieve an upgraded version of 3G W-CDMA services having up to 100 Mbps downlink speeds and 50 Mbps uplink speeds. The target for completing the first stage of the development was 2007, with service offerings perhaps by 2009.

4G Fourth-Generation Cellular Mobile Wireless. 4G technologies are still in the early research stage and no consistent industry definition exists yet. NTT DoCoMo in Japan are one of the leading companies in driving 4G. Technologies such as VSF (Variable Spreading Factor), OFCDM (Orthogonal Frequency and Code Division Multiplexing) and VSF CDMA (Code Division Multiple Access) are being proposed, along with a target data rate of over 100 Mbps for downlink and 20 Mbps uplink. 4G is likely to include MIMO technologies (see MIMO). It is likely to be well into the next decade before the technology is commercially deployed.

Access network Electronic Communications Network which connects end-users to a service provider; running from the end-user's premise to a Local Access Node and supporting the provision of access based services. It is sometimes referred to as the local loop or last mile.

ADSL Asymmetric Digital Subscriber Line. A digital technology that allows the use of a standard telephone line to provide high speed data communications. Allows higher speeds in one direction (towards the customer) than the other.

ADSL1 The first generation of ADSL, capable of data speeds of up to 8Mbit/s towards the customer and up to 640kbit/s from the customer.

ADSL2/ADSL2+ Improved versions of ADSL, offering high speeds, especially on shorter telephone lines. In the case of ADSL2+, up to 24Mb/s can be delivered towards the customer.

AM Amplitude Modulation. Type of modulation produced by varying the strength of a radio signal. This type of modulation is used by broadcasters in three frequency bands: medium frequency (MF, also known as medium wave: MW); low frequency (LF, also known as long wave: LW), and high frequency (HF, also known as short wave: SW). The term AM is often used to refer to the medium frequency band (see MF below).

ATT Analogue Terrestrial Television. The television broadcast standard that all television industries launched with. Most countries in this study are planning to phase out ATT in the next ten years.

Bit-rate The rate at which digital information is carried within a specified communication channel.

Bitstream A wholesale service providing conveyance of data traffic from an end user's premise to a point of interconnection made available by the incumbent to a competitive provider.

Bluetooth Wireless standard for short-range radio communications between a variety of devices such as PCs, headsets, printers, mobile phones, and PDAs.

Broadband A service or connection generally defined as being 'always on' and providing a bandwidth greater than narrowband.

CAGR Compound Annual Growth Rate. The average annual growth rate over a specified period of time. It is used to indicate the investment yield at the end of a specified period of time. The mathematical formula used to calculate CAGR = (present value/base value) (1/#of years) – 1

CDMA Code Division Multiple Access. The basis for the primary 2G technology; and the later evolution of mobile technology in the US and related markets. A technology that allows a band of spectrum to be shared by multiple concurrent users. Rather than subdividing the spectrum (FDMA) or determining use on a round robin basis (TDMA), unique codes are used to differentiate subscribers so they can simultaneously use the same spectrum.

Contention ratio An indication of the number of customers who share the capacity available in an ISP's broadband network. Figures of 50:1 for residential broadband connections and 20:1 for business are typical).

Co-regulation The sharing of regulation between a statutory body (e.g. Ofcom) and its licensees.

CPS Carrier Pre-selection. The facility offered to customers which allows them to opt for certain defined classes of call to be carried by an operator that has been selected in advance and has a contract with the customer. CPS does not require the customer to dial a routing prefix or use a dialler box.

DAB Digital Audio Broadcasting. A set of internationally accepted standards for the technology by which terrestrial Digital Radio multiplex services are broadcast in the UK.

Data packet In networking, the smallest unit of information transmitted as a discrete entity from one node on the network to another.

Digital dividend The spectrum that will be released by the switch to all-digital television.

Digital switchover The process of switching over the current analogue television broadcasting system to digital, as well as ensuring that people have adapted or upgraded their televisions and recording equipment to receive digital TV.

DMB Digital Mobile Broadcasting. A variant of the DAB digital radio standard for mobile TV services, and an alternative to DVB-H (see DVB, below).

Downlink speed Also downlink or download. Rate of data transmission from a network operator's access node to a customer, typically measured in Megabits per second.

DSL Digital Subscriber Line. A family of technologies generally referred to as DSL, or xDSL, capable of transforming ordinary phone lines (also known as 'twisted copper pairs') into high-speed digital lines, capable of supporting advanced services such as fast Internet access and video-on-demand. ADSL, HDSL (High data rate Digital Subscriber Line) and VDSL (Very high data rate Digital Subscriber Line) are all variants of xDSL).

DTR See DVR

DTT Digital Terrestrial Television, currently most commonly delivered through the Freeview service.

DVB Digital Video Broadcasting. A set of internationally accepted open standards for digital broadcasting, including standards for distribution by satellite, cable, radio and handheld devices (the latter known as DVB-H).

DVD Digital Versatile Disc. A high capacity CD-size disc for carrying audio-visual content. Initially available read-only, but recordable formats are now available.

