

CONTENT IN THE MOBILE PLATFORM. ON THE VERGE OF AN EXPLOSION

Technological, economic and social overview.

Drivers, barriers, scenarios and conclusions

Draft for discussion

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NB: This report will be followed by a next one treating in detail the emergent mobile 2.0 realm.

1. INTRODUCTION

Convergence, opportunities and challenges

Content in the mobile platform is an outstanding example of the convergence between electronic communications and content / media sectors. It shares with previous convergence processes the huge opportunities for new businesses, the ability for the fulfilment of users' expectations and the practical difficulties derived from existing markets transformation. At the same time, being a new field, it brings about specific challenges. Mobile content is placed at the crossroads of the past success story of mobile communications and the expectations of a brilliant mobile future where users have a leading and active role. In the words of Goggin and Hjorth (2007) "various forms of mobile media have been imagined for some time, and are now a reality: mobile internet, new forms of mobile text, mobile music, mobile film and video, mobile games, mobile learning, [...] this relatively short history of mobile is concurrently marked by the shift of the role of users from consumers to active producers – and mobile media are being heralded as a new site for consumption, democratic expression, individualism, citizenship and creativity".

The opportunities related with mobile content derive from the extras it adds to its constituents, i.e., the "anywhere and personal" in consumption of content or the "mobility and location" in social interaction or gaming. Therefore, conditions exist for the creation of a mobile content market where supply of new services and goods can match the consumption demands of users.

At this moment we start observing the first true market responses to mobile content usage, and, more modestly, to advanced applications like mobile social computing. But such a market will not emerge from scratch. There are already existing technologies and markets that count on extending their current range to become either mobile or content-led. The mobile

industry tries to incorporate value added offers into its evolving infrastructure. Content and Internet industries would like to transfer their business models to the mobile domain, taking advantage of its unique features. Will the result just be an extension of existing markets, a simple transformation of applications and content from these markets or will mobile specificities open undiscovered usages and interactions with content?. Will mobile content have a social impact beyond that of becoming just a mobile access to existing media?

The answers to the above questions imply the examination of mobile content present and future conditions for success. First, they will depend in the overall attitude of people. Consumption and interaction with content from a mobile will require social acceptance and trust in the technologies and in the business models behind. Cultural aspects are also present. Here the (very European) dilemma between economies of scale and cultural exception should be considered. There are also challenges of a more economic nature: which will be the business models that will support both the increase of traffic that new content and applications entail and that, at the same time, will be able to attract innovators and entrepreneurs?, which will be the resulting market characteristics (level of competition, entry barriers, geographical dimension, or influence and relationships with existing markets)?. There is also a techno-economic dimension: how does innovation take place in the mobile domain?, which are the conditions that foster it?. How and where, if so, will new mobile application appear?. These challenges could hide potential bottlenecks for the success of an industry with promising prospects for Europe. Note that mobile content develops from two main fields of European leadership: mobile industries and cultural diversity.

All things considered a basic assumption is made for the report, i.e., the nature of mobile communications combined with new content uses could contribute further to the disruptions brought by the digital paradigm: upheaval of traditional industries, pervasiveness and personalisation, privacy and security, the new role of users, the quest for a viable business model and the impact in (European) lifestyles and society. Therefore, understanding the nature of the mobile content challenges will help to apprehend a significant part of the challenges in the future information society evolution.

Objective, methodology and structure of the report

For the purpose of this report, mobile content applies to the creation - production, distribution – delivery - access, consumption - interaction with content (in the broadest sense) on a mobile platform, consisting at least in a mobile device and/or a mobile network.

The main goal of the analysis is to identify essential economic, competitive, technological and social forces that are currently shaping (and will shape, in the short and middle-term) the mobile content sector, and to illustrate the nature of their impact and their

inter-linkages through scenarios that should provide policy-makers with a coherent and comprehensive picture of the sector's current state and future evolution.

The report elaborates on mobile content with the background of Europe competitiveness in this area. Therefore, the methodology used is based on the information extracted from a number of EU examples and, when chosen from outside Europe, they are used as reference of practices in the sector. Annex lists the identified cases and provides a brief description for each of them. The methodology is completed with a thorough account of the literature available on mobile content trends (see References section) and with reports, information and exchange of ideas with active sources in the field (see Additional Sources section).

The report has the following structure:

In **section 2** the heterogeneous nature of mobile content space is explored, examining all the content market segments that are usually transferred to the mobile platform. A new categorization of mobile content is introduced to take into consideration both the content and the mobile dimensions and to highlight the possible future evolution of this domain. In addition some particular concepts related with mobile content classifications are also introduced.

Section 3 introduces the basic framework for the activities that take place within the mobile content ecosystem, derives a relatively detailed topology for these activities, and finally presents a practical definition of the mobile content ecosystem.

Using the activities map as a base, **Section 4** briefly discusses the main technological developments related with mobile content evolution. In particular, the mobile devices (hardware and software) used for consumption and interaction with content, the new mobile infrastructures required for mobile content distribution, and the interoperability issues are examined.

With the overview of activities and technologies, it is possible to investigate in **Section 5** the business side through all the models that are being used and that have been proposed to support the deployment of new mobile content and applications. In this same section the role that the different players have in them is discussed.

In the following **sections (6, 7, and 8)** the main techno-economic models and value chains¹ related with mobile content are presented and its expected evolution outlined. Mobile advertising is examined first, since, as explained in previous section, it is considered as the main emerging business model for the mobile content area. Next, music and games creative mobile

¹ The "expression techno-economic model" is used to consider in conjunction technology and business elements that are used in a specific segment of an industry. The expression "value chain" is used when referring to the way a player configures the delivery of value to its customers and to the relationships of that player with surrounding players.

content industries are jointly discussed, leaving mobile television for a specific section. Emerging models and value chains related with the ecosystem of mobile 2.0, for instance, user generated content, search or context-aware content, will be considered in a subsequent report.

In **section 9** a summary of general mobile / content consumer trends is presented as well as some specific trends about content consumption in a mobile platform.

In **section 10** an overview of the market, institutional and social drivers and barriers is introduced.

In **section 11** the main expected scenarios are outlined with regard to social value perceived in mobile content and to market behaviour.

Section 12 summarizes the main conclusions of the report and, finally, **section 13** sorts the main challenges and the priority issues that could help to develop a mobile content domain of social and economic interest.

2. THE MOBILE CONTENT SPACE

2.1. Defining and categorizing mobile content

The content dimension

The definition of mobile content first requires agreeing on the meaning of content. Following EPIS06 (IPTS, 2007a) project on "Creative Content" industries, content has two possible origins: creative content and processed information. Creative content refers to the "*creation of goods with an intrinsic cultural, aesthetic or entertainment value which appears linked to their novelty and/or uniqueness*". Processed information refers to discerning and timely adaptation of information to user preferences. This second type of content is always closer to an "industrialization" process; therefore it has the main goals of efficiency and usefulness. The "creativity" element would be the main difference between the two types of content², although boundaries are not well defined.

In this report it will be preferred a mobile content industries definition that includes both creative content and processed information. The main reason for this election lies in the

² The discussion about these two modes of content is relevant, and it will permeate following sections. For example, the differences between the two types are linked with the techno-economic models involved. Also, the implicit definition made for the "content industries" is wider, thus, than the ones used for "the creative content industries" or "copyright industries" (see ISTAG 2007 for definitions)

fundamental role that a blend of creative content and processed information could play in the future evolution of this domain, as it is later explained. A supplementary advantage consists of avoiding the discussions about the function of creativity in these industries and to use an a priori unconstrained area wider than the ones currently delimited by "the creative content industries" or "the copyright industries" (see for example ISTAG 2007 for detailed definitions of both). The resulting space includes, therefore, sub-sectors from the "creative content" core area, sub-sectors in the grey area around creative content (advertising, for example), as well as additional sub-sectors more information-prone.

In current practice, the mobile content domain is defined extensively by means of an approximate translation of content sub-sectors with business relevance to the mobile domain. An analysis of the main segments used by firms³ when referring to mobile content leads to the following taxonomy:

- mobile television and video, using both terms to reflect the differences between broadcasting television and on-demand video services,
- mobile music, including every possible music-related mobile activity: ringtones, backtones, full-tracks, etc, both in streaming and downloading modes,
- mobile gaming,
- mobile adult (used in a rather incoherently way, since it is composed mainly of images and audio/video),
- mobile personalisation (wallpapers, images, etc),
- mobile user generated content (that, again, could be composed of any type of content),
- mobile publishing, basically for books and specialized magazines in the mobile handset,
- mobile advertising, that it is also typically included within this area for three main reasons: it is an indirect measure of the relevance of the mobile information part, it is a main driver of mobile content business models in general, and it is itself composed of content,
- mobile gambling, that is in a grey area; although more properly a value added service, it is usually based on content accessed by the user.

³ See for example mobile content market research reports from Informa Telecoms & Media (2008), iSuppli (2007, 2008), Juniper Research (2007, 2008) and Research and Markets (2007)

Apart from some specific inconsistencies in the classification, it is interesting to note how the advertising part hides the information intensive part of mobile content and overlaps with the rest of activities (mobile television broadcasting, for example). Therefore, although the classification is extensively used in market analysis and forecasts, conclusions derived from it should be used with precaution. Also, with the partial exception of mobile user generated content, this type of classification does not consider new mobile content categories that could appear.

As a first remark, this initial examination of the mobile content domain shows already a significant degree of fragmentation (and overlapping); no less than nine segments are used currently to obtain aggregated mobile content market data and some of them include very different activities, arguably positioned under a shared heading (for example different types of music used for different purposes, compare ringtones with listening to music tracks in a mobile device, or, as another example, note the differences between television programmes broadcasting and video on demand a-la-youtube).

The mobile dimension

Up to this point only the content part has been examined, but mobile content also has, obviously, a mobile dimension. This dimension extends every possible content-related activity to a mobile⁴ platform.

With the addition of the mobile dimension two new possibilities for content arise that were not considered in the direct translation of content industries to the mobile domain. It could be the case where just the usage (now mobile) of content is the relevant element and, therefore, content requires being adapted to the mobile environment but its nature is not affected. But it is also possible to have content specifically thought and created for the mobile environment from its inception. As a consequence, there is mobile content derived from an adaptation or transformation of existing content (or content originally conceived for other media) to mobile platforms. And second, there is content specifically created or intended for/through mobile usage.

Figure 1 below depicts both dimensions of mobile content: creativeness and specificity to the mobile environment, including some examples of mobile content market segments.

⁴ In this report, mobile will be considered more than just wireless, and an intermediate step towards a ubiquitous scenario.

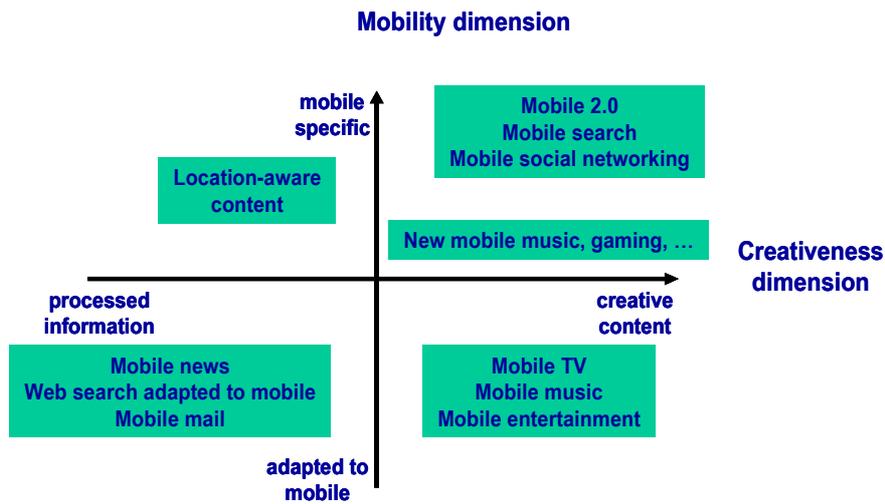


Figure 1: Mobile content dimensions: mobility and creativeness. Some examples of market segments

The resulting mobile content space can be then categorized into four broad classes (see Figure 2) not mutually exclusive:

- "adapted" for that already-existing information (coming from a different media) adjusted to be displayed and used in a mobile environment
- "repurposed", for that creative content re-used and adapted to mobility,
- "original" or "specific", for that creative content designed with mobility in mind, and
- "augmented", for that content (of any type) that uses additional and specific properties of mobile systems (such as location-awareness) to increase its value and interest for users

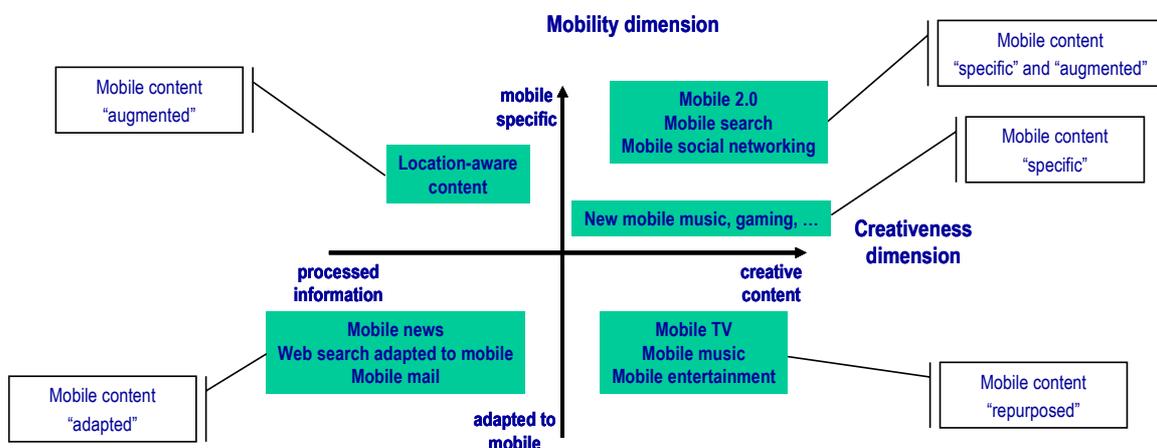


Figure 2: Categories of mobile content

The first category of mobile content, that is, information adapted to the mobile environment, is the market segment with the longest record of "mobile" experience. However, until now, the limitations in handset features, in network bandwidth and in price of services on offer have delayed its successful adoption by users. As these barriers are lowering, this category of usage is expected to surge in the short to mid term.

The "repurposed" category of mobile content, in comparison with content available in the web or through P2P, is still scarce. However, it is increasing significantly and this trend will be even stronger once tailored audiovisual and entertainment content becomes widely available. The conditions for market success of this category of mobile content still need further investigation.

The third category of mobile content, the "specific" mobile creative content, is still in its infancy, and covers a wider range of genres. It could be content created specifically and primarily for mobile usage⁵, including user generated content, or it could take advantage of some mobile feature to provide a much different user experience. An example of the latter could be a mobile game that uses intensively the proximity and (possible) continuity of use of the mobile interface. From this category perspective, the creative content industries now have available a new channel (the mobile channel), to exploit content which is distinguishable from the other channels. Content created through the mobile device will be one of its prime features.

The "augmented" category refers to the use of some "mobile qualities" not directly linked with content. Some of these qualities could be based on location systems, cameras in the device to do audiovisual queries directly from pictures taken, voice interfaces to search for content around, automatic recognition of tags in the environment, or cognitive technologies that predict user behaviour as a function of past and present records of communications usage. An example of the above ("reality mining") could be mobile content resulting from an information retrieval derived from location-based services and/or audiovisual search⁶. Note that the creation of content with explicit mobile tools (such as a mobile handset) could range from just an advantage to almost mandatory for the last two categories of mobile content.

The conclusion from the categorization introduced is that, at least theoretically, the mobile dimension is not "passive" with respect to content and it causes the appearance of new

⁵ And interestingly, its use in the web or by conventional audiovisual means, e.g. television, would be a transformation or adaptation of mobile content, thus inverting current paradigm

⁶ See IPTS (2008a) Emerging Trend Update for a more detailed discussion of the "reality mining" concept and other advanced search-related developments.

categories of mobile content not previously considered. At the same time it completes the position of legacy content market segments with regard to mobility and its evolution. As it later shown, future prospects of the mobile content sector are thought to be linked to the development of specific and augmented categories of mobile content, and therefore, as a hypothesis to be tested, mobile is not merely another platform for content distribution.

Mobile content beyond media and entertainment

The above categories are also useful to explain the different terminologies commonly used for mobile content and their relation with the concepts in the report. Mobile media refers to the mass media (radio, television, newspapers, magazines, ...) that can use the mobile as means to reach the audience. Currently, this means mostly "adapting" the information within this media to the mobile environment. Mobile entertainment refers to the use of mobile for leisure and entertainment activities such as listening to music (or using music as ringtones), personalizing the mobile handset (using wallpapers for example), gaming, or accessing to video (streaming or downloading). The term mobile content has been preferred in this report since it includes both media and entertainment, but allows foreseeing the mobile mass usage of new categories of content.

2.2. Specific features of mobile content

In the following some specific attributes used when referring to mobile content are introduced.

On-deck and off-deck

Within the mobile industry, sometimes content and applications are distinguished as on-deck or on-portal, and the opposite, off-deck or off-portal. The former to include content and applications that belong to the value chain set up by the mobile player, typically the mobile carrier, and the latter to denote content and applications outside the control of the mobile operator. While mobile carriers have traditionally bet on content within their "silo models" or "walled gardens", there is an increasing trend to use content and applications off-deck⁷. The balance between these two types is one of the main elements in the (future) business models of mobile players.

⁷ Ovum, 2007, states that by the end of 2007, 40% of the projected \$70 billion global mobile content market will be outside carrier decks

Local and context-aware content

Local content is the (location-tagged) content that surrounds the mobile user. It is, therefore, content that could be incorporated into the platform using actively⁸ the mobile device. Context-aware content goes beyond the coordinates of the geographical position and blends characteristics from the surrounding environment with the mobile personal profile, or from what the person is engaged in at the time. The result could help users to make better choices and to find better and more suited content to them. The notion of "context" is one of the main avenues of research to improve the relevance of content to users.

User created and user generated content

There are up to three different angles to look for users' contribution to mobile content: direct creation of content (a picture, video footage, ...); adding some creativity or explicit value to pre-existing content (contributing to a blog, linking and geo-tagging content, meta-data relevant for mobile content usage, ...); and as an indirect result, a by-product, of mobile social interaction (profile in a mobile dating platform, micro-blog message, ...). The name user created content is usually reserved for the first and at least part of the second case. However, in a more loose sense, content could also result from the aggregation of users' interaction. In this report, due to the possible lines of evolution of the mobile content realm, the widest approach will be taken and we will consider that content may arise through any of the processes mentioned, and, therefore, we will denote it as mobile "user generated content", instead of the stricter mobile "user created content".

Additionally, usage of the concept of user generated content allows confronting the increasingly blurred boundaries between content and applications. In the course of applications evolution, and with the aim of increasing value, they have begun to include content as a core or additional feature to engage users. This is particularly true when referring to web 2.0 services. A number of highly successful examples of web 2.0 uses a mix of application and content (Flickr, MySpace, YouTube, del.icio.us, ...) where it is not easy to tell where the application ends and where the content begins. Therefore, user generated content also usefully describes content involved in mobile social networks based on applications.

⁸ The degree of control of the user over this activity is still unknown

Communication services

As a final note to this subsection, the term communications services will be used to refer to the end-to-end exchange of private information that it is not stored or designed to increase common knowledge.

3. ACTIVITIES IN THE MOBILE CONTENT ECOSYSTEM

In preceding section, the main market segments that compose the mobile content sector were introduced. But in order to supply any type of mobile content to users, a number of activities are needed. These activities arise from the production-delivery-consumption structure of content activities, the different origins and cultures of players derived from the convergent nature of the area placed at the crossroads between various media and communications schemes; and the diversity of circumstances for mobile usage. This section overviews the nature of the activities that take place in the mobile content ecosystem.

Mobile content follows the conventional three stages model for digital mass consumption, modified to include the appearance of social computing: creation/production, delivery/distribution/access and use/consumption/interaction. The last “interaction” part tries to capture the possibility of users contributing to content creation and the social effects in the usage of content.

In the following sub-sections the main segments and players within this scheme (see Figure 3) are enumerated.

Creation and production of mobile content

The creation and production of mobile content includes:

a) the already existing creative content industries that go (or can go) mobile: audiovisual production (film making, tv programme making, "mobisodes" making, ...); music recording (including adaptation to mobile: ringtones, full tracks, ...); video games; and publishing (books, e-books, ...)

b) the already existing information and media industries that go (or can go) mobile: traditional media (tv news, newspapers, magazines, ...); other media industries (news agencies, content aggregators, ...); cultural and leisure spaces (i.e., not only confined spaces like museums or libraries, but also tourist sights, cities, landscapes, parkways, ...); and providers of located information (yellow pages, specialized search engines, navigation maps, ...).

c) new content providers specifically focused on mobility, for instance, mobile content coming up from the aggregation of sensor networks information or from machine to machine communications.

d) application providers that use mobile content as a significant feature, for instance, supplying applications that allow for the users to upload content created by them, store it, tagg it, interact with it, or exchange it.

e) the business dimension of mobile content: advertising and marketing industries; rights management providers; management and marketing of creative content (performing, ...); and mobile payment.

f) the mobile content enablement-platforms that allow for the adaptation of content to the specificities of the mobile environment.

Note that a), b) and c) above belong to the general category of content providers. Note also that the division between a) on one side and b), c) on the other corresponds to the creative dimension of content, and, therefore it is not a well-defined boundary. Observe too the big influence of location and mobile enhancing technologies in b), c), above. Finally, notice that d), e) and f) are the main drivers and enablers of the last two categories of content shown in the previous section.

Delivery, distribution and access to mobile content

The delivery, distribution and access to mobile content include:

a) digital television and radio broadcasting, including systems using VHF and UHF radio spectrum (the spectrum traditionally allocated to radio and television), and also satellite systems.

b) mobile communications systems, from 2G where some simple content as ringtones was possible to be delivered to handsets, to 3G and beyond, where any possible type of content can be distributed to mobile devices. The "beyond" part includes evolutions from both the mobile industry (as LTE⁹) and the wireless industry that becomes genuinely mobile (as mobile WiMAX).

c) Internet, in the sense that either mobile communications allow for unrestricted access to Internet, thus erasing the differences among accessing content through any of those two media, or some mobile complement is attached to a fixed Internet access. This last possibility caters for users achieving content mobility with their own means (storing podcasts in mobile

⁹ Long Term Evolution, the 4G technology that will substitute current 3.5 G systems

devices for later consumption, for instance) or setting some wireless system with enough coverage to have a convenient access.

d) new mobile content brokers and intermediaries: mobile search engines, mobile content aggregators, mobile content readers, mobile content tags and markers, mobile social networks, mobile communities, ...

Use, consumption and interaction with mobile content

The use, consumption and interaction with mobile content include:

a) mobile devices suppliers: handsets, pdas, ultra-mobile computers, mini-computers, portable players, portable consoles for games, ..., including key components and subsystems: batteries, memories, cameras, displays, interfaces, ...

b) software developers and suppliers for mobile devices: operating systems, drivers, applications, APIs, multimedia, ...

c) providers of (hardware and software) technologies for interaction and knowledge of the surrounding environment: short range devices, RFID, tags, ...

d) other industries (vehicles, transport, domestic, ...) where mobile content is an appealing complement

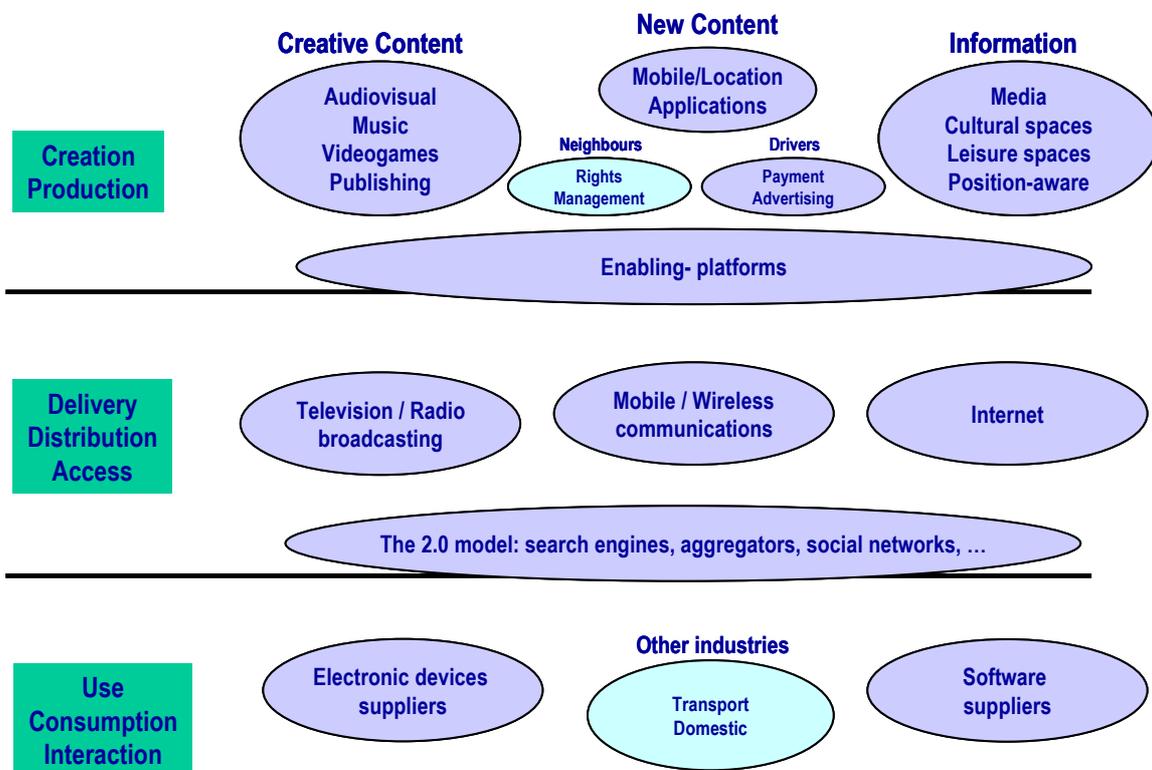


Figure 3: Sectors and players involved in mobile content

A topology of mobile content activities

The complexity of this scheme shows up in the mind-boggling number of different steps to consider for the creation-delivery-consumption of content in a mobile platform. The first are simply the different types of contents already mentioned, some of them (adapted, re-purposed) requiring adaptation to the mobile environment and some others (specific, augmented) requiring integration with additional information. The second element consists of inserting appropriately advertising (if that is the business model). The third step is the possible personalization, both for content and advertising. In the fourth stage, every piece of mobile content has to match to a quintuple layer of specifications: the hardware part of the handset (display, interface, ...); the operating system in the handset; the relevant application in the device, i.e., browser, media player, etc; the technology used in the network infrastructure (mobile communications, digital television, wireless, ...); and last, the practical implementation of the operator's mobile system, including portals, access, or particular systems for billing (sms, premium sms, ...) and marketing. On top of all of the above, it could be needed also additional elements of the platform such as: marketplaces for supply and demand negotiations of content; aggregators for independent supply of content to different operators; setting up of mobile channels; cross-carrier common short code support; cost-effective long number solutions; elements for linking with other networks (Internet) and their applications, etc.

Figure 4 shows a detailed map of the mobile content-related activities. The arrows in the figure point to the different user involvements in the mobile content ecosystem: from purely consumers of mobile content (down), to mobile social computing contributors (up), to merely access Internet in a mobile way (arrow pointing right), and to have available mobile communications as the main goal, assigning a secondary role to the rest of involvements (arrow to the left).

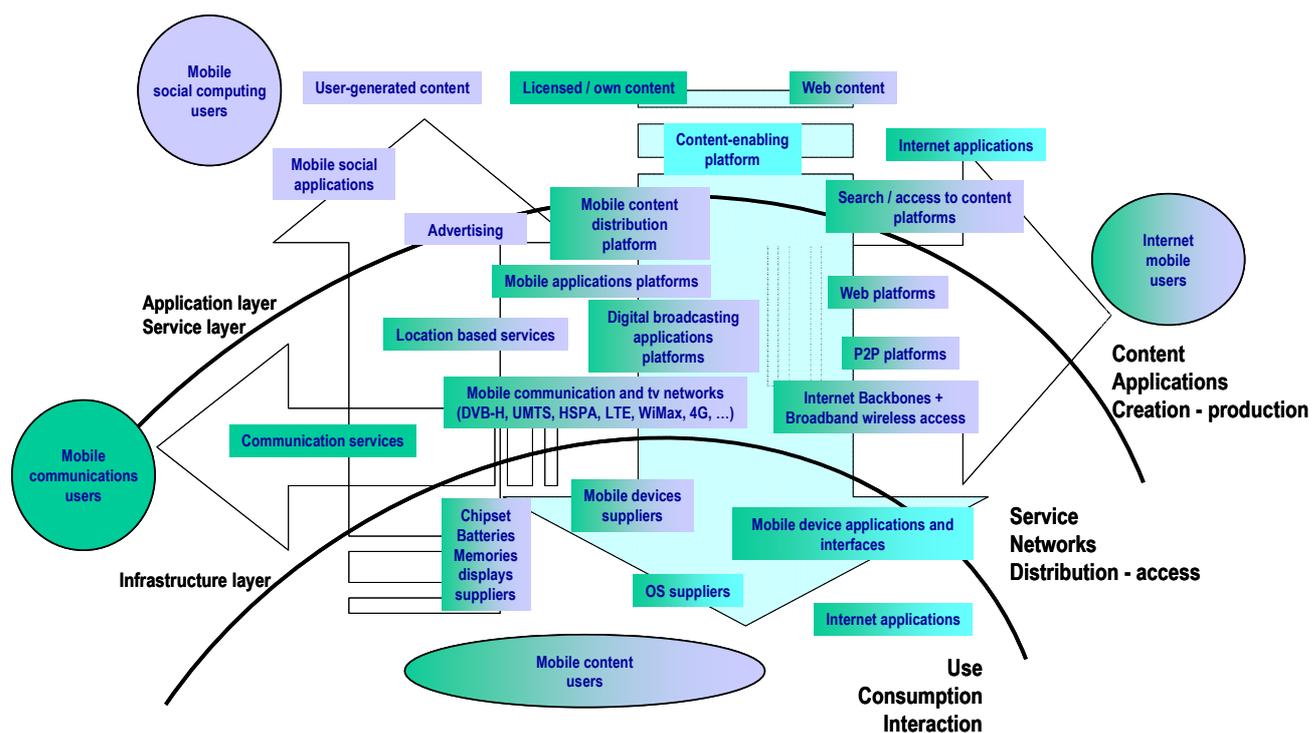


Figure 4: Map of mobile content-related activities

A practical definition of the mobile content ecosystem

The description of activities done in this section, together with the concepts introduced in previous sections, allows obtaining a suitable definition for mobile content that will be used along the paper: mobile content refers to the creation-production, distribution-access and consumption-use-interaction of content, be it creative or processed information, in a mobile platform, consisting at least in a mobile device and/or a mobile network. The last part of the definition allows maintaining an agnostic view on the evolution of mobile technologies and their adequacy for the diverse types of content.

4. TECHNOLOGY EVOLUTION AND CHANGE: MOBILE DEVICES, NETWORKS AND THE CONSUMPTION / INTERACTION WITH CONTENT

The uptake of mobile content requires progress in technologies related with creation, distribution and consumption of content in a mobile platform. Precisely, it is in and around the mobile platform that new developments are required. This platform includes mobile applications (especially those with a social inclination), mobile interaction with content, content-enabling developments, integration of location based services, next generation mobile

networks, and mobile devices hardware and software. Innovations related with these fields are currently emerging and are the main subject of investments in mobile.

But this is the well-known world of the evolutionary technologies; a number of ground-breaking technologies could eventually, change the way a mobile is used. Among them there are cognitive technologies, mesh networking, the internet of things, augmented reality, reality mining and many more.

Mobile content is also affected by developments in neighbouring areas. There are enhancing technologies as location systems or short range devices and enabling technologies like agile radio.

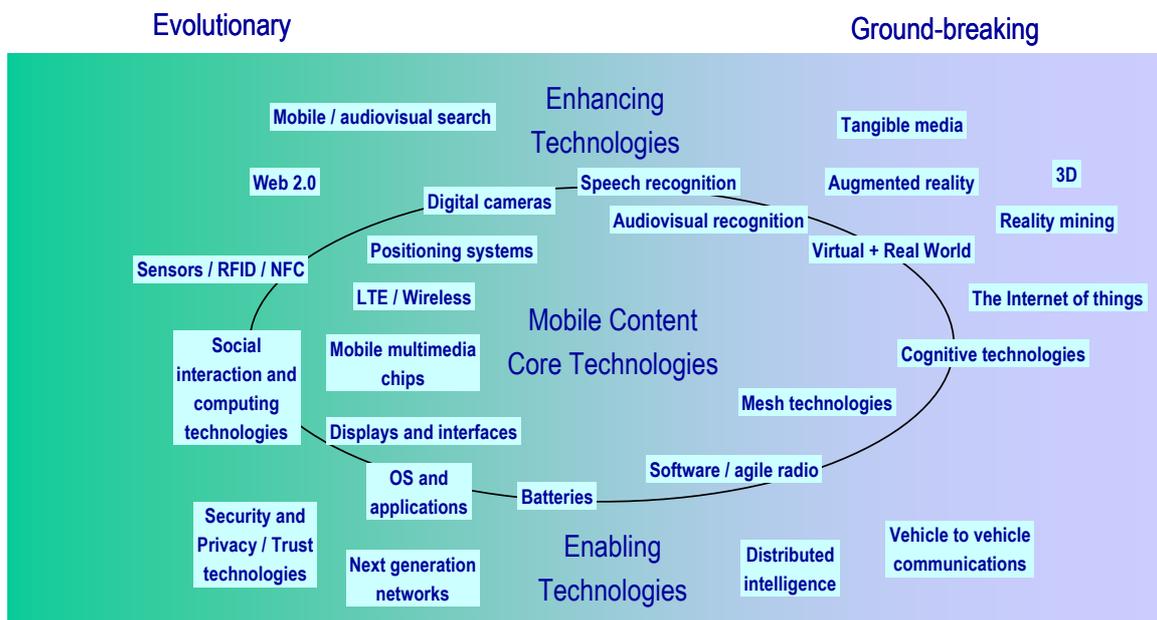


Figure 5: Examples of evolutionary and ground-breaking technologies in mobile content domain

In this report, the evolution of two main groups, devices and networks, is going to be considered, with some final considerations on standardization and interoperability.

Mobile devices

Mobile device technologies range from hardware (radio, data, batteries, displays, memory) to software (operating system, middleware and applications). In this section a very brief and integrated overview of the generic technology trends for mobile devices, in particular those relevant for content consumption and interaction, is going to be presented.

The first trend is relative to the mobile devices operating systems being able to host applications that come from outside the world of pre-loaded vendor-specific applications or exclusively available for an only type of device. Symbian (backed by Nokia) and Android

(backed by Google) are examples of this trend. The recent case of the iPhone from Apple is paradigmatic to this respect.

Box 1. The iPhone third-party applications case

Apple currently allows developers to create third-party iPhone applications that run remotely via the Safari web browser installed in the device only. At the same time, there are programs that bypass the software restrictions¹⁰ in the operating system (OS X) of the iPhone and allow third-party applications operate. Apple response has been not to condone or support the bypassing process, but to state compatibility issues that could compromise performance. Finally, Apple has announced for February-March 2008 a software development kit which will allow developers to produce sanctioned third-party applications on the iPhone.

An increasing rupture of the 'walled garden' model of enabling content on a mobile device is therefore foreseen from the mobile devices operating systems perspective.

The second trend refers to the increase of intelligence within the handset, including the ability to learn about the person who operates it. As phones become more powerful¹¹, and embed sensors such as accelerometers, camera motion sensors and GPS, researchers¹² are looking to cognitive technologies and artificial-intelligence algorithms to make sense of the data available to them (including, for example, analysis of text messaging). The result could be anticipation to the tastes and preferences of mobile content users. Hence applications of the type "reality mining", that refer to the collection of machine-sensed environmental data pertaining to human social behaviour, or "recommender systems" to provide counselling for real life consumer activities¹³.

Integration of additional facilities in the handset is another major trend for content in mobile devices. For instance, mobile broadcasting television reception capabilities built in the handset. There is also a constant evolution in audiovisual features: cameras, lenses, image recognition and image analysis, speech recognition, 3D graphics, etc. The mobile handset will become the audiovisual device of choice both for consuming and generation of content¹⁴.

¹⁰ This has nothing to do with the SIM unlocking of the device to operate in a different carrier network.

¹¹ During 2008 the first phones powered by a chip running at 1GHz will be marketed, seven years after the first pc desktop chip broke the same figure.

¹² For instance, researchers at Intel amass data from seven sensors: an accelerometer, a barometer, a humidity sensor, a thermometer, a light sensor, a digital compass, and a microphone.

¹³ See IPTS 2008a for details.

¹⁴ It is forecasted that smartphones sales will overtake laptops during 2009 (BBC Technology, 18 Feb 2008)

New types of usage and interactions with richer media demand for more complex mobile operating systems and applications. Software intricacy together with an increasing user awareness requires a qualitative leap in technologies related with mobile privacy, security and trust. In particular, threats regarding privacy intrusion, malware, hacking and identity thefts must be confronted.

Research in display capabilities, interface design and features ("haptics", for instance) and energy consumption is a constant driver for mobile consumption of content, again of particular importance for rich media and permanent consumption – interaction with content.

Also the radio management part of the device will be able to deal with an increasing number of standards, allowing the transparent use of spectrum and networks. An early proof of this trend is the emergence of dual-mode handsets based on UMA (Universal Mobile Access), offering seamless handover between cellular networks and WiFi (with fixed broadband as backhaul).

Box 2. The Motorola technology outlook case

According to Gartner Group (2007) Motorola's market share in the handset sector dropped 7.6 percentage points in the third quarter of 2007, compared with the same period in 2006, relegating the vendor to the No. 3 position, behind Nokia and Samsung. Clues as to where Motorola may be headed in the next three to five years can be found in an internal document, the Motorola Technology Outlook¹⁵, compiled annually since 2004, that features trend analysis from the company's Research Visionary Board, an external group of 47 design and technology experts based around the world, and a spectrum of staff members, who identify key trends and concepts in mobile devices, the Internet, and other areas. The document outlines six directions: (a) "the immersive Internet," meaning that consumers will be online constantly, including on their handsets; (b) "hosted applications," or standardized software available on a cell-phone network rather than vendor-specific applications available only on one device; (c) "video rerouted," or mobile television; (d) "virtually there," or posting the physical world online in real time via sensors, GPS, and RFID tags; (e) "securing the bits," or making mobile phones safer; and (f) "stimulating the spectrum," or the emergence of entirely new networks beyond the traditional cellular ones. The document also proposes "snowflake devices"—customized gadgets, such as smartphones or handheld computers, which display content specific to a consumer's taste and which feature speech and gesture recognition for a more human "feel.", and also mobile handsets with fast-loading interfaces for quicker video downloads.

¹⁵ An excerpt of the document appeared in BusinessWeek Jan 17, 2008. See http://www.businessweek.com/innovate/content/jan2008/id2008014_304911.htm

It is also important to note that the very category of being a mobile device is going to change. Not only there is an increasing variety of devices that fell within this category (smartphones, PDAs, ...) but the laptops evolve quickly to become ultra mobile personal computers (UMPCs), devices that have the same performance of a laptop¹⁶, but are extremely portable and connectable to mobile and wireless networks.

Finally, as the summary trend, the mobile device will become part of an immersive experience on mobile Internet, meaning that users will remain permanently online through their handsets and that they will interact with the physical world via ambient technologies.

Mobile infrastructures

Figure 6 represents the 2007 status of 3G adoption in some EU countries and other relevant markets. Mobile overall penetration has been included in the graph for reference about each of the markets. EU countries show modest 3G adoption rates ranging from Poland's very low 1,0 % to Italy's moderate 25,4 %. They are, in any case, far from the cases of Japan and South Korea where 3G accounts for 68,5 % and 45,5 %, respectively, of the total number of mobile subscribers. Therefore, it can be said that 3G and beyond technologies are still in the beginning of the massive adoption phase in the EU.

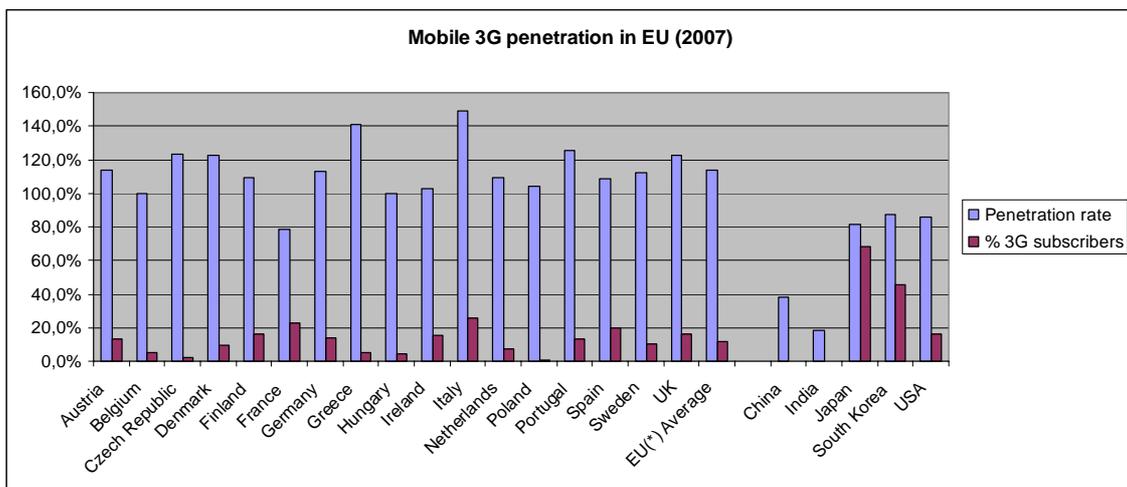


Figure 6: Mobile 3G penetration in selected EU and world countries. Source: (Netsize, 2008)

The main driver for the evolution of mobile infrastructures is the increasing data traffic resulting from both the growth in data rates per user and the number of users adopting mobile data applications. Note that the bandwidth required per user depends on the efficiency¹⁷ of mobile data transmission techniques. Figure 7 shows the experts' forecast, Maña et al (2007),

¹⁶ Intel has announced (2008) a new chip called Menlow for UMPC.

¹⁷ In terms of bits per Hz

about the evolution of available mobile data rates per user in an average location of an EU country like Spain, considering both economical and technological constraints. Note also that the total amount of spectrum required per mobile operator depends on the above mentioned factors, but also on a number of other main factors: the level of quality of service (number of users concurrently accessing mobile data, type of usage, evolution of user perceptions about service quality); the ability of the mobile transmission technology to manage and re-use frequencies; the topology and type of the network; the density of users; and the size of the cell.

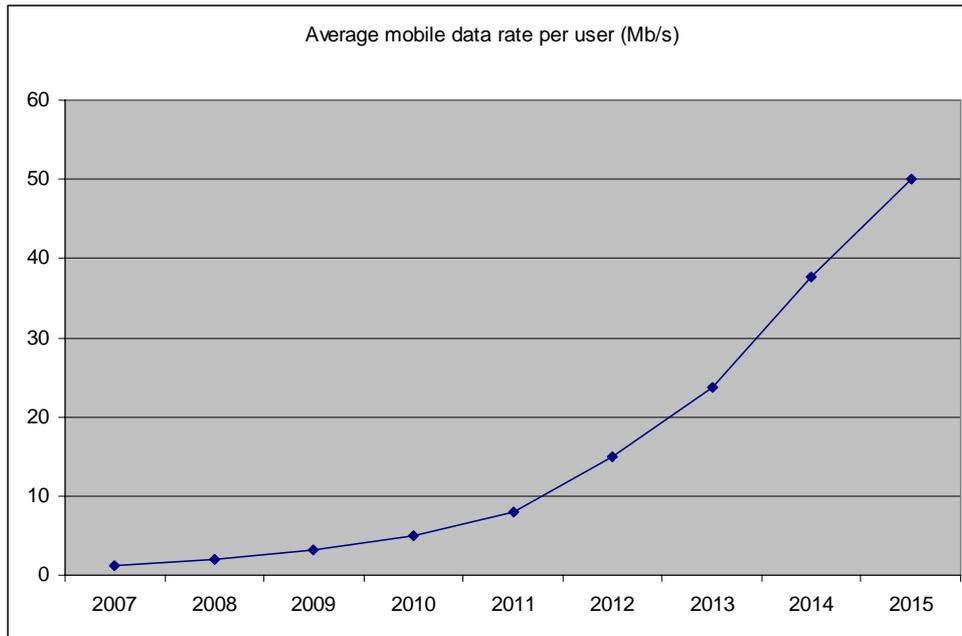


Figure 7: Forecast of available mobile data rates per average user. Source: adapted from (Maña, 2007)

This increase in bandwidth will take place as an evolution of existing networks and technologies, but also blending some results from the process of fixed – mobile convergence. In the following the major trends are introduced. Table 1 summarizes relevant data and pros and cons for each technology.

The first step in this evolution is already happening with the transition from 3G networks to 3,5G networks based on standards like HSPA¹⁸ (in Europe). Today's limits of this technology are 14 Mb/s downstream and 5,6 Mb/s upstream, though these speeds could be difficult to achieve for a relatively small simultaneous number of users trying to access from the same cell. HSPA is forecasted to be widely deployed in Europe between 2009 and 2012 (see for example, (Maña, 2007) and also data from GSA, 2008, and for additional details see Box 3).

¹⁸ See Box 3.

Box 3. The HSPA case

High-Speed Packet Access (HSPA) is a set of mobile communications standards that extend and improve the performance of existing UMTS protocols, therefore the label of 3,5G technology. It is currently composed of two standards, HSDPA (High-Speed Downlink Packet Access) and HSUPA (High-Speed Uplink Packet Access). The latest survey from the Global mobile Suppliers Association (GSA, Sept 2007) states that 138 HSDPA networks have commercially launched services in 66 countries, compared to 58 commercial launches (in 37 countries) reported by GSA in previous year. A further 47 HSDPA networks are currently in deployment, for a total of 185 HSDPA operator commitments in 81 countries. The survey confirms that HSDPA services are commercially available in 26 of the 27 EU Member States. HSDPA provides theoretical down-link performance of up to 14.4 Mb/s. Existing deployments provide up to 7.2 Mbit/s in down-link. Up-link performance is a maximum of 384 Kb/s. Voice calls are usually prioritized over data transfer. By February 1, 2008 (GSA data) 125 HSDPA network operators had commercially launched or were deploying 3.6 Mbit/s peak or higher downlink data rate capability. HSUPA provides improved up-link performance of up to 5.76 Mbit/s theoretically. HSUPA alleviates uplink capacity bottlenecks, e.g. for mobile gaming or mobile VoIP. The first HSUPA system was launched in early 2007. According to GSA research, by February 1, 2008 a total of 52 network operators had committed to HSUPA including 28 HSUPA networks commercially launched in 24 countries. These networks are today supporting almost 2 Mb/s peak on the uplink. Further speed improvements will be available with the use of Evolved HSPA, otherwise known as “HSPA Evolution” or “HSPA+” systems. HSPA Evolution would bring end-user data rates up to 40 Mb/s, using the transmission of multiple parallel data streams to a single terminal using Multiple Input Multiple Output (MIMO) technologies¹⁹.