DVR Digital Video Recorder (also known as Personal Video Recorder and Digital Television Recorder). A digital TV set-top box including a hard disc drive which allows the user to record, pause and rewind live TV.

EDGE Enhanced Data Rates for GSM Evolution: An extension to GSM/GPRS standards that can support data rates in excess of 200Kbit/s. EDGE is a relatively inexpensive way for GSM operators to provide data services without rolling out a UMTS network. Recently developed EDGE – Evolution allows data rates of up to 1Mbit/s.

Ex ante regulation Regulation to address behaviour before it happens.

Fibre-to-the-cabinet Access network consisting of optical fibre extending from the access node to the street cabinet. The street cabinet is usually located only a few hundred metres from the subscriber premises. The remaining segment of the access network from the cabinet to the customer is usually a copper pair but could use another technology, such as wireless.

Fibre-to-the-home A form of fibre optic communication delivery in which the optical signal reaches the end user's living or office space.

Fibre-to-the-building A form of fibre-optic communication delivery in which an optical fibre is run directly onto the customers' premises.

FM Frequency Modulation. Type of modulation produced by varying the frequency of a radio carrier in response to the signal to be transmitted. This is the type of modulation used by broadcasters in part of the VHF (Very High Frequency) band, known as VHF Band 2.

GDP Gross Domestic Product.

GPS The GPS (Global Positioning System) is a 'constellation' of 24 well-spaced satellites that orbit the Earth and make it possible for people with ground receivers to pinpoint their geographic location.

GSM Global Standard for Mobile Telephony, the standard used for 2G mobile systems.

HD Radio Hybrid Digital Radio. A radio standard developed in the US for terrestrial broadcasters, offering high-quality audio.

HDTV High-Definition Television. A technology that provides viewers with better quality, high-resolution pictures.

Headline connection speed The theoretical maximum data speed that can be achieved by a given broadband. A number of factors, such as the quality and length of the physical line from the exchange to the customer, mean that a given customer may not experience this headline speed in practice.

HSDPA High Speed Datalink Packet Access, an evolution of 3G mobile technology, often known as 3.5G, which offers higher data speeds.

HSUPA High Speed Uplink Packet Access – an upgrade to 3G mobile technology that allows data to be sent from customer's devices more quickly.

Interconnection The linking of one Public Electronic Communications Network to another for the purpose of enabling the persons using one of them to be able (a) to communicate with users of the other one; (b) to make use of services provided by means of the other one (whether by the provider of that network or by another person).

International roaming A service offered by mobile operators that allows customers to use their phone abroad. The home operator has agreements with foreign operators that allows customers to make and receive calls, send and pick up text messages, and use some of the other mobile services (such as access to voicemail or topping-up credit on pre-pay phones). The exact services available and the charges for their use vary between operators.

Internet A global network of networks, using a common set of standards (e.g. the Internet Protocol), accessed by users with a computer via a service provider.

IP (Internet Protocol) The packet data protocol used for routing and carriage of messages across the Internet and similar networks.

IPTV Internet Protocol Television. Television and/or video signals that are delivered to subscribers or viewers using Internet Protocol (IP), the technology that is also used to access the Internet. We use the term to mean delivery over a 'closed intranet', typically operated by ISPs and local-loop unbundlers, rather than over the public internet. IPTV services are hosted on servers placed in the exchange, which means they can be delivered with assured QoS since the ISP has more control over the network.

ISDB Integrated Services Digital Broadcasting. A separate broadcasting standard developed in Japan. during the early 1980s, which led to the development of the ISDB standard. Japan

started terrestrial digital broadcasting using the ISDB-T standard through NHK and commercial broadcasting stations on 1 December 2003.

ISDN Integrated Services Digital Networks. A standard developed to cover a range of voice, data, and image services intended to provide end-to-end, simultaneous handling of voice and data on a single link and network.

ISP Internet Service Provider. A company that provides access to the internet.

ITU International Telecommunication Union.

LLU (Local Loop Unbundling) LLU is the process whereby incumbent operators (in the UK this means BT and Kingston Communications) make their local network (the lines that run from customer's premises to the telephone exchange) available to other communications providers. The process requires the competitor to deploy its own equipment in the incumbent's local exchange and to establish a backhaul connection between this equipment and its core network.

Local Loop The access network connection between the customer's premises and the local PSTN exchange, usually a loop comprised of two copper wires.

MMS Multimedia Messaging Service. The next generation of mobile messaging services, adding photos, pictures and audio to text messages.

Mobile termination rate The 'per minute' fees that mobile phone companies charge other carriers to deliver incoming calls to users on their networks.

Multichannel In the UK, this refers to the provision or receipt of television services other than the main five channels (BBC ONE & TWO, ITV1, Channel 4/S4C, Five) plus local analogue services. 'Multichannel homes' comprise all those with digital terrestrial TV, satellite TV, digital cable or analogue cable, or TV over broadband. Also used as a noun to refer to a channel only available on digital platforms (or analogue cable).

Multiplex A device that sends multiple signals or streams of information on a carrier at the same time in the form of a single, complex signal. The separate signals are then recovered at the receiving end.

MVNO An organisation which provides mobile telephony services to its customers, but does not have allocation of spectrum or its own wireless network.