The next step for mobile networks has several competing / cooperating alternatives, dubbed jointly as belonging to 4G or Next Generation Mobile Networks (NGMN). See Box 4 for a discussion on 4G evolution approaches.

Box 4. The 4G case: sequential or disruptive evolution

While there is a vision forecasting sequential evolution from 3G to 4G technologies, it is also widely believed that competing technologies may disrupt the forecasted evolution patterns. The introduction from the IPTS report of Rodriguez-Casal et al (2004) to the 4G issue is still valid: "Following the paradigm of generational changes, it was originally expected that 4G would follow sequentially after 3G and emerge between 2010 and 2015 as an ultra-high

¹⁹ MIMO uses multiple transmit and receive channels and antennas to improve performance and throughput for radio signals

speed broadband wireless network [...] Little consensus has emerged regarding this view, nor has it been defined in detail [...] The [linear] vision, in essence, is about a future 4G network that provides very high data rates (exceeding 100 Mb/s), which will be deployed several years after 3G has become commercially available on a large scale. Additionally, it is expected that these 4G networks will enable seamless interoperability and interconnection with other mobile devices. It is assumed that they will generally have a cellular structure, which builds on the fundamental architecture of preceding generations of mobile technologies. However, not everyone sees the future of mobile communications as a smooth progression from one generation to the next. Indeed, technologies are currently emerging that may either complement or compete with 3G [...] the wireless local area network [and their evolution] form part of the concurrent 4G scenario". Disruptions may arise from innovations based on the pure radio technologies, but more probably from a constellation of developments including those, but also spectrum management, device capabilities, and network architectures.

LTE²⁰, a 4G solution belonging to the linear vision in the evolution of mobile communications, is scheduled to be deployed from the completion of 3.5G networks, i.e., from 2009-12 onwards. LTE specifications for the system architecture are expected to be completed in 2008. The main advance is a new radio air interface technology known as Orthogonal Frequency Division Multiple Access (OFDMA) that will allow for instantaneous downlink and uplink peak data rates of 100 Mb/s and 50 Mb/s, respectively.

The evolution to 4G is also affected by fixed-mobile convergence. Fixed-mobile convergence means, among other more business-oriented approaches, the advent of femtocells, indoors and confined spaces mobile base stations 3G-like that allow to combine high bandwidth from a fixed connection with the mobile flexibility (roaming included for the most advanced models). Femtocells could start to be rolled out intensively²¹ in the next two years in EU. Suppliers and mobile operators consider this a promising field. Note that femtocells use licensed spectrum, unlike other results of fixed – mobile convergence such as Wi-Fi on top of a fixed broadband connection. Femtocells could help provide solid indoor coverage, saving network operators from building more radio towers and all their paraphernalia (site management, city councils taxes and complaints, neighbours' reluctances, energy consumption, ...). Base stations are the critical element for the deployment of 4G technologies, since these require a higher density of radio stations than 3G to deliver higher data rates to users. This technology also

²⁰ Long Term Evolution

²¹ Sprint (USA) has commenced to deploy femtocells in metropolitan areas in 2007 and Research Analysis (2007) suggests that widespread commercial deployment could happen as early as 2008. ABI Research (2008) reckons there could be 70 million femtocells in use by 2012.

allows new bundles of services (fixed – mobile, at home or outside home) of interest both for consumers and network operators. Last, they could help the transition of rigid network topologies to mesh networks (see below).

The main concurrent 4G alternative comes from the evolution of wireless data networks and consists mainly of WiMAX²². The mobile flavour of WiMAX offers up to 15 Mb/s with a coverage radio of 5 km and it is also based on OFDMA. WiMAX could be used, in principle, both in unlicensed and licensed bands. WiMAX is used also as a backhauling solution and, therefore, could be complementary with any other mobile – wireless technology. There are already roll outs of pre-WiMAX²³ and WiMAX technologies and it is expected to be deployed up to 2015. The combination of cellular and WiMAX is also named UMA²⁴ and requires specific (dual) handsets. There are also plans to update mobile WiMAX and in January 2007 the IEEE outline a proposal for a new 802.16m standard able to provide up to 100 Mb/s in high mobility scenarios. Last, there are also proposals to include WiMAX in the LTE standard.

Table 1: Summary of relevant data for mobile communication technologies

	HSPA (3,5 G)	LTE (4G)	Femtocells	Mobile WiMAX (4G)	Cognitive radio and mesh networks
Theoretical maximum data rates	14 Mb/s (downstream) 5,6 Mb/s (upstream)	100 Mb/s (downstream) 50 Mb/s (upstream)	-	50 Mb/s	-
Typical data rates	3,6 Mb/s (downstream) 2 Mb/s (upstream)	-	-	10 Mb/s	-
Begin of massive deployment	2008 - 2010	2009 - 2012	2008 -2009	2008	-
Enhanced version	HSPA+ 40 Mb/s (downstream)		-	100 Mb/s	-

²² Examples of some other possibilities are Mobile-Fi, Wireless USB and Ultra Wide Band (UWB). Mobile-Fi (IEEE 802.20) is similar in its goals to IEEE 802.16e, the so-called "mobile WiMAX". UWB are a group of radio technologies with a bandwidth greater than 500 MHz, used in small distances (less than 10 meters) and transmitting with low power to avoid interference in other radio systems. Wireless USB is a practical implementation of UWB aimed at connecting wirelessly multimedia peripherals at high speed.

²³ Most notoriously WiBro standard in Korea, launched commercially in June 2006.

²⁴ Universal Mobile Access referred originally to the combination of cellular technologies and WiFi

Critical technologies	MIMO	OFDMA	Management	OFDMA	Dynamic spectrum management
Main advantages	Evolutionary from existing 3G	Evolutionary from 3,5 G	Fixed-mobile convergence Increase of coverage	Not a legacy technology	Data rates Coverage
Main disadvantages	Transition technology	Time-to-market	Integration in existing networks	Business case for new technology	Early development state

The 4G scenario is completed with a number of technologies that could impact significantly on the technology roadmap. Cognitive radio (also known as “agile radio”) techniques analyse radio spectrum in real time and use the most appropriate frequencies for that service and environment. It is, thus, a dynamic spectrum management technology that potentially optimizes spectrum usage. Software defined radio or simply software radio is the generic name for the technologies able to use simultaneously and dynamically several standards and frequency bands. Mesh networks allows that every receiver (handset) in the network can be used to transmit and re-route communications. Although it is obviously a technology more complex to deploy than a fixed cellular system, it embodies appealing features such as higher user data rates and coverage without compromising interference levels.

The case of mobile television must be also mentioned. Mobile video can be streamed to each user separately, but there are several technologies that allow sharing the spectrum needed to deliver mobile television-like services. DVB-H is the EU-backed technology to broadcast digital terrestrial television to handheld devices. MBMS²⁵ allows using 3G spectrum to multicast television and video to mobile users.

The comparison among 4G technologies in terms of spectrum efficiency reveals that each of them aims at using the same radio technology (OFDMA) and therefore this will not be the source of definitive comparative advantages. The technology choice will depend on the business case that itself depends on the flexibility and efficiency in the deployment of the services and applications that the operator wants to roll out. Regarding deployment costs of any of the cellular technologies presented, they depend initially on the allocated frequency band²⁶

²⁵ Multimedia Broadcast / Multicast Services

²⁶ Motorola document "The promise of WiMAX" (2007) indicates that a WiMAX network at 3.5 GHz could have as many as 30% more base stations for a particular coverage that one operating at 2.5 GHz. The reasons are that at higher frequencies, radio signals suffer greater losses and undesired propagation effects.

but, over time, costs will be similar, since the limitation in coverage will come from the data rate (quality) provided to concurrent users, and not from the frequency band of operation.

As a summary, the evolution of mobile networks from their current state is definitively required for the mass adoption of consumption and interaction with rich media content and mobile social applications. However, its influence in mobile content adoption, although important, is not critical at this point, and its main use is serving as a roadmap for the type of applications related with mobile content that will be possible over time.

Standardization and interoperability

Mobile services suffer from a high level of technical complexity: there are several radio networks (2.5G, 3G, HSDPA, ...), very complex IP infrastructures (portals, gateways, billing, LBS, MMS, rendering engines), different protocols (SMS, MMS, WAP, streaming), support for hundreds of different mobile devices (feature phones, smartphones, PDAs, etc) with different operating systems²⁷ and applications. In addition, operators' role in portal, billing, and personalization combined with the "revenue sharing" approach makes the technical chain long and shared by too many actors to be easily controlled and managed. New media bring new issues around usability, while traditional issues like availability and performance are more difficult to analyze in a mobile environment, since problems can occur anywhere in the technical chain. The results of the complex topology of mobile content provision show up in interoperability, and in 2007 around the 20% of mobile multimedia commercial transactions never completed²⁸.

Box 5. The Trolltech case

Nokia has announced an agreement (2008) to acquire Trolltech, a Norwegian company that has built a cross-platform for Internet-mobile applications and platform for mobile applications development able to work with several systems like Mobile Windows or Linux. Analysts consider that this move will allow Nokia to extend the potential base of handsets suited for their applications beyond those that already use Symbian.

The heterogeneity of existing solutions and the lack of standards create fragmentation of mobile content markets. Standardization would have several positive effects in the mobile content segment. The first refer to innovation and competition, since standardization will allow for convergence to thrive, it would also simplify working with 3rd party applications (co-

²⁷ As an example, of approximately 240 million subscribers (2007) in the U.S. less than 10 million of their phones use Microsoft, RIM, Symbian or Palm operating systems

²⁸ Data from Zandan, 2007

innovation) and it would pull down technical barriers. But standardization could also help provide stable answers to usability and social concerns (quality, security, privacy, trust, ...).

On the other hand, the lack of standardization promotes the appearance of innovators who benefit from the complexity. The emergence of middleware runtime environments like Sun's J2ME and Qualcomm's BREW have enabled developers to create and deploy third-party applications across a wide range of proprietary operating systems. The same applies to any other layer of the mobile content sector: applications, media players, interactivity, digital rights management, advertising, content provision, etc.

There is some pressure from big players in the mobile content domain to reduce the number of mobile platforms (at least, the mobile operating systems) due to the increasing costs of maintaining and developing applications for each one²⁹.

Box 6. The mobile operating system de-facto standardization case

Apple's iPhone was launched in 2007 and it has sold 4 million units in its first 200 days on sale³⁰, capturing 20% of smartphones sales³¹ during 3Q 2007. iPhone represents 2% of global smartphones³² but mobile Internet traffic to Google surpassed any other during Christmas 2007, exceeding traffic from Windows Mobile and RIM's Blackberry and temporarily that incoming from Symbian-based devices.

Google's Android was unveiled by the Google-led Open Handset Alliance in November, 2007 and still (1Q 2008) no wireless carriers have agreed to allow such handsets on their networks, although several analysts and operators have mentioned the possibility of having Android devices by the end of 2008 and some prototype smartphones based on Android were presented in the Mobile World Congress 2008. Although analysts³³ believe that Android-based mobiles will not be significant for the smartphone market in 2008, in the first two months, programmers downloaded the software development kit for Android more than 250,000 times, according to Google. By contrast, developers downloaded the Symbian OS Getting Started guide some 70,000 times in the 12 months ended in September 2007.

Symbian is a proprietary operating system specifically designed for mobile devices. Symbian is currently (1Q 2008) owned by Nokia (47.9%), Ericsson (15.6%), Sony Ericsson

²⁹ A. Sarin, CEO of Vodafone, argued for the existence of only around 5 operating systems for mobile devices, instead of the tens existing (Mobile World Congress, Feb 12, 2008, Barcelona)

³⁰ Up to January 14, 2008

³¹ Data from Gartner. Top smartphone seller was RIM with 39% during the same period.

³² Smartphones based on Symbian represent 63% of total, Windows Mobile 11% and Blackberry 10% (IDC, 2007)

³³ Survey by Chetan Sharma Consulting (2008)

(13.1%), Panasonic (10.5%), Siemens AG (8.4%) and Samsung (4.5%). Symbian is not open source software. However, phone manufacturers and other partners are provided with parts of its source code. The APIs are publicly documented and up to Symbian 8.1 anyone could develop software for Symbian OS. Symbian 9.1 introduced new capabilities and a platform security framework. To access certain capabilities, the developer has to digitally sign their application. Basic capabilities are user-grantable and developer can self-sign them, more advanced require certification and signing via the Symbian-signed program; which uses independent test houses and/or phone manufacturer approval. For example file writing is a user-grantable capability, and access to multimedia device drivers requires handsetphone manufacturer approval.

Windows Mobile is a compact operating system combined with a suite of basic applications for mobile devices based on the Microsoft Win32 API. Devices that run Windows Mobile include Pocket PCs, Smartphones, Portable Media Centers, and on-board computers for certain automobiles. It is designed to be somewhat similar to desktop versions of Windows, feature-wise and aesthetically. Additionally, third-party software development is available for Windows Mobile. Windows Mobile has been updated several times, with the current version (2007) being Windows Mobile 6 and a new release scheduled for 2008. Microsoft projected in 2008 that shipments of devices with Windows Mobile will increase from 11 million to 20 million units.

The bottom line is that standards and interoperability are needed in this area, but markets are still in an early stage where the prospects of de facto standardization (i.e., "the winner takes all" model) are still too powerful to be counterbalanced with the advantages of an agreed framework.

There are two main, not incompatible, routes if the choice is for open access. The first is producing an open development environment to be used on an existing handset according to a set of rules, the other is allowing for the possibility of bringing any handset to a mobile network and access to radio and associated services following a set of rules. Box 6 shows examples of strategies in both directions.

5. MOBILE CONTENT BUSINESS MODELS

The focus of mobile industry is on how to generate revenues from mobile content. Alternatively, content industries try to figure out how to use the mobile channel as a different source of revenues. Both of them confront the issue of the investment needed for new infrastructures deployment able to support a potential explosion in mobile traffic due to intensive use of content and applications. At the same time, the evolution of mobile content

towards a greater involvement of users also requires business models suitable for flexible, application-centric, user-determined configurations, typical of the web 2.0 paradigm.

The content and media perspective

In this scenario, there are a number of possible generic business models³⁴, see for instance (2007), (Rappa, 2007), that exist in other markets and that can be adapted to the mobile content environment from the content and media perspective:

- Brokerage, meaning market-makers. The broker usually charges a fee or a commission for each transaction it enables. Brokerage models of interest for mobile content are: services for marketplace exchange, virtual marketplace, buy and sell fulfilment, transaction broker, distributor, and search agent.
- Infomediary. These are information intermediaries assisting buyers and/or sellers to understand and use a market. They usually profile consumers, consumption habits, producers, products and target marketing campaigns.
- Merchant. Simply wholesalers and retailers of mobile content goods and services.
- Direct-to-consumer. The producer of content can reach consumers directly and thereby jump over the distribution channel.
- Affiliation. The affiliates provide purchase-point click-through to the merchant. Variations include banner exchange and pay-per-click. It is a business model highly complementary with advertising.
- Community. User loyalty to the community is used to produce revenue from selling ancillary content or through voluntary contributions. It is typically complementary with advertising and subscription for premium services.
- Subscription. Users are charged a periodic (daily, monthly or annual) fee to subscribe to mobile content. It is a common practice to combine free content with premium content. Subscription fees are incurred irrespective of actual usage rates. Subscription is frequently combined with advertising.
- Pay per use. Also called utility model, on-demand model or pay-as-you-go. It is based on metering usage and, thus, unlike subscriber model, pay per use is based on actual usage rates.

³⁴ Non-exclusive

- Advertising. It will be examined in a specific section.

The most important models for the mobile content sector are (and will be) subscription, pay per use and advertising. The first two imply the user paying directly for the service or good she/he consumes. The last makes mobile content free to final users. A separate section is devoted to mobile advertising since it is forecasted to have an increasing importance, in a similar path to that of Internet. The slow uptake of mobile payment also influences the adoption of the above business models and the reasons behind seem to coincide with the difficulties of mobile value added services (see Section 0) to users.

The evolution of these three models will determine the viability of every content segment within the mobile platform. Therefore, since the resources (time, expenses) that the user will devote to the consumption of mobile content are limited and in conflict with the resources devoted to other (content consumption) activities, a fierce competition will be expected in both the pay model (subscription and pay per use) and in the free model (advertising).

Box 7. Buongiorno, a mobile content provider case

Buongiorno is a mobile media and technology company in the cellphone entertainment and personalization industry. It partners with telecom, media and Internet companies in over 30 countries to distribute, package and create music, games, videos, wallpaper, ringtones, chat, user-generated services, TV voting, quizzes, and to sell advertising. It also helps companies market through proprietary labels, and sells directly through its Blinks brand. It distributes across the U.S., Europe, South America and Mexico, the Middle East, Africa, Hong Kong (joint venture with Mitsui) , in Russia, India, the Far East and China. In the consumer services part, Buongiorno offers a portfolio of services and pieces of content to wired and wireless telephone users globally through a multi-channel strategy that includes direct distribution as well as through partnerships with telecom companies and media groups.

Additionally, within these three main possible models, it is considered that mobile content will suffer an accelerated transformation from good to service. The paradigm of being a good implies, first, that content is a product; second that content can be delivered to a purchaser; and third, that in the process there is a transfer of ownership³⁵ from seller to customer. However, the perspective of mobile usage³⁶ strongly stresses the possibility of having a service instead of a commodity as such. The specific features of the mobile platforms lead into this direction:

³⁵ Even temporal as in a rental

³⁶ Additionally to digitisation that caused the first shift from product to service.

limited handset capabilities, the possibility of ubiquitous access, and the improvements in both the network and handset capabilities.

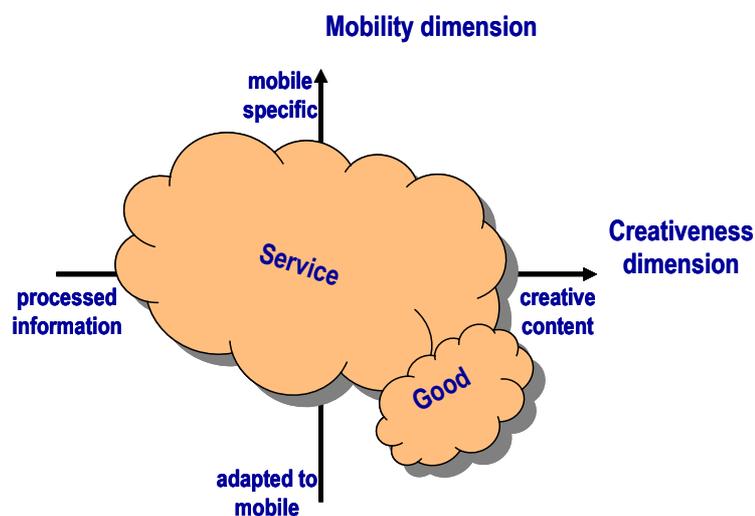


Figure 8: The good vs. the service paradigm in mobile content

On the evolution of the walled garden: the models for network deployment

Mobile business in Europe has been traditionally characterised by the operators' pre-eminent position, controlling many elements within their value chain, from network and services to applications and content. The result from the perspective of mobile content and applications is the well-known "walled garden" "silo model" or "on-portal" model³⁷, where content and applications revenues are generated by operators within their own value structure and where users are guided to stay confined as much as possible within this structure. The bottom-end rationale for a walled garden in mobile content is the use of a scarce and costly resource: the mobile networks. Undoubtedly, see for example (S. Ramos, 2005), this model has eased the way for infrastructure development. The next challenge is the deployment of new/next generation mobile infrastructures, like the ones described in section 4, either maintaining the walled garden model or assuming its evolution into a new scheme.

Regarding mobile content, the first issue to mention about the walled garden model is that is not neutral for the deployment of new content and applications: in a number of cases (particularly true for innovative proposals, not foreseen in the platform framework) the mobile content or application must be technically and business compatible (or even be developed

³⁷ Also known as "on-deck", see Section 2.2

within) the particular mobile platform; and secondly, each operator takes a different approach and uses a different platform.

However, the increasing pressure from demand to enjoy unrestricted and wide choice of content - applications and the changes in the mobile industries structure are causing an evolution of the business model for mobile carriers. Citing Holden (2008) "the level of control exerted by [mobile] operators rankles with, and exasperates, the content providers, an environment not necessarily conducive for the introduction and mass adoption of innovative mobile services [...] companies which specialise in a given area of content (be it music, games or adult content) are unconvinced as to the operator's efficacy in marketing their particular product, in that operators, after all, are mobile specialists and not specialists in music / games / adult content".

As an initial consequence of these new pressures, what is average allowed by walled gardens is and will be changing over time. Now all the major operators have standard agreements for such contents as ringtones, wallpapers, games, but, in general they do not have it for reach media content like mobile TV, radio, video on-demand, music streaming and downloads. The restrictions also are dependent upon the type of the device (not every smartphone behaves the same within the mobile system), the type of delivery mechanism (e.g., videos clips could be delivered via MMS but not via media players), and by the particular platform.

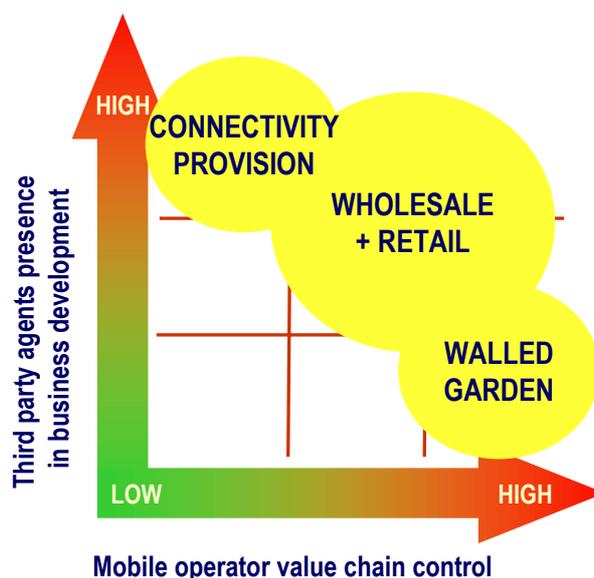


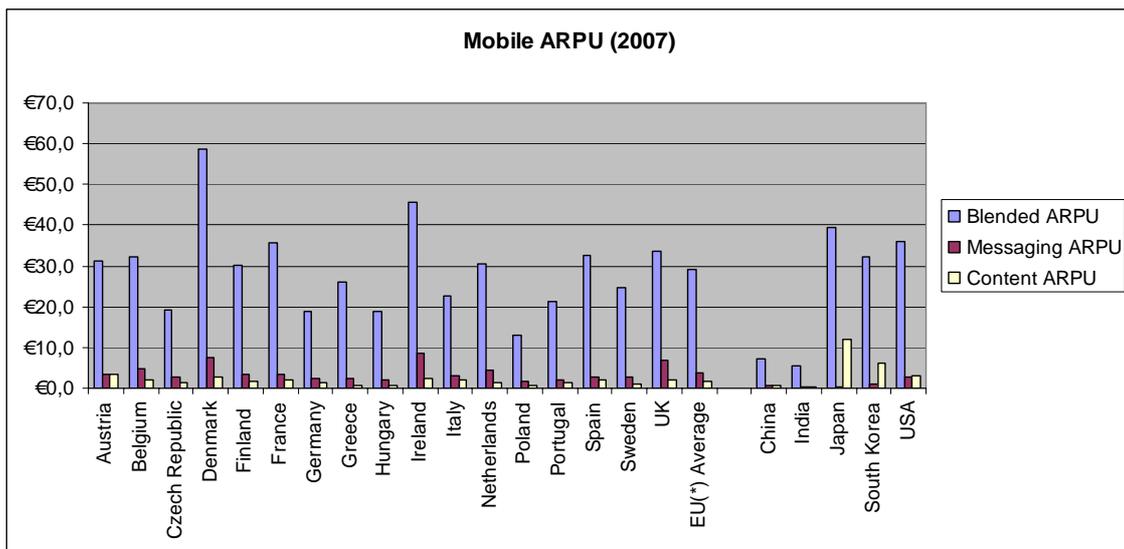
Figure 9: The mobile content business models from the mobile carriers' perspective. Source: adapted from (S. Ramos, Feijóo, C., Castejón, L., Pérez J., Segura, I., 2002)

All of these difficulties lead to envisage the opposite model: the mobile operator as a mere provider of connectivity or a "bit pipe / dumb pipe". Here the revenues for mobile content

accrue to content providers, enablers and brokers. Obviously, there is a resistance from mobile operators to embrace this model in the short term.

Between the walled garden and the connectivity models, there will be intermediate possibilities, attractive enough since they could represent having (at least a part of) the best of both worlds. All of them use to some extent the chance of mobile operators to become wholesale providers of services for content-related players, or also offering their own private brands to users. The result of using this model resembles that of department stores or shopping malls or, better, multi-department stores, hypermarkets and superstores. This model might also be seen as a reaction against the possibility of losing the entire retail content revenues to third parties through off-portal and side activities by end-users. Also within this model there will be an increasing presence of Internet-like business models, currently absent from the telecomm industry. Nowadays, this last model seems to be the choice for mobile operators, although the answer to the issue of the costs derived from the development of next generation infrastructures is still unsolved.

None of these models mentioned is exclusive and it is forecast the co-existence of them up to the mid-term. Nevertheless, their relative degree of importance will be relevant for the type of innovations to be expected in the mobile content domain and for the transition to a new mobile 2.0 model. In any case, as Figure 10 shows, the models based in content revenues for operators are producing up to now (2007) very low results for mobile operator, and with the major exceptions of Japan and Korea, where content ARPU is 30,5% and 18,9% respectively, they are below the 10 % threshold³⁸.



³⁸ Austria is the only exception with a 11.1 % content ARPU.

Figure 10: Total, messaging and content monthly ARPU in selected EU and world countries.
Source: (Netsize, 2008)

Table 2 surveys some offerings of EU main mobile operators with 3G and 3,5G technologies roughly proving the evolution from pure walled garden to more open models, including some connectivity models.

Table 2: A survey of some EU mobile operators 3G services offers. Source for data: (Ovum, 2008a) and (Ovum, 2008b) and own elaboration

Country	Operator	Service name	Description	Type of model
France	Orange	World	(Dec 2004) Service portal	Walled garden
France	Orange	Offre Star	Internet access and tv	Intermediate
Germany	T-Mobile	Web 'n' Walk	Internet access	Connectivity (flat rate up to 5 GB)
Germany	Vodafone	Foto-Community	Posting and viewing pictures	Walled garden
Germany	Vodafone	Mobile Internet Flat	(June 2007) Internet access on Vodafone live	Intermediate
Germany	Vodafone	Mobile Connect Flat	(Abr 2008) Unlimited Internet access	Connectivity (flat rate up to 10GB)
Spain	Telefonica	Movistar Emocion	Content and participation portal	Walled garden
Spain	Telefonica	Internet movil PC	Internet access	Connectivity (not flat rate)
United Kingdom	3	SeeMeTV	(Oct 2005) Posting and viewing mini movies recorded by users	Walled garden
United Kingdom	3	Mobile web	(Jan 2005) Web access	Intermediate
United Kingdom	3	Moblog	(Mar 2007) Submit images or posts on the Internet communities	Intermediate
United Kingdom	3	Kink Community	(Aug 2007) Online relationships by posting and viewing pictures and profiles	Walled garden
United Kingdom	3	X-Series	(Dec 2006) Access to Orb, Sling, Yahoo!, Windows Live Messenger, eBay, Google, ...	Intermediate - Connectivity
United Kingdom	O2	Mobile web services	(Mar 2005) Web access	Intermediate
United Kingdom	O2	LookAtMe	(Jul 2006) Send and receive videoclips	Walled garden
United Kingdom	O2	My Bluebook	(Nov 2006) Save a copy of pictures, videos and text	Walled garden

United Kingdom	Vodafone	Mobile Marketing	Marketing services	Intermediate
United Kingdom	Vodafone	MySpace / YouTube	(Feb 2007) Posting and screening pictures and videos	Intermediate
United Kingdom	Vodafone	Mobile Internet	(Jun 2007) Internet access	Connectivity (flat rate up to 120 MB)

It is important to highlight that the connectivity models in place, up to now, always include some type of limitations, unlike fixed broadband connections. Therefore in practical terms they preclude (very) heavy usage of the mobile network. 3 UK is perhaps the most notorious example of a cellco embracing the connectivity model. They have reported³⁹ a surge of 14-time higher data usage of their network between October 2007 and March 2008 due, mainly, to the use of "dongles" (3G/3,5G USB devices for laptop mobile access to Internet).

Another main point is the discussion on mobile operators models are the investments needed for the deployment of the new infrastructures mentioned in Section 4. Undoubtedly, the deployment of the NGNs is the technical and business element around which the future evolution of the information and technology sector revolves. However, numerous uncertainties remain regarding their development. Some operators have started to invest but maintain their doubts over whether the applications and services offered over a NGN shall be sufficient to provide a return to investment and, at present, they are not sure which killer application, if any, will develop to provide sufficiently a new revenue stream. Available evidences, see De-Antonio et al (2006), or Forge et al (2005) show that the cost for the deployment of such networks is in the same scale that today's broadband connection fees. For instance, Forge et al (2005) report that "our simulation indicates minimum ARPU levels of 15-19 €monthly will be needed for 4G business cases to become viable, under our assumptions ...". Following these results, although major investments are required, it is feasible that mobile connectivity models support the deployment of mobile next generation networks, and that they can compete with fixed broadband offerings. Obviously, the pace of this deployment will depend on the departure point for the different types of operators and on a number of factors regarding general economic situation, competition and both the supply and the demand sides of the market.

Finally, an additional factor that cannot be forgotten is that the provision of converging services over mobile NGN will reinforce the importance of agents different from the pure telecommunications field, in particular content providers and software and hardware suppliers.

³⁹ Available at http://www.bbc.co.uk/blogs/technology/2008/04/mobile_net_takes_off_but_can_y.html

The control and intelligence of these new networks, at the centre or at the edges, will be a key element for the opportunities of each of these types of players.

A separate mention is needed for the MVNOs⁴⁰. Theoretically, see (Dippon, 2006) for a complete evaluation of them, this type of operators could make a different value proposition to that of mobile network operators and, in particular, could serve as a first try at mobile content markets with higher risks or being more innovative. However, they have mainly concentrated in the voice market and, although there are some exceptions⁴¹, there are no signs of a major change of trend⁴².

Shared revenues: mobile operators and content providers

A consideration about the revenue flows. The revenues from users (retail revenues) can be based on connectivity fees, intensity of usage (per any range of MB / GB) and consumption of premium content (subscription or pay-per-use). This last part is typically shared between the mobile operator and the content provider. This is only feasible when the mobile content is on-deck and/or if the revenue goes through the billing system of the carrier (using, for example, SMS to pay for the services). In addition to the retail revenues, the wholesale revenues would be derived from the services the mobile operator offers to content providers. Additionally to the retail / wholesale distinction, the mobile industries also discriminate among mobile originated and mobile terminated services. Mobile originated are the services that begin in the content delivery platform and finish in the mobile device (the push model) and terminated are the content services that emerge from the mobile handset (the pull model)⁴³. Note that the first type is more prone to advertising and subscription, while the second, that requires some action from the user, belongs to the impulse buy model.

⁴⁰ Mobile virtual network operators

⁴¹ Including the failed branded MVNO attempt of Disney

⁴² For example, eMarketer (2006) forecast that in 2010 MVNO data revenues will account for only about the 18% of the total mobile communications revenues in the UK.

⁴³ User generated content will not belong to any of them, being a separate model.

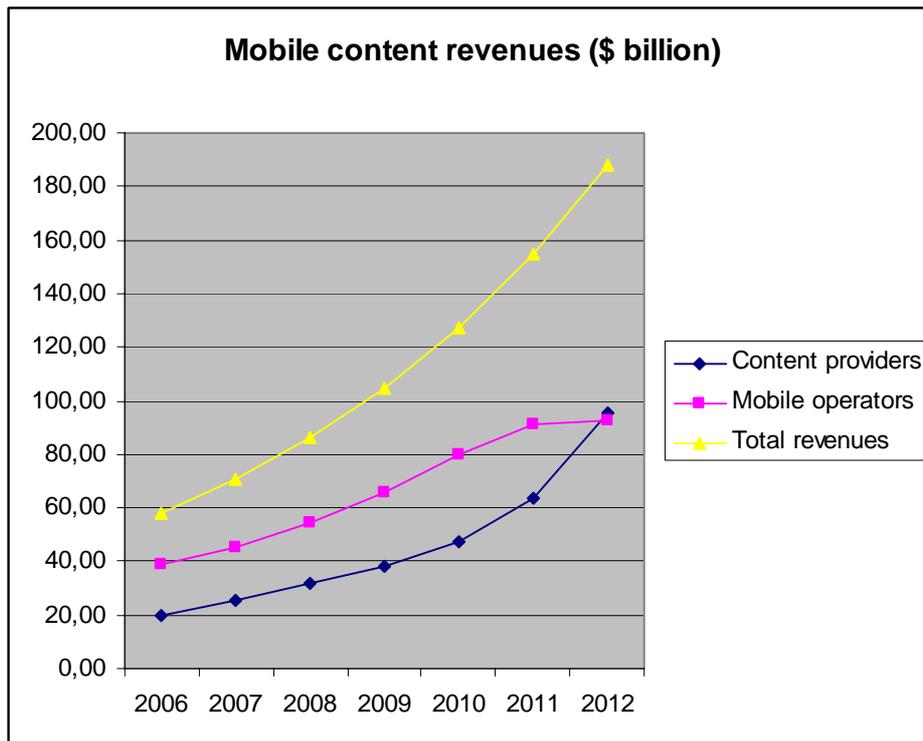


Figure 11: Mobile content revenues (\$ billion). Source: own elaboration from data and forecasts of (Holden, 2008; InformaTelecomsandMedia, 2008; iSuppli, 2008; ResarchandMarkets, 2007; Uglow, 2007)

Figure 11 shows the market research firms' forecasts for mobile content revenues, content providers and mobile operators, that will grow from \$ 71 billion in 2007 to \$ 188 billion in 2012. Using the same data, the figure also shows how the distribution of the revenues of content providers and mobile operators evolves over time with an approximate 50% of the total forecast for both types of players to be reached in 2012.

Box 8. Helio, a virtual mobile network operator case

Founded in 2005, Helio is a USA MVNO joint venture between SK Telecom and EarthLink. Helio caters to a customer base it describes as young, connected consumers who are interested in multimedia advanced mobile services, in exclusive high-end devices and in special pricing. Helio had 130,000 subscribers by August 2007 and nearly 200,000 subscribers in Jan 2008. Helio has average revenue per user (ARPU) over \$85, well above the industry average⁴⁴ of under \$50. Some other parameters of interest are: an average of over 550 text messages per member per month, many times the industry average; instant messaging penetration 3 times the industry average⁴⁵; 95% of Helio brand members access the Web through their mobile device

⁴⁴ CTIA, Semi-Annual Wireless Industry Survey, June 2007

⁴⁵ All data for comparison from M:Metrics, November 2007

versus an industry average of about 13%; each month, 60% of Helio brand members access MySpace via their Helio and average nearly 500 page views; in December 2007, Helio members uploaded photos from their device to the web at a rate 5 times the industry average.

The unexpected guests: device suppliers' and application providers' new roles

Mobile content is used as well as part of the strategies of players different from mobile operators and content providers. There are recent and important examples of this new approach: mobile device suppliers like Apple (from iPod to iPhone), Nokia (Symbian development platform or the Ovi platform), or application providers like Google (the Android suite). All of them look for new profits from the combination of mobile content with their portfolio of products and services. They share a common perspective, therefore, to lower external barriers (technical, economical and from usability) to consume and interact with mobile content.

Forward-looking, it is acknowledged that a third perspective that completes those of mobile operators and content providers has appeared with considerable strength. This should be reflected in the scenarios for the evolution of mobile content since not only introduces new paths in markets evolution, but highly influences the users' perception on the value and experiences related with mobile content.

The irruption of these new players could have a deep impact in the mobile content domain. As (Feijóo, 2006) state "Thus, the value of the contents itself is modified and, with this change, the value chain is transformed, pushing out the conventional contents exploitation approaches [...] (the disruption) does not necessarily imply a cannibalization of the usual contents exploitation models, although this could occur in practice".

6. MOBILE ADVERTISING

Mobile advertising⁴⁶ is an extension of the traditional media broadcast model. The mobile content player provides content (typically free, but not necessarily) and applications mixed with advertising. The procedures to mix content and advertising are manifold: banners ads, full-screen ads (placed, for instance, before the user consumes content), placed within the content (product placement in video and games) or interactive (the user must wade through the ad to reach the content).

⁴⁶ And also web advertising

Mobile advertising is also influenced by user behaviour. Here also there are multiple possibilities. The first option links high volumes of user traffic with mass advertising in a mobile portal. In a lower scale, there are also personalized portals and niche portals with targeted advertising. Classified ads use the interest of users to charge for listing fees and/or membership fees (and typically include conventional advertising also). User registration systems allow for free access but require users to provide demographic data and permission for tracking, later surveyed for targeted advertising campaigns. Note that mobile user registration could imply tracking contextual information like location, time of the day, weekday, etc. Sponsored links (also called contextual advertising) are matched to search terms, user queries, web visits or key words and, furthermore, in the mobile content world, could include the mobile user profile (location, for instance). Summing-up, the personal and anywhere features of the mobile environment are considered to play a key role in advertising trends.

Drivers for mobile advertising

There is a crisis in conventional advertising, and specifically in marketing through television⁴⁷. Advertisers feel that they are not going to get the impact and sustainability of their brands by just doing conventional (i.e., television) ads. They are looking for better ways to reach consumers and they are beginning to move their advertising budgets from television to other media. Thus, a partial substitution process towards mobile advertising has already begun⁴⁸, impelled by the feeling that mass-media marketing is over and that there is a need for more targeted approaches. Also in the same direction, since users manage an increasing number of media, a unique media (like television) advertising strategy will miss a growing number of users. At the end, advertising will be where the impact is.

The drivers for the success of mobile advertising can be classified into two categories. The first originates in the success of mobile communications (number of users, bandwidth available) and in the increase of multimedia usage in the mobile environment. The second derives from the special features of the (very personal) relationship with the mobile device: personalized and "location sensitive" marketing, or also the m-commerce vision of the mobile as a "credit card with an antenna". From an advertiser's point of view, mobile may provide unparalleled reach and a reliable and fairly accurate measurement tool of the success of a marketing campaign.

Box 9. Users' response to mobile advertising

⁴⁷ In the words of J. Raj, New Media Chief at Visa, "the days of doing a tv spot and reaching everybody are dwindling; the mobile phone is very personal, and it's always with you".

⁴⁸ It began first with Internet advertising

A recent survey⁴⁹, involved interviewing a total of 1,535 mobile users across the UK, Germany, Italy, France and Spain during October 2007, has shown that it is in Italy and Spain where consumers are most interested in mobile marketing. According to the survey, more than half of users in these countries say they are at least moderately interested in mobile marketing; a similar amount say they would consider “opting in” to such a service. In the other countries surveyed, there was greater resistance to the concept, with Germany being the least receptive. Extrapolating the survey’s findings, the Mobile Marketing Association (MMA) reports that 70 percent of German consumers have no interest whatsoever in mobile marketing (compared to 65 percent in the UK and 60 percent in France). The survey found that interactive voting, receiving ads and product/service information are the most common applications of mobile marketing, with 18-to-34-year-olds showing the greatest willingness to participate in mobile marketing efforts. However, MMA warns operators (and advertisers) not to focus all their efforts on this age group, as 35-to-54-year-olds are only marginally less interested in an opt-in service. It is in the 55+ age group where interest in mobile marketing is significantly lower.

Added to these advantages, current market research shows that there is a significant part of mobile users that are not willing to pay for access to content. However, mobile advertising is seen increasingly as the "machine within" in the business models for applications and contents in mobile.

Mobile advertising value chain

Currently, the mobile advertising value chain consists of the following main segments: advertisers, marketing agencies, content providers, enablers, aggregators, carriers and consumers. The enablers' role is the creation of a marketplace where advertisers and owners of mobile content (sites, games, ...) can interact and, from here, adapt advertising to content and deliver it to users as personalized as possible. The aggregators manage that advertising from multiple sources (and in general, content, applications and services to which is related) reach users belonging to different carriers and with different handsets.

Box 10. The case of the consolidation in the mobile advertising segment

Mobile advertising has entered a period of consolidation and has raised the interest of the biggest companies in the ICT domain. ScreenTonic was acquired by Microsoft, Third Screen Media by AOL, Actionality by Yahoo, Enpocket by Nokia and, interestingly, Amobee has received funding from two competing mobile operators (Vodafone and Telefónica Móviles). The profiles of some of the more innovative companies are briefly outlined in the Annex.

⁴⁹ Conducted by Synovate

The emerging nature of mobile content increases the importance of mobile advertising as an enabler of marketplaces, therefore adding to the justification of its separate consideration.

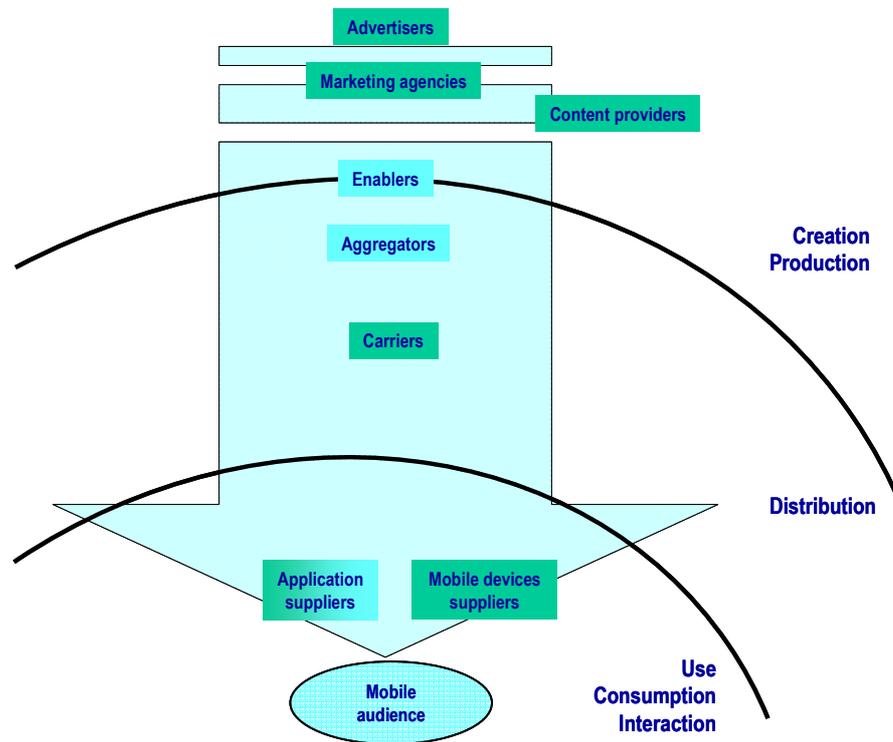


Figure 12: Value chain of mobile advertising

Within this value chain, there are two main techno-economic models for mobile advertising and promotion. The first is a push model that should be able to create impacts at any level (continental, national, regional, local, city, zip code, particular location, ...) including the personal level. For these, the system needs to support extensive querying and segmentation capabilities to have the marketing campaigns in place for each niche. The second approach is to use some type of sensitiveness to the context, be on the terminal (mobile web page, mobile search) or outside it in the environment around (location, tags, ...). The result is an ever changing provision of highly personalized advertising. The second model uses further the specific features of the mobile environment.

User concerns and mobile advertising conduct codes

The main barriers for mobile advertising are due, in the supply side, with the still at large unknown user response to it, and, and more important, in the demand side, with the concerns about consumers' abuse, privacy, and user's data protection. To circumvent these last two concerns, currently the mobile industry seems to be developing around auto-regulation and

the adherence to different conduct codes⁵⁰. To this regard, it still too early to know if this approach will suffice and no solid data about user response is available.

Box 11. The precedent of the Jamba/Jamster case

Jamba is a mobile phone content provider originally founded in Berlin during 2000. It was bought by VeriSign for \$270 million in 2004. Jamba at the time built mobile applications, games, ringtones and wallpapers, and was also in over 40 countries worldwide. In 2005 Jamba also added to its revenues by adding "impulse purchasing" - when you downloaded one ringtone, you were offered others. This turned into interactive advertising, for which the mobile owner was charged, sometimes unknowingly. This created controversy in Europe, and was quickly withdrawn. In the United Kingdom, the Mail on Sunday⁵¹ decried what it described as a "ringtone rip-off," citing several examples, among them, that of a young girl who ran up a bill of £70 in a short time, just by ordering ringtones and wallpapers. Some mobile advertising analysts⁵² argue that "they probably single handedly set back the mobile content industry by about 3 years with their deceptive marketing practices".

Mobile advertising prospects

The evolution in consumption habits, the proliferation of mobile devices and the characteristics of the mobile environment seem to lead to new heights for advertising revenues are the features on which market forecasts agree for considering mobile advertising as the main source of income for mobile content business models⁵³. In particular, contextual advertising and the personal relation with the mobile device promise higher levels of advertising expenditure than in any other media. Nevertheless, it is not clear if user sensitivity to current invasive ways of mobile advertising has been correctly considered. An initial abuse of mobile advertising could cause a social reaction in the opposite direction, and cause demands to improve the level of privacy in the mobile environment (at least with regard to advertising), in particular compared with conventional media. There have been some precedents in this direction (see Box 11). In recapitulation, two diverging paths are possible to mobile advertising mainly as function

⁵⁰ See for example <http://mmaglobal.com/codeofconduct.pdf> , the Mobile Marketing Association code of conduct.

⁵¹ Available at http://www.mailonsunday.co.uk/pages/live/articles/news/news.html?in_article_id=345213&in_page_id=1770

⁵² E. Lum from EJM Wireless Research. See <http://wirelessinprogress.blogspot.com/2007/06/mobile-advertising-reality-check.html>

⁵³ See section 11 of this document

of its social acceptance and the ability of advertisers to manage the sensitivity of mobile consumers.