Narrowband A service or connection providing data speeds up to 128kbit/s, such as via an analogue telephone line, or via ISDN.

Next-generation core networks (NGN) Internet Protocol based core networks which can support a variety of existing and new services, typically replacing multiple, single service legacy networks

Next-generation access networks (NGA) Broadband access networks that connect the end-user to the core network capable of a bandwidth quantity and quality significantly in excess of current levels (a benchmark of 20Mbit/s or more is often used).

OECD Organisation for Economic Cooperation and Development.

Oftel Office of Telecommunications, whose functions transferred to Ofcom on 29th December 2003.

PAYG Pay-as-you-go.

Pay-per-view A service offering single viewings of a specific film, programme or event, provided to consumers for a one-off fee.

PDA Personal Digital Assistant.

Peaktime In the UK, the period during which: a radio station broadcasts its breakfast show and, on weekdays only, also its afternoon drive-time show; a television station broadcasts its early- and mid-evening schedule. Typically used by Ofcom to refer to the period between 18:00 and 22:30 each day (including weekends).

Peer to peer distribution The process of directly transferring information, services or products between users or devices that operate on the same hierarchical level.

Podcasting Away for digital audio files to be published on the internet, which can then be downloaded onto computers and transferred to portable digital audio players.

PSB Public Service Broadcasting, or Public Service Broadcaster. The Communications Act in the UK defines the PSBs to include the BBC, ITV1, Channel 4, Five and S4C.

PSTN Public Switched Telephony Network.

PVR See DVR

Quad-play Supply of TV, broadband, landline and mobile from a single supplier for a single subscription fee.

Radio Authority The statutory body responsible for the licensing and regulation of non-BBC radio services between 1990 and 2003. It was one of the bodies replaced by Ofcom.

RAJAR Radio Joint Audience Research The pan-industry body which measures radio listening.

Regulatory holiday A commitment by a regulator not to impose regulatory measures on a given product or service for a specified period of time.

Service bundling (or multi-play) A marketing term describing the packaging together of different communications services by organisations that traditionally only offered one or two of those services.

Service provider A provider of electronic communications services to third parties whether over its own network or otherwise.

Share (Radio) Proportion of total listener hours, expressed as a percentage, attributable to one station within that a defined area.

Share (TV) Proportion of total TV viewing to a particular channel over a specified time, expressed as a percentage of total hours of viewing.

SIM card (Subscriber Identity Module) A removable smart card used in mobile phones to authenticate the mobile subscriber and store data. Each card has a unique number known as International Mobile Subscriber Identity (IMSI).

Simulcasting The broadcasting of a television or radio programme service on more than one transmission technology (e.g. FM and MW, DAB and FM, analogue and digital terrestrial television, digital terrestrial and satellite).

Streaming content Audio or video files sent in compressed form over the internet and consumed by the user as they arrive. Streaming is different to downloading, where content is saved on the user's hard disk before the user accesses it.

Sub-loop unbundling A variant of LLU where a competitive operator takes control of only a portion of a customer's local loop, allowing them to install their equipment closer to the customer and potentially offer higher-speed services. In Sub-loop unbundling, the point of handover is commonly the Primary Connection Point (PCP) or street cabinet.

TD-CDMA Time Division Code Division Multiple Access. One of the family of 3G mobile technology standards.

Telecommunications, or 'Telecoms' Conveyance over distance of speech, music and other sounds, visual images or signals by electric, magnetic or electro-magnetic means.

Triple-play Supply of TV, broadband and landline from a single supplier for a single subscription fee.

TVWF Television Without Frontiers. A range of provisions designed to achieve coordination of the legal, regulatory and administrative frameworks of European Union member states with respect to television broadcasting, adopted by the European Council in 1989 and amended in 1997.

VDSL Very high bit rate DSL. This is currently the fastest version of DSL and can transmit very high data rates on short reaches of the local loop.

VoD Video on Demand A service or technology that enables TV viewers to watch programmes or films whenever they choose to, not restricted by a linear schedule. Also Near Video on Demand (NVoD), a service based on a linear schedule that is regularly repeated on multiple channels, usually at 15-minute intervals, so that viewers are never more than 15 minutes away from the start of the next transmission.

VoIP Voice over Internet Protocol. A technology that allows users to send calls using Internet Protocol, using either the public Internet or private IP networks.

WCDMA Wideband Code Division Multiple Access. One of the family of 3G mobile technology standards.

Web 2.0 A perceived second generation of web-based communities and hosted services - such as social-networking sites and wikis, which facilitate collaboration and sharing between users.

WiFi hotspot A public location which provides access to the internet using WiFi technology.

WiMAX A wireless MAN (metropolitan area network) technology, based on the 802.16 standard. Available for both fixed and mobile data applications.

Wireless LAN or WiFi (Wireless Fidelity) Short range wireless technologies using any type of 802.11 standard such as 802.11b or 802.11a. These technologies allow an over-the-air connection between a wireless client and a base station, or between two wireless clients.

WLR Wholesale Line Rental A regulatory instrument requiring the operator of local access lines to make this service available to competing providers at a wholesale price.