Another aspect of interest is the scalability of mobile advertising. The growth of mobile advertising could only come from two sources: a general growth in the advertising total expenditure in mass media and/or a substitution effect with mobile advertising using some of the expenditure previously assigned to some other media. Using data provided by (Wieland, 2008) mobile advertising expenditure during 2006 was about US\$0.8bn, a tiny 0.11 % of the global mobile revenues and 0.18 % of global expenditure on advertising. With this figures in mind, the spectacular 80% CAGR of mobile advertising forecasted for 2007-2012 does not seem so relevant⁵⁴. Therefore, it will be from this date onwards when mobile advertising will confront scalability real issues since a mere growth of the advertising market will not be enough to sustain mobile advertising growth. As a comparison, see (ZenithOptimedia, 2007), Internet accounts in 2007 for a 7.0 % of the US\$445bn global advertising market and it had an annual growth of 28% from 2006. As a final note, (Wieland, 2008) quoting Acision⁵⁵ points that it is possible for mobile operators to generate up to 10 % of their income from advertising if direct relationships with advertisers are established⁵⁶.

7. MOBILE CREATIVE CONTENT: GAMES AND MUSIC

The mobile creative content deals with the provision of re-purposed creative content and new creative content to mobile users. It includes every creative content industry: audio, video, games and books, to mention the most important. In this section the music and games parts will be considered in detail, leaving the video for a following section on mobile television.

Value chain of mobile creative content and new players

Each of the creative content industries that goes mobile has differential features. Nevertheless, to concentrate on the most important aspects, a common structure for their value chains is introduced and, later, in specific sub-sections, the relevant disparities are presented.

⁵⁴ More recent figures (Juniper Research 2008) have cut the growth to 40%.

⁵⁵ A supplier of mobile messaging platforms

⁵⁶ Vodafone has announced plans in 2008 in this direction, i.e., avoiding advertising intermediaries as Google or Yahoo.

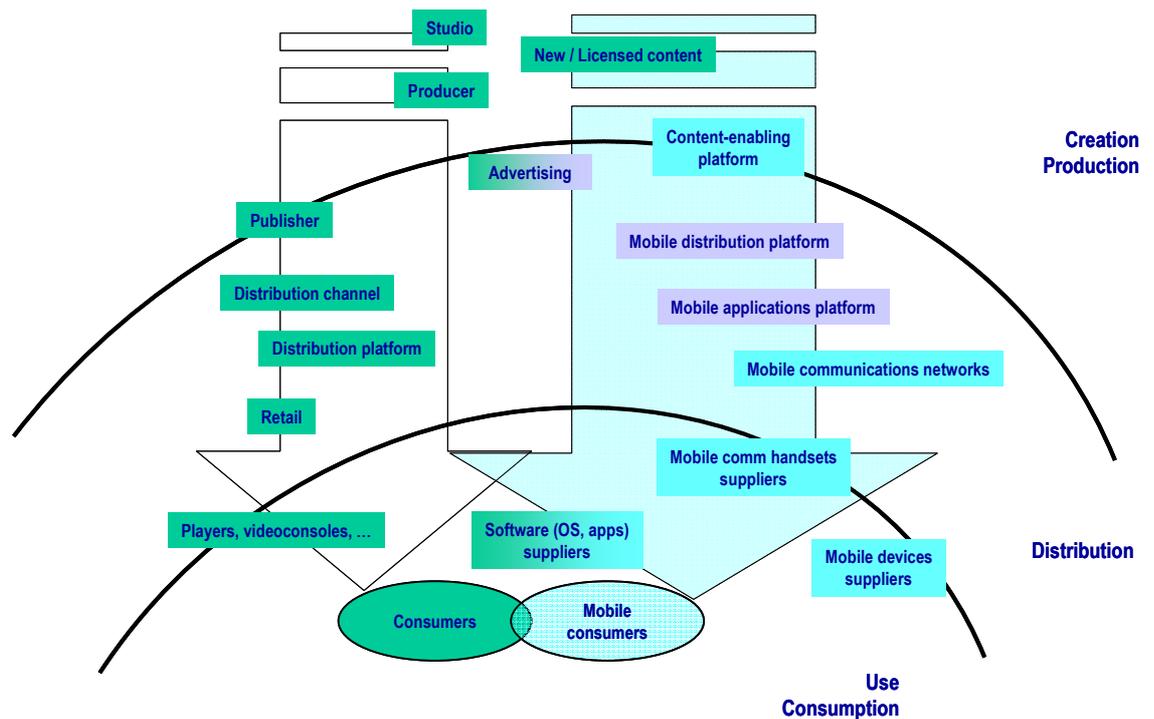


Figure 13: Value chains of creative content (left) and its mobile equivalent (right)

The main differences between the creative content value chain and its mobile counterpart are: the appearance of new types of players, the content enabling platforms and the mobile distribution platforms; the consumption of creative content in a mobile device and in a mobile environment; the link, via mobile applications, with the Internet world; the interaction of users with content in a mobile environment, like, for instance, in mobile gaming; and the transformation of content from good to service. Each of these aspects will be introduced in following sub-sections.

Mobile content enablers and the complex topology of mobile content delivery

The forecast for the success⁵⁷ of mobile content enablers is evident from the examination of the complexities of mobile content delivery. There are a mind-boggling number of different elements to consider for the right delivery of content in a mobile platform. The first are simply the different types of contents (video, games, audio, image, text, application to person, messaging, ...) that must be adapted to the mobile environment. The second element consists of inserting appropriately the advertising, including possible personalization, in each type of content. In the third step, every piece of mobile content has to match to a quintuple layer of specifications: the hardware part of the handset (display, interface, ...); the operating system

⁵⁷ iSuppli (2007) forecasts that mobile content enablement platforms will double revenues in five years (2012).

in the handset; the relevant application in the device, i.e., browser, media player, etc; the technology used in the network infrastructure (mobile communications, digital television, wireless, ...); and last, the practical implementation of the operator's mobile system, including portals, access, or particular systems for billing (sms, premium sms, wap, ...) and marketing. On top of all of the above, it could be needed also (as mentioned previously regarding advertising) additional elements of the platform such as: marketplaces for supply and demand negotiations of content; aggregators for independent supply of content to different operators; setting up of mobile channels; cross-carrier common short code support; cost-effective long number solutions; elements for linking with other networks (Internet) and their applications, etc.

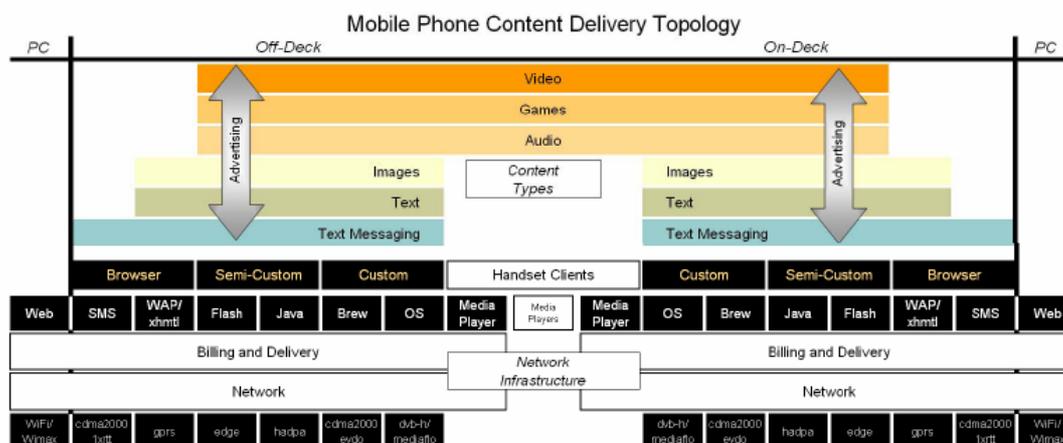


Figure 14: Mobile content delivery. Source: iSuppli (2007)

This highly complex environment for mobile content delivery poses some interesting questions about its possible lines of evolution, in particular, about the necessity and appearance of (open) standards, the entry barriers that exists, the transaction costs involved in the business, or the difficulties for extending Internet-like applications to the mobile realm. At the end, each of these issues refers to mobile content fundamental problems: the uncertainty about potential market failures; the possible inefficiency of general innovation in mobile content provision due to the above complexity, and the additional costs it imposes in users, resulting in demand contraction and delay. Asymmetric information situations and walled gardens are also being promoted indirectly as a consequence.

On the other side of the coin, mobile content enabling was an unexplored area and an increasing number of new companies have targeted it. Therefore the interface between mobile content creation – production and mobile content distribution is one of the major segments where innovators and entrepreneurs seek for opportunities.

Box 12. Bango and mBlox, two mobile content enabler cases

Bango is a UK company founded in 1999 that has created a platform that gives content providers access to the direct-to-consumer opportunity, selling their content. The service

collects micro-payments from users using available billing methods, identifies users and applies operator content controls. From a mobile operator perspective, it allows access and billing to off-portal content.

mBlox is a company originally founded in the UK (1999) and now located in the USA that is the world's largest mobile transaction network specializing in providing operator connectivity and mobile billing capabilities to businesses. They intermediate between businesses and mobile operators managing the delivery and billing of mobile content and mobile services. European headquarters are in London, UK., and also serves clients from offices in Düsseldorf, Madrid, New York, Paris, Singapore, Stockholm and Sydney.

Mobile music prospects

For years, music has been the main driver in mobile entertainment and in mobile content consumption. Ringtones were the first mobile content service to reach mass adoption. Their continuation (realtones, ringbacks, ...) have served to increase the size of the mobile music market. Now, with the growing capabilities of mobile devices (memory in particular), of network bandwidth and with prices decreasing, there are prospects of users downloading and streaming full music to their handsets. As a consequence, the music this segment might lead the mobile creative content segment for the next five years (Juniper, 2008).

Additionally to these pure mobile drivers, there are at least two more, external to mobile, worth considering. The first is the demand for personal music enjoyment and for personal music consumption devices. This "personal" perspective could result in a single integrated (mobile) communications and entertainment device. The second driver is the need of the music industry to find a new channel for distribution. To this regard, digital mobile distribution of music offers some short term comfort (a more "controlled" scenario with users increasingly inclined to consume music in a mobile), but in the end it will face the same issues than online music.

Another noteworthy issue is the unknown triumphant business models for mobile music. There are three main possible candidates: downloading, subscription-based services, and free streamed mobile radio, i.e., personalized, and based on advertising. The result could be a major signpost for the entire mobile creative content sector.

The mobile music prospect would not be complete without the complications it confronts. From technology to markets and users' perspectives, the difficulties are: handset capabilities (battery life in particular); network capacity and coverage (i.e., in rural areas); service pricing (both from music industry and from mobile data carriers); market structure (fight for business control between mobile carriers and content providers); and consumers trust

(privacy, interoperability, getting rid of DRMs, not getting stuck in a proprietary environment, ...).

Taking an EU perspective, see Figure 15, the mobile music market has a small size country per country, and an aggregate value similar to China or Japan, and well below USA. This regional comparison suggests that the EU mobile music market will lose weight with regard to Asia and that USA is significantly ahead in this creative industry segment. The total value of mobile music market was 161 M€ in EU in 2007, up from 76 M€ in 2005 (ScreenDigest, 2006).

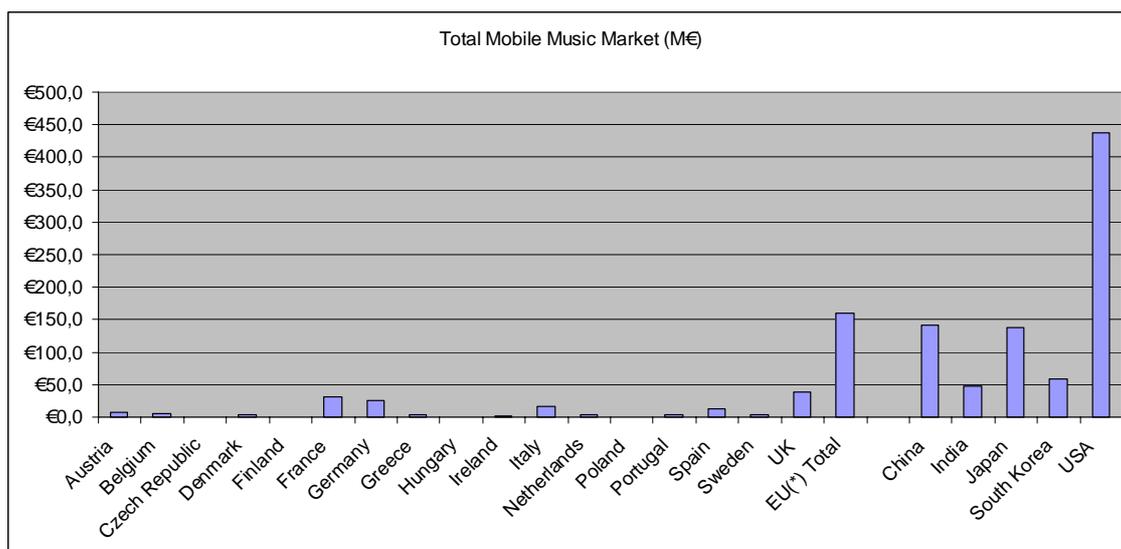


Figure 15: Total mobile music market (M€) in selected EU and world countries. Source: (Netsize, 2008)

Mobile gaming prospects

Second to music, mobile gaming is one of the fastest growing segments in mobile creative content industry⁵⁸. Some of the drivers for the success of mobile gaming are similar to those of music: the growing capabilities of mobile devices, of network bandwidth and the mobile device acceptance as a multipurpose communications and entertainment device. However, there are some specific features of mobile gaming that help explain its forecasted success. All of them are related with an increasing market size that departs from a modest situation. Note that now, almost any handset is capable of being used for some type of gaming, but, at the same time, there is a low level of penetration of mobile games. Among these specific

⁵⁸ In a similar profile than other gaming areas, Asia has been leading the demand for mobile games (Japan and Korea are main examples). Juniper Research (2007b) believes that the fastest growing region for mobile gaming will be the Indian sub continent due to the fact that "the mobile handset is the de facto games console in a region with negligible broadband penetration and no console base to speak of".

mobile gaming drivers, there are technological improvements (for instance, device-embedded technologies to improve the gaming experience), the shift in the demographics of the player to encompass a wider audience, the rise of the "casual" gamer that uses "dead" time to play, and the increasing interest of leading game companies in the mobile environment.

Box 13. The Gameloft case

Gameloft was founded in France in 1999 it is an international publisher and developer of video games for mobile phones. The company creates games for mobile handsets equipped with Java, Brew, or Symbian technology. It has partnership agreements with licensors and personalities such as Ubisoft Entertainment, Universal Pictures, Endemol, Viacom, Sony Pictures, FifPro, Paris Hilton Ent., Lamborghini, Derek Jeter, Reggie Bush, Steven Gerrard, Vijay Singh or Llewton Hewitt. In addition to the partnerships, Gameloft owns and operates such brands as Block Breaker Deluxe, Asphalt: Urban GT and New York Nights. As a result of agreements with telecom carriers, handset manufacturers, specialized distributors and its online store, Gameloft now has a distribution network covering 75 countries. Gameloft has worldwide offices in New York, San Francisco, Kansas City, Seattle, Montreal, Mexico, Buenos Aires, Paris, London, Düsseldorf, Copenhagen, Milan, Madrid, New Delhi, Seoul, Hong Kong, Beijing, Tokyo and Sydney. Gameloft is listed on the Euronext Paris Stock Exchange. Gameloft had a staff of 4,000 at the end of 2007, up 50% over the end of 2006. Gameloft posted consolidated revenues of \$92m in 2006, \$140m in 2007, and a growth of 25%-30% is expected for the year 2008. Gameloft is also profitable since 2003.

Mobile gaming drivers are not completed without referring to the enhanced experience that could be provided to users using a number of technologies around mobility, such as location or social networks. This evolution of mobile gaming will be dealt with in a subsequent report.

As in the case of music, there will be competing business models for mobile gaming (pay per use – downloading, subscription, or free with advertising) and a number of barriers to its adoption. Among them stand the pending developments in the device (user interface experience, batteries, memory, the adequacy of the handset shape for gaming), network coverage, service pricing (both for the content provision and for data transmission) and the expansion of mobile gaming demographics (to include females, older adults, ...).

Box 14. Other types of mobile content case studies: books, images and dating

Movels is a company from the Netherlands, founded in 2007, that provides a platform to read books in a mobile handset. They offer the first chapter for free and then around 4,5 € per book. It is possible to establish own library, comment on books, recommend them, and have a

social network based on books. It is based on a J2E application that allows changing font size, orientation in the display, etc.

SnapMyLife is a USA company founded in 2007 that is a Flickr-a-la-mobile with picture sharing, personalization, getting alerts of uploads by friends, etc. The business model is based on advertising and sponsorship. They have during Feb 2008 about 1.000 new users a day. To avoid "become an online dating" they filter content out manually.

The 3G Dating Agency is a UK company founded in 2004 that is a dating agency based on the use of the mobile handset: pictures, messages, location, etc. There is no subscription fee, payments only when sending and receiving information. It is moderated to avoid incorrect usage.

Taking an EU perspective, see Figure 16, the mobile games market shows a different situation than music. The aggregate size of EU market is comparable to USA and Japan, the world leaders and significantly ahead of other Asia economies. The report of Screen Digest for the EC estimated the market for mobile games in Europe to have been 426 M€ in 2005 (ScreenDigest, 2006). Data from (Netsize, 2008) are 437 M€ in 2007 for the EU.

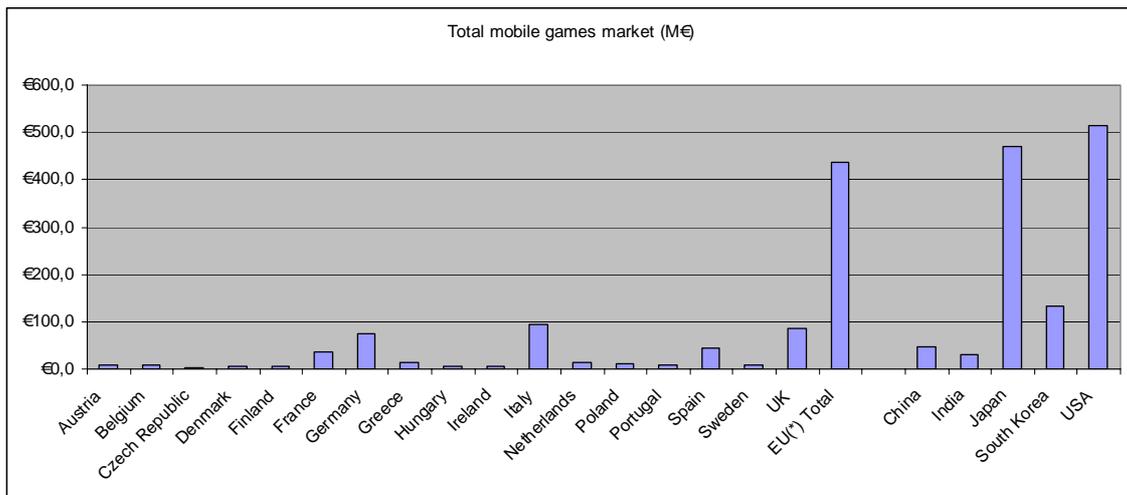


Figure 16: Total mobile games market (M€) in selected EU and world countries. Source: (Netsize, 2008)

8. MOBILE TELEVISION: AUDIOVISUAL BROADCASTING AND STREAMED MOBILE COMMUNICATIONS

The term mobile television or also sometimes mobile video, as it is accepted generally, includes two very different and competing systems: television over audiovisual broadcast

networks⁵⁹, and video over two-way mobile (cellular) communications networks. The technologies and approaches involved in the two cases are radically distinct.

Mobile broadcast television uses a one-way dedicated broadcast network to deliver audiovisual channels to mobile users. Conceptually the only difference with a conventional broadcast system for television is the possibility of mobile reception of the transmitted signal, but the structure of the value-chain is basically the same (see Figure 17). Theoretically, mobile broadcast television is more efficient in terms of spectrum usage, since users share the same signal, although this has to be contrasted against the preferences of usage of mobile consumers. The main types of devices for the use of mobile broadcast television are: mobile (cellular) telephones, portable video players (integrated or not in a mobile communications device), video screens in vehicles, and laptop computers. Note that, therefore, the broadcast type of mobile television suits not only mobile communications devices, but a broader range of potential receivers.

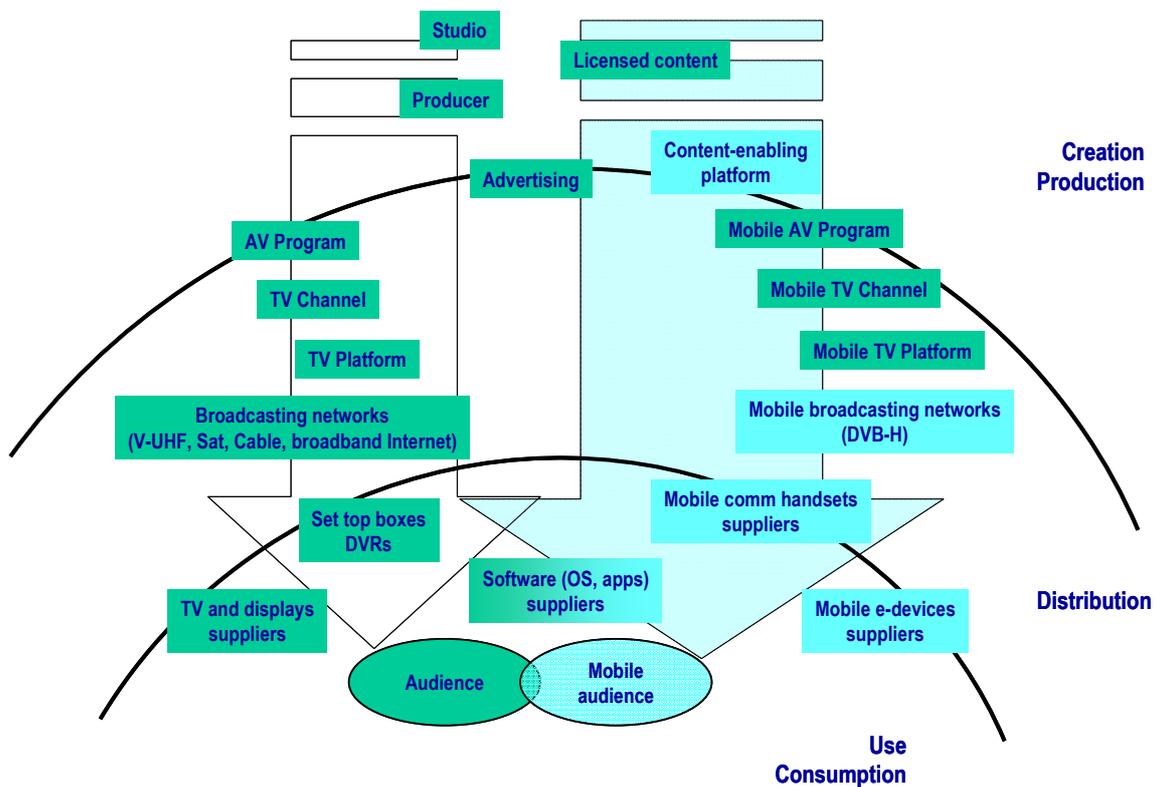


Figure 17: Value chains of audiovisual broadcasting and mobile audiovisual broadcasting

The use of video in a mobile communications system (3G type networks being preferable) is an extension of the mobile creative content value chain to include now a richer

⁵⁹ There are also some other names, with the same meaning, for this type of mobile television such as: mobile / handheld (broadcast) digital television (M/H DTV). The most appropriate nomenclature is still not completely defined.

media. There are three types of possibilities to stream video within this system. By far the most used is the unicast, where each user has a separate individual stream of video to the handset. Unicast streaming consumes bandwidth resources of the network rapidly as the number of users increase. The second possibility consists of multicasting simultaneously to a number of users the same stream. This obviously requires the users to be synchronized to some extent⁶⁰. The last can use some version of P2P for video on a mobile network, but it is still under research.

To belong to an interactive scheme like that of the mobile communications allows for an easier deployment of all types of video-based techno-economic models, therefore the preference for the term “video” to describe this system, instead of just “television”. However, this section will refer mainly to the television-like services through mobile communications to maintain coherence. Delivery of video in a mobile communications system introduces all the elements (content enablers, complex topology, etc) discussed in Section 0 about creative content. Mobile streamed television is the most common form of mobile television at present.

In the next subsections an integrated perspective on mobile television will be supplied, realizing the mentioned basic difference between the two possible systems.

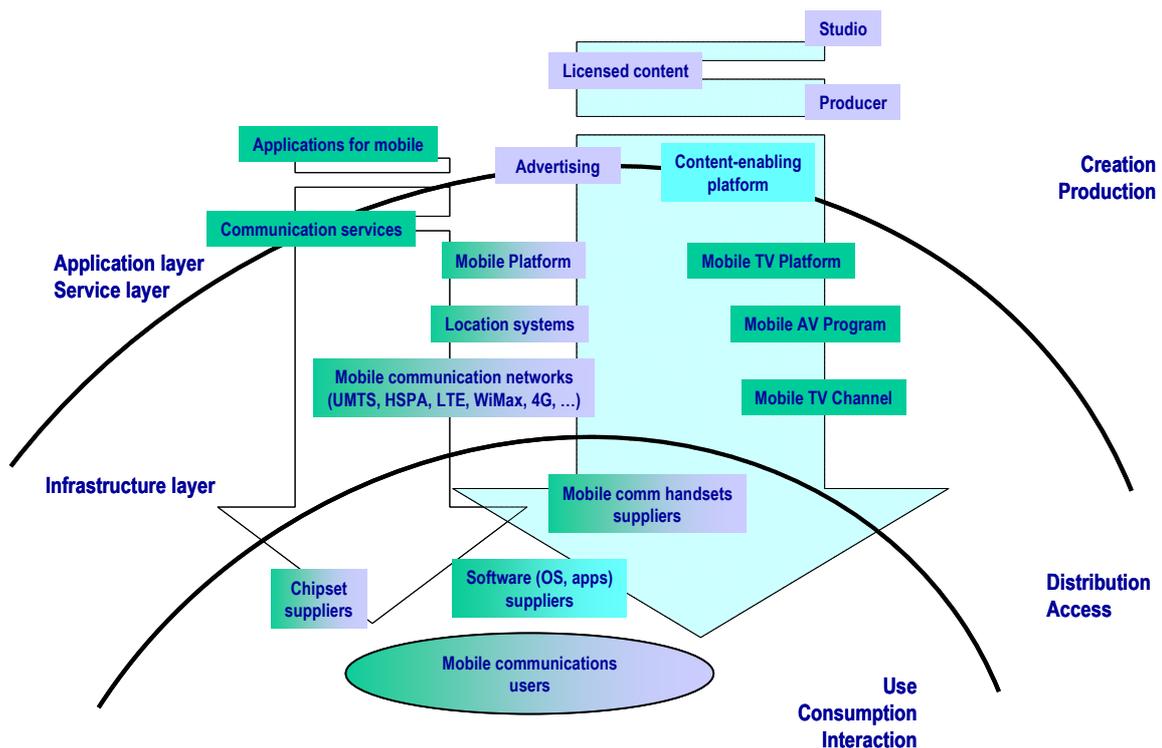


Figure 18: Value chains of mobile communications and mobile communications audiovisual

⁶⁰ Examples of services for multicasting could be "live-feed" from a show, or an scheduled transmission such as news broadcast every day at a certain hour.

Mobile television prospects

The perspectives on mobile television range from openly enthusiastic ("watching video on cell phones could eventually surpass demand for games, ringtones and wallpapers and reach 100% of the population", R. Hyatt, Director of Mobile Content, Cingular, in BusinessWeek⁶¹), to moderate ("everybody is basically putting their toe in the water ... we are all aware how hugely significant mobile television is going to become both culturally and financially in the next couple of years", L. Moonves, CEO, CBS, in NYTimes⁶²), or even pessimistic ("fully fledged, live TV on your mobile would be a welcome distraction for many commuters, but don't be distracted from the fact that it's unlikely to live up to the over-inflated promises". P. Trotter in PC Pro⁶³). Interestingly, year 2007 has been much quieter in terms of mobile television big declarations, maybe a sign of the quest for the right model to its provision.

Precisely, the mobile television model confronts technological and business hurdles, still pending a definitive resolution.

On the technical side, mobile devices have battery life difficulties (mainly due to backlit LCD screens) and require a high quality of reception to avoid drop-outs. Note that if main users are commuters, this is not the best type of places for coverage and sharing bandwidth while on the move.

Anyway, although mobile communications devices are the main target of mobile television, there are other possibilities, in particular for the broadcast type. A recent study⁶⁴ of Ducey et al (2008) highlights the role of portable video players as a second option. The same report argues that video in vehicles will evolve more slowly due to the delays related with introducing new factory-installed options and due to its relegation to the "back seat". The same report argues that laptops should have digital tuners to receive DTT as a near term opportunity, instead of mobile television as such.

Television broadcasters also have to consider that there is a number of competing solutions incompatible and with different vendors supporting them. Very recently (November 2007), EC has endorsed DVB-H as a European standard for mobile television broadcasting, despite some opposition from a number of Member States⁶⁵, already engaged in competing solutions. Although not mandatory, all Member States will be required to support and encourage

⁶¹ 11th October 2005

⁶² 27th February 2006

⁶³ 14th July 2006

⁶⁴ For the Nacional Association of Broadcasters of USA

⁶⁵ Britain, Germany and the Netherlands

the use of DVB-H for the mobile television services. This step will probably make DVB-H the de facto European standard. Nokia is perhaps the most prominent supporter of DVB-H. Other technologies include DVB-SH (developed by Alcatel – Lucent) that combines satellite and terrestrial environments, the Korean DMB, the Japanese ISDB-T, MediaFlo from Qualcomm and the Chinese STiMi. Each of these technologies has a different impact in network cost, caused mainly from their capacity to manage bandwidth.

On the business perspective, there is still an unknown choice among the three main possibilities: subscription, where consumers pay a recurring fee for access to video content; on demand, where consumers pay on a per download / per view basis; and advertising, where consumers access for free. Mobile operators have opt mainly for the first two, while the trials and services already functioning in the broadcasting side are typically based on subscription and/or advertising. The advertising free model has to consider also the free-riding problem if any player subsidizes the handset. Finally, network costs for the deployment of dedicated mobile television networks have to be tested against the perspectives of returns on investments, especially when national coverage is compulsory.

Box 15. The SeeMeTV case

3 mobile operator launched the SeeMeTV service in the United Kingdom in October 2005, allowing its customers to submit their own video content, and at the same time, allowing other subscribers to watch them. Users pay a small micropayment (the price decided by the video's creator) to watch these videos. The user who created the videos will get paid 10% of the amount of money that is paid by other users to watch the video. This service does allow some *adult* content, but this is protected by a PIN to prevent minors accessing it. Users are paid once they have made £10 using PayPal. 3 argues that the service has received more than 30,000 clips from aspiring directors and it has had more than 4 million mobile downloads.

Among the plethora of data on the response of users to mobile television and business models, maybe the most interesting is the result⁶⁶ about 44% of USA mobile consumers interested in viewing mobile video, but only 19% of them willing to pay for it. And even more interesting, with local weather and local traffic updates leading the type of mobile videos consumers are interested in. It could be concluded, therefore, that there is still a gap among what supply plans to deliver and what demand expects from mobile television.

⁶⁶ From Jupiter Research and Pliq (2007) data

The confusion in the supply side is probably increased by the complex relationships between broadcasters and mobile operators. A citation from the FAQ of the DVB-H Forum⁶⁷ sheds some light on the issue: “Mobile television doesn’t need to involve anyone other than the broadcast network operator, and the service provider. However, there are many reasons why a co-operative approach [with mobile operators] may be judicious. For example, many countries have mobile phone models which see the phones being subsidised by the operators, and to have mobile television on such phones would require some co-operation between the mobile television operator and the telco. Billing is going to be a key element to the success of mobile television, and telecoms operators typically have sophisticated billing infrastructures in place – and a subscription model is that favoured by viewers according to the DVB-H trials underway. On the other hand, there are countries where the regulatory model prevents free-to-air broadcasters from becoming involved in pay-television services on terrestrial networks. In such an environment, DVB-H could be considered for broadcasting to handhelds, e.g. suitably equipped mobile phones, PDAs, etc. And in this environment, the co-operative approach may have fewer benefits”. Audiovisual regulation affects, thus, the development of mobile television.

The issue above has been also labelled as the “the SIM or not to SIM” dilemma of the mobile television, showing the relevance of the billing and control mechanisms of mobile communications operators and revealing also the key role that handset suppliers can play in his evolution.

But the different perspectives of broadcasters and mobile operators is also present in a much different element: the availability and the management of spectrum for mobile television. The digital switchover of digital terrestrial television frees spectrum, the so-called “digital dividend”, that among other usages could be devoted to either mobile television broadcasting or mobile communications. Note that spectrum used by terrestrial television (VHF / UHF bands) is prime spectrum, because it offers a technical and economic valuable combination of capacity (bandwidth) and range. Figure 19 shows the proposal suggested by the EC (2007a), as part of the electronic communications package review, for using this spectrum between the two. However, there seems not to be a common EU agreement⁶⁸ on how to use and when this part of the spectrum as was shown in the recent WRC-07 of the ITU. Meanwhile Member States could follow diverging paths⁶⁹ in the use of digital dividend. Digital dividend is also a showcase for

⁶⁷ Accessed 27th January 2008

⁶⁸ CEPT propose a common approach, but a definitive agreement was postponed to WRC-2011

⁶⁹ From UK’s 112MHz (UHF band) of digital dividend, and 208MHz of interleaved spectrum to Spain’s possibly not having dividend at all

the new trends in spectrum management. The EC also wants to give a political signal with the reform: "If the choice is between the 300th TV channel and a new wireless broadband service, I want that Member States decide in the interest of the citizen," has said⁷⁰ EU Telecoms and Media Commissioner. A recent report on the economic impacts of alternative uses (meaning mobile) of the digital dividend argues that the investment in wireless communications could bring an additional 0.6% GDP growth per year for the EU economy by 2020 in the mobile case when compared with broadcast TV (Forge, 2007). On the other side, it is argued that (Oliver & Ohlbaum Associates, 2008) a market for UHF spectrum is likely to fail and not allocate a socially optimal amount of spectrum to terrestrial TV.

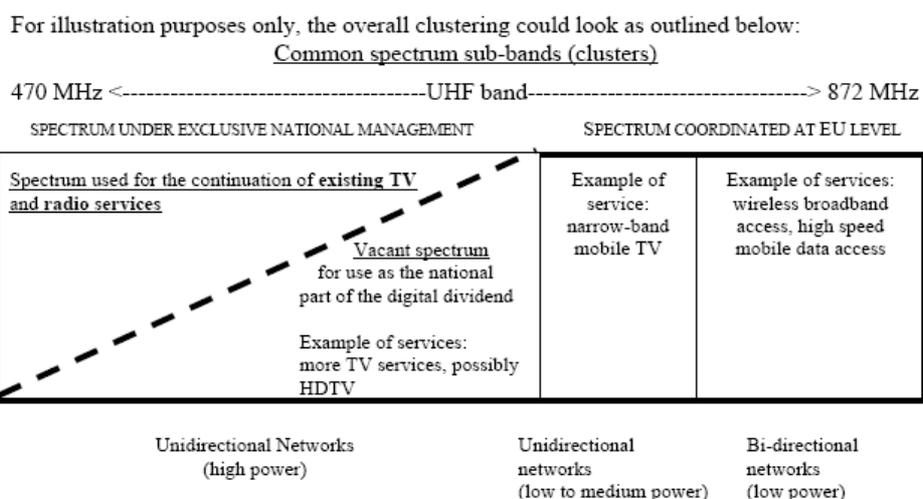


Figure 19: Proposal for use of digital dividend from digital television switchover. Source: EC 2007a

Additional issues of concern for mobile television are the licensing of highly appealing contents from right holders (i.e., soccer) and the effects that this could have in competition, the digital rights management issue, the growing competition from other entertainment sources (videogames, for instance) that are also portable or mobile, or the trend to time-shift (and podcast) television programmes.

All in all, mobile television suffers from notorious unknowns that could result in significant delays for its acceptance and mass adoption.

Box 16. The YouTube for mobile devices case

YouTube provided full mobile video service up to 2007 only to Apple's iPhone and to Helio (SK Telecom – EarthLink). It also offered a scaled-down version with selected clips to

⁷⁰ From the "The EU Telecoms Reform proposes a Single Market for 500 million consumers – Frequently Asked Questions". Memo/07/458. Brussels, 13 November 2007. Last accessed: January 27, 2008

subscribers of Verizon Wireless (participated by Vodafone). From 2008 a full-fledged streaming service will run on selected devices from Motorola, LG Electronics, Nokia and Sony Ericsson. It will be available in 17 countries and 11 languages. YouTube notes on its mobile web site⁷¹ that: “YouTube Mobile is a data intensive application. We highly recommend that you upgrade to an unlimited data plan with your mobile service provider to avoid additional charges”.

From an EU perspective, Figure 20, that shows the early stage of development of mobile television in most of the EU countries, also suggests that Europe has the chance to lead the development of the mobile television market and, therefore, it is very logical that measures were taken to ensure that potential obstacles to its development are removed on time. Data from (Netsize, 2008) indicate a EU mobile television market for 2007 of 198 M€

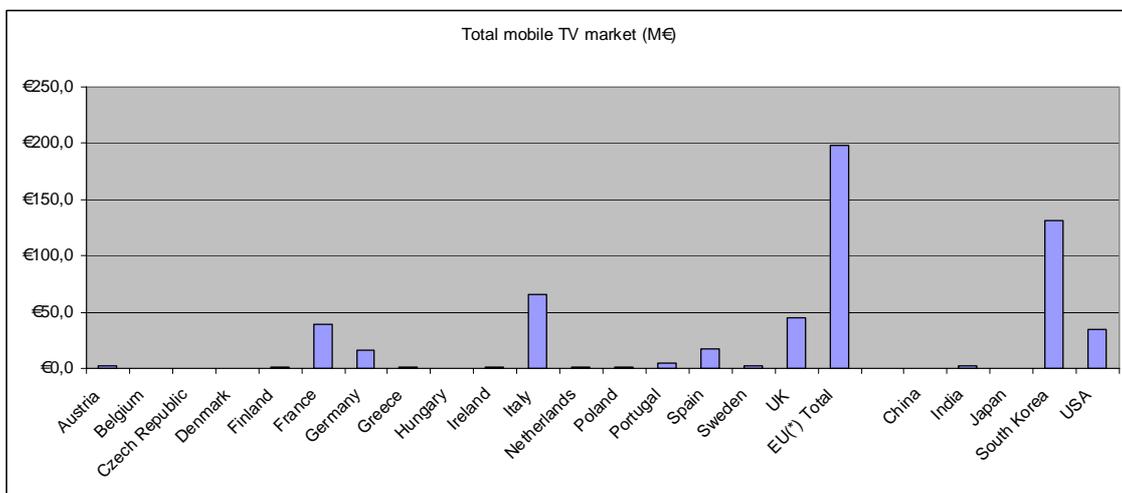


Figure 20: Total mobile television market (M€) in selected EU and world countries. Source: (Netsize, 2008)

9. MOBILE CONTENT SOCIO-ECONOMICS

This section is divided into three parts: the general consumer trends about either mobile or content, some considerations on the adoption and acceptance of advanced services in mobile communications, and finally, some specific trends for mobile content consumption. The aim is not to create a theoretical framework for mobile content socio-economics, but list the main elements that could determine the evolution of this area from the social – demand perspective.

⁷¹ Last accessed January 28, 2008

General (mobile/content) consumer trends

The world is becoming smaller. It means that persons, news, information and content travel fast and are of interest for distant communities and users. In marketing terms, there is a fascination with themes from other places and cultures. At the same time, we are seeing the rise of new local cultural hotspots. As a result, there is a fragmentation of content and the long-tail effect is more apparent than ever. Conventional media, even in its digital incarnations, are not able to keep up with the rhythm and variety of information. Mobile content and applications are, therefore, a natural media to access, to interact, and to keep updated and connected with the community.

In addition, the social networking involved in the web 2.0 paradigm has increased the sense of staying connected, what contributes to the perception about the need to keep connected in all situations.

Box 17. The Twitter case

Twitter began as a research and development project inside a San Francisco start-up in March 2006. It was initially used internally by the company, but as the service gained popularity, it was officially launched in October 2006. Twitter is a free social networking and micro-blogging service that allows users to send "updates" (or "tweets"; text-based posts, up to 140 characters long) to the Twitter website, via short message service, instant messaging, or a third-party application such as Twitterrific. Updates are displayed on the user's profile page and instantly delivered to other users who have signed up to receive them. The sender can restrict delivery to those in his or her circle of friends (delivery to everyone is the default). Users can receive updates via the Twitter website, instant messaging, SMS, RSS, email or through an application. For SMS, four gateway numbers are currently available: short codes for the USA, Canada, and India, as well as a UK number for international use. Several third parties offer posting and receiving updates via email. TwitDir (a directory of Twitter users with a public profile) identified almost 900.000 Twitter users in February 2008 with a rate of growth of about 1,500 new users a day.

In general terms, it can be asserted that we are reaching (at least for the privileged users, acknowledging the mobile variety of the complex phenomenon called digital divide) a first phase of early maturity with the digital revolution. The users begin to get used to and feel confident with technology. They are able now to switch on and off from (mobile) technology. Mobile handsets are no longer seen as strangers, but as partner and useful tools.

Adoption and acceptance: the globally (mobile) connected urban tribe and the slow uptake of mobile advanced services

There are several theories to explain how innovations are taken in use and spread. In the theory of adoption (see Rogers, 1995) users are categorized on the basis of how inclined they are to adopt new innovations. These groups are innovators, early adopters, early majority, late majority, and laggards. Under this theory, the important groups to analyse the future of mobile content will be the first two ones. However, as mobile technologies reach the above mentioned early maturity, it is not completely clear whether this theory of adoption will be universally valid for all cases. It has been argued that it must be complemented by a theory of acceptance, where user's intention to use a new system is determined by perceived usefulness and perceived ease of use, in turn influencing actual use (see Akesson and Eriksson, 2007, for a comparison between the two theories).

With this background, the mobile innovators – early adopters group could be characterized⁷² as: male / female, 20-something, middle-upper class, educated, working, entrepreneur, well-travelled, social, cultural, media hungry, e-gadgets users, high speed wireless – mobile connected, casual, fashionable and trend conscious.

While in the past such a group would have sufficed to spread new mobile service offerings following the adoption model, the slow uptake of mobile value added services observed in practice should also be explained under the acceptance theory, where the usefulness (value) and ease of use for users (and non-users) are the relevant features. It would be, thus, that mobile content is a case of incipient maturity in the mobile industry and its evolution from now on will be more dependent on the behaviour of demand than the mere innovations from the supply side.

To this regard, there has been a significant degree of discussion on why mobile content services are been slowly accepted in the EU markets, even if the devices making them possible are finding their way to consumers and the network capabilities are there, at least for urban areas. Carlsson et al (2006) suggest that there is a supply – demand mismatch for mobile content-related services in general, and they show the case of Finland, considered to be a leading EU mobile market, technologically advanced and with a population ready and willing to adapt to new services. Even in Japan and Korea, the paradigm countries for the adoption of mobile services, the same trend exists and the basic ringtones have kept to be the most successful mobile content segment up to 2005 (see, for example Funk, 2005). Also Jenson (2005) has criticized the mobile industry in general for applying a default thinking summarized

⁷² Adapted from marketing trends published by Synovate, 2007

in the phrase: “MMS is an extension of SMS and therefore a natural progression for the industry”. However, reality has shown to be more complex and “it seems all too easy to create products that misinterpret the true needs of the consumer and engender little enthusiasm [...] marketing failures of both WAP and Instant Messaging [in the mobile world] should be an enormous cautionary tale”. The same author proves how the detailed interaction, the choices, the learning curve and the message concept involved in sending a message using both SMS and MMS is rather different. Therefore, the conventional wisdom of the second being just a natural evolution of the former is simply not valid.

Akesson and Eriksson (2007) have found also that mobile media services are still not adopted and ubiquitously ingrained in use patterns. The fundamental driver for adoption of mobile content services seems to lie in the value perceived by users, and not in the traditional communication of the technological innovation, typical of the theory of diffusion (see Rogers, 1995, for details on this theory). It would be, thus, that mobile content is a case of incipient maturity in the mobile industry and its evolution is more dependent on the behaviour of demand than the mere innovations from the supply side.

There are a number of current data on the uptake of mobile content that support these hypotheses. In the 2006 Swedish survey used in the Akesson and Eriksson’s work, it was found that there were only a 6% of adopters of 6 or more services of a list that comprised: ringtones, news services, information services, bank services, time tables, sport results, music downloads, traffic information, videos, ordering services (like tickets) and mobile payment (for parking). Low adopters (1-2 services) and non adopters at all accounted for almost 77% of the sample. They observed the same rate of slow adoption than in a 2005 Finnish study (Carlsson et al, 2006). As an example outside EU, two years after the introduction of video in cell phones in the USA (i.e., 2006), just 1% of subscribers, i.e., 2 million, pay \$10 to \$15 per month for the service. In the same period less than 4% of subscribers downloaded games. Even, worldwide mobile phone gaming revenue slid⁷³ 9% during the three months ended in June 2007, sparking concern about slowing demand in the category, although it could also be only a seasonal effect in an emerging market still not well understood. However, some data could show a change in the horizon. For example, consumption of video and games is three times stronger in 3G handsets in the USA (2006).

A summary of some of the latest results available⁷⁴ (cf. Akesson and Eriksson, 2007, Kargin and Basoglu, 2007, and Carlsson et al, 2006b) show that usefulness and ease of use are

⁷³ iSuppli 2007

⁷⁴ Latest published data use surveys from 2006, therefore the situation could have changed meanwhile

the most important aspects for service usage, that mobile services are too complicated to use, that there is a lack of interest in new services as such, and show as well as the influence of the cost level. These last barriers are there even though advanced mobile devices, which enable the services, are both well spread and accepted among the consumers. The results also explain that the relative advantage often communicated for mobile media services on the anytime and anywhere accessibility is not reflected in the use patterns identified. The main motivation for using the mobile for advanced uses was found to be the experience of connecting to other people and to learn about new things, rather than to be entertained or surprised. Another finding of relevance from these studies in the particular case of rich media usage was that the consumers need to find a context (place, environment, emotional situation, social relationships, ...) for using these advanced services.

Box 18. The Blyk case

Blyk is a mobile virtual operator for 16 – 24s that is funded by advertising. It aims to link young people with brands they like and give them free text messages and minutes every month. The offer in the UK (Sept 2007) consists of up to 217 free texts and 43 free minutes a month. Users fill in a detailed form on registration, generating an updatable online profile, and are then matched to relevant brands and given the opportunity to interact with them through ads in the form of quizzes, special offers and questions which are free for users to respond to or access. Brands advertising through the network include Adidas, Boots, Borders, Coca-Cola, Colgate, Ford, JJB Sports, L’Oreal, McDonalds, Mastercard, NatWest, Miss Selfridge, Penguin, Sky, STA Travel, Sony BMG, Sony Ericsson and Xbox. The launch to access to the network is by invite only, either through promotions - as in welcome packs for first years at University - or in the style of viral launches, where members were given a number of invites to pass along to friends. Requirements for users are an MMS-capable phone, and pay as you go charges at 10p/text, 50p/minute for call charges and 99p/minute for data charges for calls and texts outside the allowance. Blyk is currently operating in the UK only and it has plans to go pan-European during 2008. Blyk argues that its advertising response is 29% compared to below 1% for Internet and around 3-6% for mobile advertising. Therefore, Blyk behaves, for advertisers, as a media channel, providing direct access to the 16-24 year old market. In a recent speech, Blyk⁷⁵ suggests that mass adoption and acceptance of mobile value added services depend on: (a) cost (i.e., the main reason for young people to change operator); (b) the ease of use (the challenge for the operator would be innovation through simplification); (c) the idea of relevance-to-me (that would be the reason behind engagement); (d) the clear perceived value (from here, mobile

⁷⁵ P. Ala-Pietila, CEO of Blyk, presentation in the Mobile World Congress, Feb 11, 2008, Barcelona

content would be a market very segmented, varying and dependent on culture, ...); (e) customer needs first (therefore a case of moving target, where providers of mobile content should change their value proposition accordingly).

Maybe the dichotomy between these two theories and the groups of users they represent explains the gap amidst supply and demand expectations regarding mobile advanced services. The heterogeneous nature of mobile content is another factor explaining the difficulties in spreading mobile value added services. Content in the mobile platform is composed of diverse niche markets with different behaviours and evolutions. Hence, the need to segment user demands to really understand adoption and acceptance of mobile content. Next generation mobile content providers and operators seem to acknowledge this gap and the need for further segmentation. See the Blyk case in Box 18.

Specific mobile content consumer trends

Acknowledging the unresolved conflicts stated in previous section, users' studies⁷⁶ show that content on-the-go appeal is related with elements from music, video, games, the sharing of content and the sharing of common interests. They also highlight the needs of the users (in no particular order) for knowledge, safety, feeling empowered, intimacy, individuality, independence, interesting experiences and creativity.

As a final reflection, the case of SMS (see Kasesniemi, 2003) proves that when users perceive value they are willing to adopt the solution, the cost being a secondary element. Equivalently, to judge if a mobile service qualifies as a mobile value service, the so-called "Braudel Rule" (Keen, 2001) tells that it should "change the limits of the possible in the structure of everyday routines" to be massively adopted.

10. MARKET, SOCIAL AND INSTITUTIONAL DRIVERS AND BARRIERS

In the following paragraphs the main drivers and barriers in the mobile content sector evolution are reviewed. A classification with regard to market (techno-economic), social acceptance and institutional implications will be used, stating in advance that a great number of drivers and barriers do not belong strictly to just a single category.

For the sake of comparison with the findings in this report, Box 19 summarizes the roadblocks identified in the mobile part of the Screen Digest report of 2006 for the European

⁷⁶ Synovate, 2007

Commission on interactive content. The main differences with what is presented in next sections are that the Screen Digest report focus in market entry barriers and supply side issues, accordingly with the level of development of the market segments at the time, while this reports tries also to cover development issues, future threats and new issues on the social / demand side. Nevertheless, the roadblocks mentioned in Box 19 remain to be solved in general.

Box 19. Roadblocks summary of the Screen Digest report (ScreenDigest, 2006) on the mobile distribution of interactive content

Technical roadblocks:

- Digital rights management
- Spectrum allocation
- Deployment of infrastructures

Economical roadblocks:

- Collective management of rights
- Operator data tariffs and consumer information
- Operator revenue shares
- Mis-selling of subscription services
- Royalty issues
- SMS short code harmonisation

Legal roadblocks

- Content regulation for mobile
- Television regulation crossover
- Mobile tv and rights licensing conflicts
- Classification⁷⁷ of contents
- Rights exclusivity and territoriality
- Location services

⁷⁷ Gambling, adult, etc

Market drivers

The economies of scale and the increased convenience for users derived from convergence⁷⁸ is the first market driver of mobile content. The convergent "force" has been already functioning during the last decade, and the first results are now in the markets (IPTV, audio and video from Internet, etc). The inclusion of mobile within the convergence main stream is the current trend and it will keep pushing the mobile content sector well into the mid term. The low level penetration of mobile converged solutions is also an initial explanation on the attractiveness of the mobile content market and of the expectations about its success. Among all the segments, music (closely followed by gaming) seems to be the leading example in the short term to prove if (converged) mobile content meets the expectations. Current and increasing mobile music success will serve as a milestone for other mobile content segments (see Juniper, 2008, for instance). Convergence appears at multiple different levels in the mobile content domain. It comprises, for instance, the move towards a single multi-purpose communications and entertainment device, or mobile media perceived by content providers as a new (and preferred) channel for content consumption.

The expansion of the mobile content market is dependent on the growing capabilities of mobile devices (memory in particular), on data rates available for users, and on the decrease in prices both for data transmission and for premium content consumption.

Box 20. The case of the 3G applications and services survey of the GSA

In February 2008 it was published a research, Ovum (2008a), carried on behalf of the Global Mobile Suppliers Association (GSA) during Q3 2007 to highlight and make public good examples of 3G services from operators around the world in a number of categories: mobile broadband, mobile advertising, social networking, place shifting and mobile search. GSA announced that the research will be updated on a quarterly basis from Q1 2008. They state the following key findings, without providing any direct evidences in the report:

- HSPA services finally provide users with a "broadband experience" on mobile
- The inflection point for 3G growth is based on good devices and flat rate tariffs
- Growth will continue, provided tariffs are reasonable
- There are some good applications already in use and, as usage increase, much more energy will go into application development

⁷⁸ Convergence is used in the usual sense of electronic communications and audiovisual addressing common demands from users, i.e., ubiquitous access to any type of information.

- There is evidence that people will largely take their PC-based usage of the web onto mobile, with applications such as social networking and media sharing providing strong drivers
- The bulk of the revenue is so far in access and traffic, with high potential from advertising and search although they are currently in their early stages

Upcoming technological improvements, for instance, device-embedded technologies to improve the mobile gaming experience, automatic speech and visual recognition, cognitive technologies, short range technologies, location technologies, mobile social networks, etc will help drive the market growth.

New players also act as main drivers of market evolution taking innovative roles demanded by the new structure of mobile content markets. In particular, content enablers at the edge between production and distribution, and content brokers situated between distribution and consumption – interaction. An example can be application providers that allow users to upload content created by them, store it, tag it, interact with it, or exchange it on a mobile platform. The list of opportunities for new market entrants seems endless: mobile search engines, mobile content aggregators, mobile content readers, mobile content tags and markers, mobile social networks, mobile communities, etc.

The increasing multiplicity of choice and innovation in the mobile devices capable of managing rich content (smartphones, PDAs, ultra-mobile computers, mini-computers, portable players, portable consoles for games, ...) serves as a main driver for the mobile content sector. Also recent innovations⁷⁹ in both hardware and software for mobile devices will increase the speed of change and bring about new developments of interest for the market.

Finally, there are specific drivers for the transition to a mobile 2.0 paradigm. Among them, the usefulness of location-tagged content that surrounds the mobile user and context-aware content that blends characteristics from the surrounding environment with the mobile personal profile, or from what the person is engaged in at the time.

Market barriers

Figure 21 presents a diagram of the market barriers that affect the mobile content domain. The market barriers are organized following a Porter forces model: barriers to entry, threats of substitutes and inner development barriers (that have been organized along the production – distribution – consumption structure). In the rest of the section, each of this barriers is explained with some detail.

⁷⁹ Like the iPhone from Apple or the Android suite from Google.

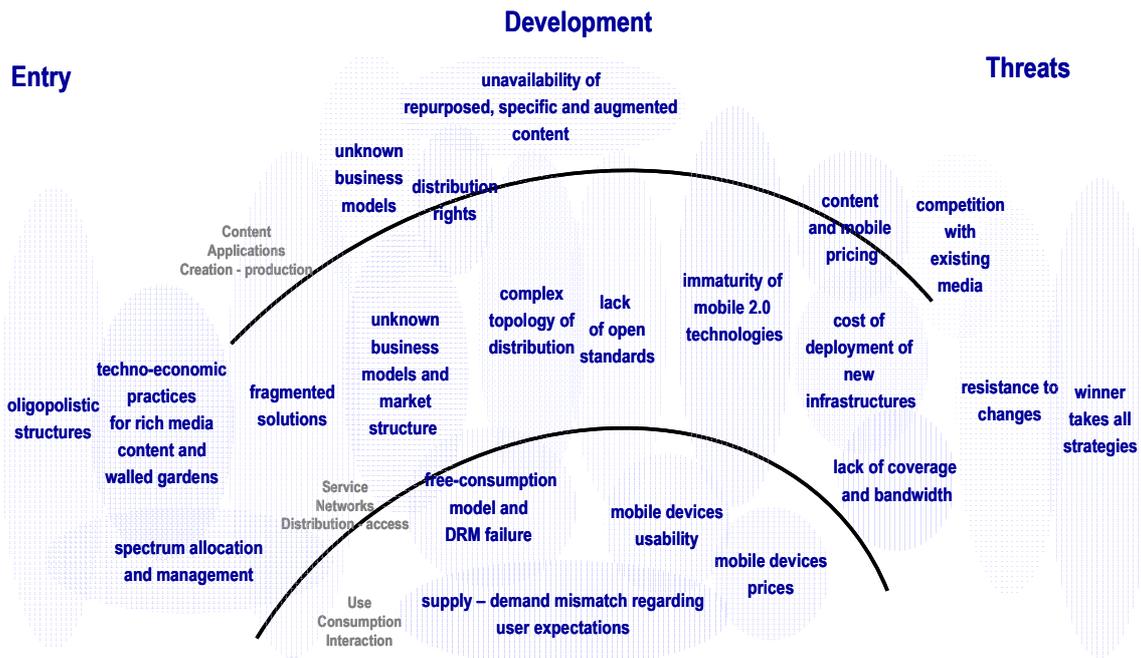


Figure 21. Map of market barriers for mobile content

Convergence as a process has weak points. In the case of mobile content, it was shown in previous sections that this area is composed of diverse segments (sometimes niches) with different behaviours and uncertain evolutions. The resulting inhomogeneities would create fragmented solutions that might delay an integrated approach to the mass adoption of some types of mobile content. An symptomatic example of barriers of this class is the current mobile television duality between streamed services from cellular networks and services from broadcast networks. Another example is the unknown main type of business model from the content providers' perspective, be it downloads, subscriptions, rentals, or advertising based. One more illustration is the business and usage confusion derived from content offered simultaneously on-deck and off-deck mobile operators. Mobile convergence progress is not and will not be a smooth path, since it basically means disruptions and upheaval of traditional content and mobile industries that have, therefore, a resistance to the changes.

Box 21. The 2008 China Olympics mobile television case

The Chinese government is pushing for widespread mobile television availability for the 2008 Olympics. Mobile operators in China have developed the techno-economic model for streaming mobile video services over a 2.5G or 3G network, but since 3G availability is scarce (it is even argued that China's version of 3G, TD-SCDMA, will not be in place for the games), the preferred approach is on the broadcast side. CMMB (or S-TIMI) is the technology developed in China and selected by the State Administration for Radio, Film and Television (SARFT) as the main platform for delivering broadcast television services to mobile devices. The CMMB network will use both satellite and terrestrial signals to obtain coverage both in

densely populated cities, including indoor reception, as well as in sparsely populated rural areas. The commercial launch of mobile broadcast television in China is anticipated to coincide with the Beijing Olympic Games. CMB Satellite, a Hong Kong-based affiliate of EchoStar, is the primary provider of S-band satellite capacity for China's CMMB mobile video system. Siano will be the mobile broadcast television chip maker and Huaqi, the largest supplier of MP3/MP4 handheld devices in China (35% of market share), will be the provider of handheld devices. According to Juniper Research (2007) mobile TV market in China will grow from \$36 million in 2007 to \$98 million during the Olympic Games in 2008.

A barrier is also provoked due to the type of business models envisaged for mobile content. Since they are the same that the ones traditionally used for content, each of them draws from already-existing markets and therefore requires a fierce competition with existing media for the users. Consider, for instance, advertising. Publicity agencies do have a budget to share among different media, and although the mobile world might mean bigger expenses in a more effective and targeted advertising, at the end they will have to subtract resources from the allocations to some other media.

An additional market barrier is the unavailability of the different types of mobile content and the innovative applications around them. The "repurposed" and specific categories of mobile content, in comparison with content available in the web or through P2P, are still scarce. This will change with the gradual adoption of mobile as the environment of choice for content consumption and interaction.

However, rich media content (video, for example) is hardly found off-deck mobile operators. In this sense, current techno-economic practices act as a barrier for the dissemination of innovative and complex modes of content. Walled gardens are an example of the difficulties for the rapid dissemination of innovative mobile content proposals. In those cases, the mobile content or application must be technically and business compatible (or even be developed within) the particular⁸⁰ mobile platform. On the other side the oligopolistic structure of some of the major content providers segments does not simplify the issue, since mobile operators are forced to reach agreements precluding more open approaches. As a summary of the competition situation, in particular for emerging rich media content markets, it can be said without exaggeration that every player tries (logically) to exert his market power in this new domain.

Furthermore, right holders of (existing) content, or more appropriately the collecting societies that represent them, have an important role in the evolution of the market. Royalties charged for mobile content distribution rights are different from other digital content rates, from

⁸⁰ Each operator takes typically a different approach and uses a different platform

case to case, and from country to country. Added to the complication, there are also multiple right holders and no one-stop shop for multiple countries⁸¹.

The origin of barriers to innovation lies in the complexity of the mobile content distribution topology. Barriers appears due to the lack of (open) standards and the increase in the transaction costs involved. This complexity can hide potential inefficiencies in mobile content provision. Winner takes all strategies (de facto standardization) and walled gardens are also being promoted indirectly as a consequence.

Lack of opportunities for innovation and availability of mobile content is also present at specific critical issues like spectrum allocation and management. The absence of a (EU) uniform approach in the case of the digital dividend in the transition to digital terrestrial television is a major example⁸².

Also along the line of mobile content availability, it is the absence of the "augmented" category of mobile content. What is worse, it could be the case that the entry barriers to deploy this type of mobile content are high enough to allow only for a handful of (existing) players to create effectively this market and, thus, cause the usual difficulties associated with dominant positions. An example could be the availability of geo-tagged searchable content for the mobile environment, where only those players already with the capacity of searching and geo-tagging content could enter in the mobile domain with perspective of success.

There are also fears (in content providers and mobile operators) of the mobile content sector going along the same steps that the content on-line markets and, in particular, that a culture about free-consumption would be installed among users previous to the establishment of sound business models. These fears act as a barrier against rapid advances in the mobile content provision and cause that "more controlled" scenarios are preferred. Mobile DRM technologies were seen as the solution for this issue, but inner difficulties in their development (refer to ScreenDigest, 2006, report) and the contagious effects of Internet practices are changing rapidly the scenario. See Box 22 for details.

Box 22. The mobile DRM case

⁸¹ The recent European Commission (2007b) Communication on the Creative Content Online in the Single Market considers the multi-territory licensing issue, in particular for back catalogue content. To this regard, it has been argued that a pan-European allocation of rights could favour large network operators groups and that local companies could face difficulty in securing rights within specific countries in order to differentiate their content offering (see ScreenDigest, 2006)

⁸² The effects of this type of barriers (and most of the ones cited in the section) are magnified when approaching the issue from a pan-European perspective. Main negative effects are related with lack of economies of scale, market fragmentation, increase of transaction costs, lack of standardization, lack of harmonization, roaming technical difficulties and roaming charges.

Almost all mobile handsets have the Open Mobile Alliance 1 (OMA 1) solution integrated for mobile content DRM basic functionalities and interoperability. This is an open standard. To overcome limitations OMA 2 was created, but it run into problems with the MPEG LA licensing operation that had some rights on the technologies behind this standard⁸³. Due to the delays and the need for increased functionality, a number of players chose to deploy proprietary mobile DRM solutions. The results are an increase of interoperability issues, of compatibility problems, of costs for repurposing content, and roaming and churn difficulties. As a maybe definitive shift in this issue, and following the Internet trends, in 2008 it has been announced the first mobile music distribution system without DRM (EMI through Jamba Music). It is also possible load mobile handsets with content from what it is called "side-loading", i.e., transferring content directly from another device (like a home PC). This mechanism has an important influence in the mobile domain to keep it not far from the Internet developments regarding content.

Open standards importance deserves to be highlighted since their need emerges in every software layer, be it on the mobile device (operating systems, applications, content players, location based services, etc) or in the mobile platform (aggregation, right management, advertising measurements, content management, etc). Interoperability and internal market harmonization (for example, regarding SMS short codes) also affect to market development, especially across EU.

Furthermore, as an image in the mirror of the market drivers, there are market barriers related with the still modest availability (and high price) of mobile devices, with some of their features (displays, usability and user interfaces, battery life, handset shape for gaming or reading an e-book), with the cost of deploying new infrastructures⁸⁴, with IPR issues⁸⁵, with the lack of enough network bandwidth and coverage in rural areas, with the immaturity of technologies for a truly mobile 2.0 model (technologies for interaction and knowledge of the surrounding environment), with the confusing and expensive schemes of pricing both for mobile data

⁸³ For details refer to Screeedigest (2006) study for DG Information Society and Media of the EC

⁸⁴ In general for next generation mobile networks, but also for mobile broadcasting

⁸⁵ For instance, in April 2008 seven key infrastructure vendors (Alcatel-Lucent, Ericsson, NEC, NextWave Wireless, Nokia, Nokia Siemens Networks and Sony Ericsson) have announced an agreement for a framework for establishing predictable intellectual property rights licensing costs related to next-generation wireless technology LTE. They have agreed that the maximum aggregate royalty level for LTE IPR in handsets will be a single-digit percentage of the sales price. In addition, they have agreed that when LTE modems are integrated into, for example, notebook computers, the IPR costs will have a royalty rate under \$10. However, other vendors (Qualcomm, Nortel, InterDigital, ...) currently do not belong to the agreement. Obviously prolonged battles over IPR will likely result in delays to LTE deployment.

transmission⁸⁶ and premium content consumption, and also with the confusion derived from current market structure (the mentioned fight for business control between mobile carriers and content providers⁸⁷, for example).

Box 23. The EU mobile data roaming case

Summary of speech⁸⁸ of EU Information Society and Media Commissioner Viviane Reding during Mobile World Congress 2008 in Barcelona: "What we want to achieve is simple: Sending text messages or downloading other data via a mobile phone while being in another EU country should not be substantially more expensive for a consumer than sending text messages or downloading data at home. This is the logic of the borderless single market which we in Europe already agreed to create 50 years ago. Consumers should feel at ease when sending an SMS from the beaches of Spain or when skiing in the mountains of Austria. And business customers should be able to use data communications in the EU like their competitors are doing in the single market of the United States. Higher roaming charges abroad must be justified by additional costs of operators, or they will have to disappear [...] to avoid regulation, the industry will have to show its responsiveness to consumer concerns by credible reductions of the cost for data roaming both at the wholesale and at the retail level and by transparent offers compatible with the spirit of the single market. The market situation on 1 July 2008 will be decisive for whether regulation will be necessary or not"

Finally, as the slow uptake of mobile content services proves, there is a supply – demand mismatch that act as a market barrier. Its origin seems to lie in a misconception about a positive response of users just to natural innovations. However, the question of providing value to users remains unanswered at large.

⁸⁶ Particularly in the case of data roaming. EC will investigate the data roaming tariffs during 2008 and will propose concrete measures if they are found to be unreasonably expensive. See Box 23. The average price of transferring 1 MB of data within the EU was above 5 € in Sept 2007. For additional details consult the latest ERG benchmark data report (3Q 2007) at http://erg.ec.europa.eu/doc/publications/erg_07_85_intl_roaming_rep.pdf

⁸⁷ The revenue shares among content providers and mobile operators is a good example. Typically mobile operators retain up to 50% of revenues for content provision on-deck and up to 35% for off-deck content (paid by premium SMS, for example). This does not take into account data transmission charges.

⁸⁸ See http://ec.europa.eu/information_society/activities/roaming/data/index_en.htm (Last accessed: Feb 19, 2008)

Social acceptance drivers

The deep continuous and pervasive personal⁸⁹ relationship with the mobile handset is the main social driver (and origin of possible barriers) for the acceptance of mobile content. Figure 22 presents an overview of issues for social acceptance of mobile content with regard to this main dimension.

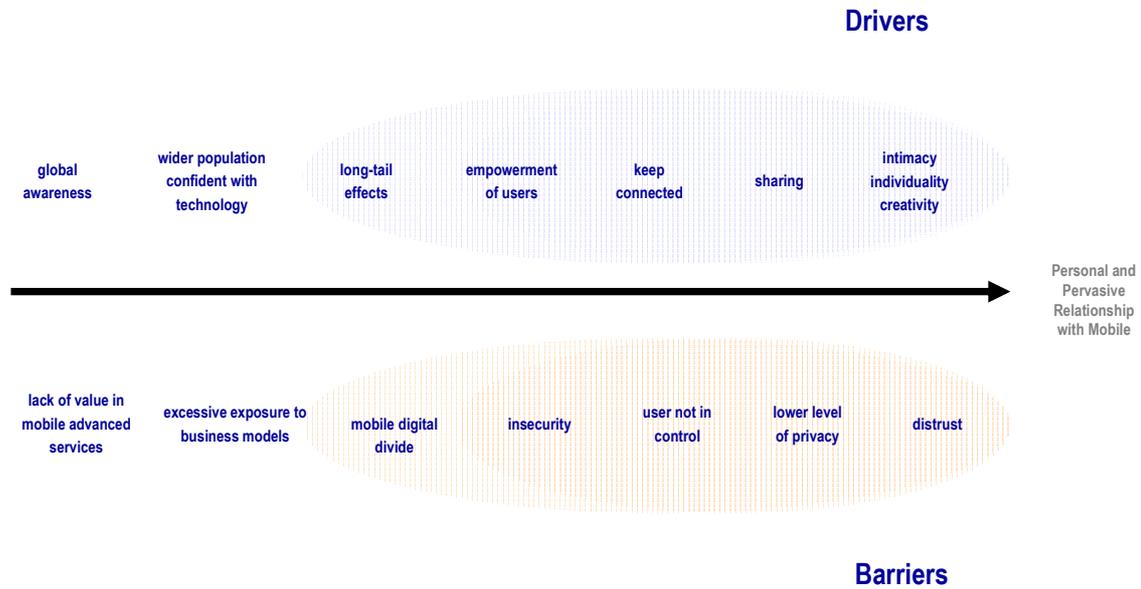


Figure 22. Overview of drivers and barriers for social acceptance of mobile content

Also, there has been a shift in the demographics of the mobile user to encompass a wider population that feels confident using (and switching off) the mobile technologies. Therefore the number of potential interested users has risen significantly (consider, for example, the increasing amount of "casual" gamers that uses "dead" time to play in a mobile).

There are also a number of general consumer trends that contribute to drive the mobile content area. A global awareness ("the world becoming smaller") increases the interest in accessing at timely news, information and content about far away places. This trend is complemented by the raise of local cultural hotspots, from where content of interest spreads around.

The long-tail effect that explains the social success of some Internet applications (social computing, but also all types of goods sellers) could be transferred as well to the mobile content sector, especially when considering that conventional media (even digital) are not able to keep up with the increasing amount of information connections.

⁸⁹ Not meaning necessarily being alone or disconnected from other users

The empowerment of users derived from the digital revolution is another major social driver. In particular, the increasing importance of users – consumers in the 2.0 paradigm (be it web based or mobile based) will be a main ingredient for the transition from current mobile content schemes to newer grounds.

The social influence of early adopters (trend setters) in the mobile content sector can be highlighted in addition to the above. The relevant attributes that define their behaviour are: mobile always connected, media hungry - knowing what's hot at the moment, fashionable - trends conscious, interested in sharing content and experiences, and in general feeling empowered and independent through the use of technology.

As a summary, the experience of connecting to other people and to learn about new things, the sharing of content and the sharing of common interests are main social drivers for mobile content. Additionally mobile content can also contribute to satisfy users' needs for knowledge, feeling empowered regarding intimacy, individuality and creativity. Thus, the shift of the role of users from consumers to active producers, with mobile media as a new paradigm for consumption and expression can contribute to the success of mobile content.

Social acceptance barriers

The continuous exposure to mobile content and, in particular, to some of the business models thought for it has an unknown response from users. For example, mobile content contextual advertising and the personal relation with the mobile device promise higher levels of advertising expenditure, but user sensitivity to invasive advertising proposals could cause a counter-reaction. The "personal" relationship with the mobile handset demands here a higher level of privacy (and trust) than in more conventional media. ScreenDigest (2006) report shows the consequences of consumer abuses: "A number of portal companies have been fined for mis-selling subscription services to consumers. This has created a number of problems in the market, primarily with consumer perception of mobile content generally, portals in particular ...".

The issues about trust are probably the main barriers for mass acceptance of mobile content. Trust covers a constellation of issues: privacy, control, security, personal abilities, knowledge, interoperability of mobile content services within the personal environment, open consumption schemes, etc. The achievement of a good solution for privacy will be the main battlefield among users and providers. Control refers to the user knowing and deciding about the decisions taken within a mobile content platform. Security is also a concern when transactions (payments, personal profiles) are based on a personal device like the mobile. As an example, mechanisms for restricting access to gambling or adult content are very inconsistent across EU.

There is also an inclusion aspect of mobile content acting as a barrier. Mobile content usage requires knowledge and specific skills not available for every user. Therefore, mobile content it is still perceived as interesting only for early adopters and advanced users, and not for other demographics. However, mobile content can be extremely useful and inclusive for immigrants, older people, etc.

Finally, it is worthy to insist in the still at large unknown response of users to several mobile content proposals and that they, in general, still do not see value in mobile advanced services in the sense of changing the limits of the possible in the structure of everyday routines.

Institutional drivers

Mobile content can be a continuation of the highly successful story of mobile communications, specially having in mind the room for innovations that could mean productivity and growth for European society and the empowerment of users derived from their leading and active role. The impulse of convergence (technological, in markets and in regulation) to allow for ubiquitous access and interaction with content goes along the same track of productivity and growth. Therefore, these two drivers imply the search for the best conditions of innovation to appear in mobile content techno-economic models. They also mean the establishment of a competitive - regulatory framework favourable to the emergence of mobile content markets.

The promotion of cultural diversity through a highly personal channel is also a main institutional driver within the EU context. The inclusive facet of mobile content also adds to this driver and it is a major force in its own.

Finally, from the institutional perspective, there is a driver derived from the importance that mobile content will have in European lifestyles and society, due to its contribution to civil society empowerment in general.

Institutional barriers

There is a fragmented approach to mobile content due to its convergent nature. The fragmentation is apparent in the framework for innovation, in the policies and regulations about emerging and increasing competition, in the regulatory framework in general, and the measures to increase social awareness and equal opportunities. The uncertainties in the evolution of mobile content sector, the unavailability of wide success stories, the perception on some users' distrust and its complexity contribute to delay the decisions on integrated approaches.

It is also worthwhile noting that EU has a diminishing weight in the total global mobile content sector. This is due, not to EU lack of interest in this sector, but to the growth of

emerging regions, particularly taking into consideration that some other cultures⁹⁰ have a higher social acceptance for the use of the mobile when consuming content.

11. SCENARIOS AND TRENDS

An overview of existing mobile content forecasts

The mobile content is still in its early stage of development; however, market research and analysis firms⁹¹ expect that it increases significantly in the near future, and becomes a key market for a converged ICT sector.

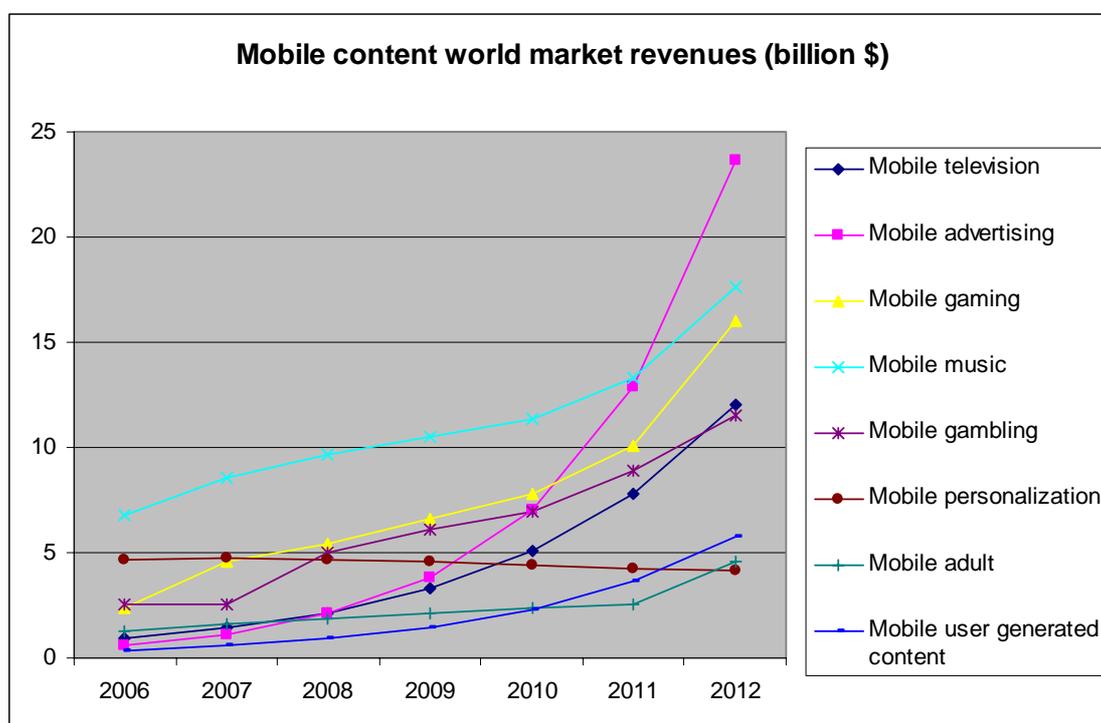


Figure 23: Evolution of mobile content revenues. Source: own elaboration from data and forecasts of (InformaTelecomsandMedia, 2008), (iSuppli, 2008), (Uglow, 2007), (Holden, 2008) and (ResarchandMarkets, 2007).

The data available for the next five year forecasts (i.e., with 2012 horizon), see Annex: data for mobile content forecasts, and the trends shown in Figure 23, would show that:

⁹⁰ Mainly from Asia

⁹¹ See for example (InformaTelecomsandMedia, 2008), (iSuppli, 2008), (Uglow, 2007), (Holden, 2008) and (ResarchandMarkets, 2007).

- Content in the mobile platform is composed of diverse niche markets with different behaviours and evolutions
- Advertising is forecasted to be the main business model permeating all content areas of interest for users: browsing information, search, personalisation services (ringtones, ringbacks, logos, etc), music, video, m-commerce and entertainment (games, gambling, etc). It is estimated⁹² that in 2011 mobile advertising will account for one-fifth of global spending on Internet advertising.
- Mobile consumption of music is forecast to still be in 2012 the biggest segment of mobile content, accounting⁹³ for \$ 17.6 billion of revenues with subscription-based music services providing the majority of mobile revenues derived from original recordings.
- Mobile television (that comprises both streamed services from cellular networks and services from broadcast networks) is expected⁹⁴ to create revenues from end-users of nearly \$ 12 billion in 2012. Broadcast television is forecast⁹⁵ to reach about 65 million subscribers in 2010 and more than 155 million two years later, with a CAGR of 66.2%.
- Mobile gaming (one time downloads, subscriptions and rentals) will lead the remaining niches for mobile content and its revenues are expected⁹⁶ to nearly triple from 2006 to 2011 to \$6.6 billion.
- Mobile user generated content (currently composed of personal content distribution, social networking, and dating services) it is expected to increase⁹⁷ more than tenfold from 2007 to 2012.
- EU participation in these markets is variable, depending on comparative penetration of enabled devices, on social acceptance of each market segment, and on the growth of emerging regions (China, Far East and India Sub-

⁹² Strategy Analytics, 2007, and Informa Telecoms & Media, 2007

⁹³ Juniper Research, 2008

⁹⁴ Juniper Research, 2007

⁹⁵ Research and Markets, 2007

⁹⁶ iSuppli, 2007

⁹⁷ Juniper Research, 2007

Continent, mainly) but could be averaged⁹⁸ in 2012 around the 20 – 25 % of total mobile content revenues from a 2007 average of 25 – 35 %.

As a complement to this summary of forecasts, Table 3 shows the expectations of growth of the mobile content industry (supply-side), using as reference a comparison with the index of current success of ringtones (considered to be 100 for simplicity). As it is easily deduced, music and video are the main drivers of growth expected for the mobile content sector.

Table 3: Evolution of mobile content usage. Sources: own elaboration from market expectations data (see web references)

Type	Indicators	
	Sales as of today (index, max 100)	Expected growth (index, max 100)
Ringtones	100	15
Music full-track	9	100
Images	28	40
Video download	18	50
Video channels	6	80
Adult content	20	10
Games	57	30

A hype cycle theory

As an initial summary of trends, treated in detail in following sections, the theory of the Gartner hype cycle⁹⁹ could help to depict a general view of the situation. Under this perspective, the technology trigger would have happened for the most part, and mobile content, very heterogeneous in nature, would have several of its components spread around the "peak of inflated expectations" (gambling, adult), the "trough of disillusionment" (television) and the beginning of the "slope of enlightenment" (gaming, music, and advertising).

⁹⁸ Summary of sources above

⁹⁹ For a detailed explanation, consult http://en.wikipedia.org/wiki/Hype_cycle

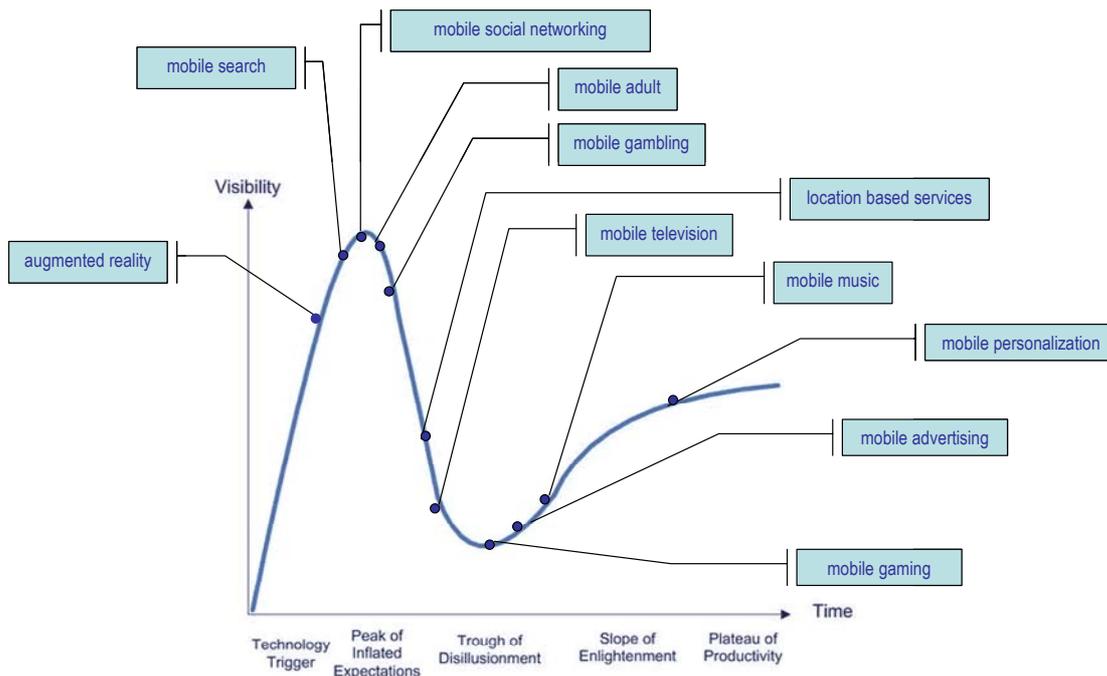


Figure 24: A 2007 vision of the hype cycle on mobile content

The most important conclusion at this stage from the 2007 hype cycle vision shows that for the most part mobile content is far from maturity, and that a number of issues must be addressed to jump from expectations to actual market acceptance.

The mid to long term scenarios

As it is often explained, scenarios do not try to be exact forecasts of the future, on the contrary, the value of a scenario approach is to compare and contrast starkly contrasting pictures of possible futures. Therefore, the first step is to select meaningful dimensions to distinguish among alternative futures. As it has been shown throughout the study the two main dimensions of uncertainty in the mobile content are related with the structure and behaviour of the market and with the perception about value in mobile content by the users. Therefore, these two have been selected as the axes to depict possible scenarios.

All the scenarios depicted share some common hypotheses (except for the dark one at the end of the section), derived from current trends that are assumed to reach their main goals in the mid term. These hypotheses (consolidated trends) common for every scenario are:

- mobile content will develop, although the rate of adoption is still an open issue,
- convergence between electronic communications and audiovisual will continue and also there will be a process of convergence between fixed and mobile infrastructures, or alternatively, (mobile) next generation networks will develop and will be used also for audiovisual consumption and interaction,

- there will be enough bandwidth and coverage for mass adoption of main mobile content services in the mid term (although having enough bandwidth and coverage could be an issue for certain geographical areas),
- mobile devices with the appropriate features will be deployed or, alternatively, the cost of mobile content-enabled devices will not be a barrier for mass adoption in the EU

To complete the differentiation of the scenarios and to provide relevant insight, they have been developed against their position regarding a number of trends that have a higher degree of uncertainty than the previous hypotheses and, thus, are used to define precisely the scenarios. The trends with a higher level of uncertainty are:

- the rate of users' adoption/acceptance of main types of mobile content (music, games and television) in the short, mid, and long term (an s-curve),
- the rate of deployment of mobile next generation networks in the short, mid and long term (an s-curve) and, in particular, the rate of deployment of fixed-mobile convergence,
- the main role of users (including their level of empowerment) regarding mobile content,
- the importance of the users' perception about trust, privacy and security
- the main business models,
- the availability of re-purposed, specific and augmented content,
- the type of successful main players,
- the type of relationships among applications and content,
- the level of standardization, interoperability and, in general, the level of complexity of mobile content distribution,
- the role of mobile devices,
- the main successful network technology,
- the role of content rights management, collecting societies and royalties,
- the level of relative importance of EU industries compared to global industries in mobile content,
- the civil society perception on the importance of EU culture and the desired level of preservation of cultural diversity,

- the intensity of innovations required,
- the appearance of disruptions (technical and economic)

Table 4 summarizes the characteristics of the four main scenarios identified, highlighting their differences and Figure 25 depicts them in the market openness – social value axis.

Table 4: Summary of characteristics of scenarios

	Scenario A "Connectivity is king"	Scenario B "The specialists"	Scenario C "Heavyweights of Internet"	Scenario D "Mobile 2.0 grial"
Level of market openness for main players (mid term)	Limited	Large	Limited	Very large
Level of social value	Low	Medium	High	Very high
Adoption of mobile music and games, short, mid and long term	Low	Medium	Low	Medium
	Low	High	Medium	High
	Medium	High	High	High
Adoption of mobile television, short, mid and long term	Low	Medium	Low	Low
	Low	High	Low	Medium
	Medium	High	Medium	High
Deployment of mobile next generation networks, short, mid and long term	Low	Low	Low	Low
	Medium	Low	Low	Medium
	High	Medium	Medium	High
Role of users, empowerment of users (mid term)	Intermediate	Intermediate	Important	Very important
Importance of users' issues regarding trust, privacy and security	Medium	Medium	High	Very high
Main business model (mid term)	Connection and usage fees Wholesale revenues	Advertising, Subscription and pay per use	Advertising	Any
Availability of re-purposed content (mid term)	Medium	High	Medium	High
Availability of specific content (mid term)	Low	High	Low	High
Availability of augmented content (mid term)	Low	Low	Medium	High
Type of main players	Telecom operators	Content providers	Internet	New players and Internet 2.0

Relationships among applications and content	Medium integration	Low integration	High integration	High integration
Level of standardization and interoperability	Low	Low	Medium	Medium
Technical complexity in mobile content distribution	High	Medium	Medium	Very high
Main network technology	Mobile comms evolution and fixed mobile convergence	Same + role of audiovisual broadcasting	Open networks and open applications	Open networks
Role of mobile devices	High	High	Medium	High
Level of technological developments required	Medium	Medium	Medium	Very high
Role of content rights management	Medium	Important	Low	Low
EU industries relative importance (mid term)	High	Low	Low	Unknown
Level of preservation of EU cultural diversity and relevance	Same than current	Increasing	Same than current	Increasing
Intensity of required innovations	Medium	Medium	Medium	High
Possibility of disruptions	Limited	Medium	Medium	High

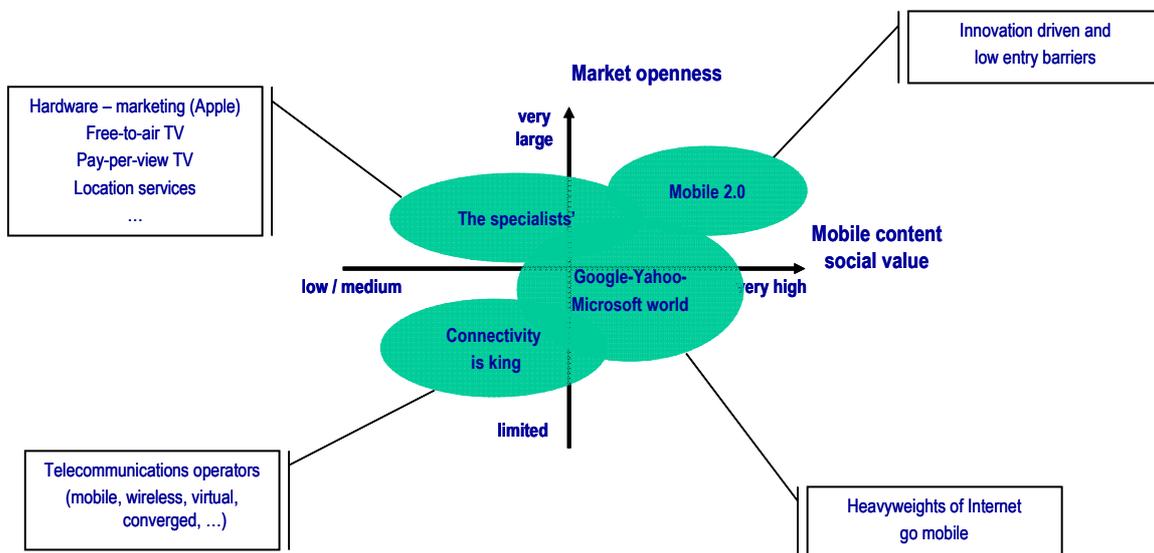


Figure 25: Scenarios for mobile content

The summarized analysis of the depicted scenarios leads to the following conclusions:

- The resulting structure of the mobile content sector, and from here, the drivers, barriers and priority issues, is very dependent on the type of players who lead this area and who lead the transition to mobile 2.0
- Scenario A implies that the high costs involved in the deployment of a mobile infrastructure are decisive for the structure of the market. During the process contents are "commoditized" and the added value remains in connectivity.
- Scenario B denotes that the content providers are the players able to extract value from mobile content and to maintain control over it. However, each of them is specialized in a certain techno-economic model. Therefore, the users, although perceiving relevant value in mobile content, are confronted with a set fragmented approaches with low levels of standardization.
- Scenario C entails that the models for content consumption and interaction in the mobile domain are a translation of the Internet ones. Access to mobile content has a significant value that is captured by the main Internet players. Connectivity is an utility in this scenario.
- Scenarios A, B and C have relatively high entry barriers (costs of deploying and operating mobile networks, control of relevant contents, and critical facilities to access content, respectively). Scenario D on the contrary has lower entry barriers due to a process of standardization for the basic technologies (similar to the existing in Internet).
- Scenarios A, B and C are compatible to a certain extent with Scenario D, and they could behave as transition steps to the latter.
- Scenario D is the most prone to the appearance of disruptive innovations and where users are more empowered. At the same time it is the scenario where there are greater risks for privacy and security issues.
- EU industries compared with other regions are better positioned in general in scenarios A and B, with the Scenario D unknown at large to this respect.
- EU cultural diversity is easier to preserve in Scenario B.
- Augmented content will be widely available in Scenarios C and D.

Finally, a dark scenario (Scenario E) it is also briefly outlined. Within this scenario the personal relationship of the user with the mobile device is exploited with low levels of concern about privacy. That causes a division among users. Those willing to accept the advantages provided by players in exchange of their low level of privacy, and those who counter-react

against mobile technologies. The division results in social convulsions and a review of the general role of technology in society.

12. CONCLUSIONS OF THE REPORT

a) An explosion of mobile content available for users is expected

The attractiveness of the mobile domain, the process of convergence, the low level of penetration of current solutions and the many possible benefits for users will cause an abundance of mobile content.

b) Innovation will take place in the marrying of mobile applications and enabling / enhancing technologies which exploit the interactions between the virtual and the real world in everyday routines. As a consequence mobile content and applications will not be just an adaptation from those already existing in the wireless world. Augmented content, largely unavailable today, is another major opportunity.

The mobile dimension in this domain has been partially neglected until now. We are in the dawn of a mobile content explosion where specific and augmented varieties of content are just emerging. These new categories of mobile content rely on a number of attributes in the environment of the user, such as location of the user, behavioural routines, the situation where content is used, or new layers of information placed in real objects. This type of content will have an increasing importance and, in the medium term, will transform the mobile content domain. Hence, innovation will be expected in applications and technologies that will use the mobile device as a tool in between the virtual and the real world. Not the applications, nor the technologies, nor the augmented content to allow this new type of interaction are in place now.

c) Creative destruction in the mobile content ecosystem

There are many different aspects of interest in the mobile content ecosystem: creativity and mobility; content being adapted, re-purposed, developed specifically, or augmented; media, mobile and new players' approaches to business models; new circumstances for users' involvement with mobile content such as local, context-aware or user generated. From each of them it is possible to devise a techno-economic model that has little in common with the others. It can be the case that we are witnessing the first steps in an expanding area where every dimension has a chance for success. It would be at a later stage where (at least partly) integration of mobile content could take place, including the loss of relevance or complete disappearance of those dimensions with no interest. In the current phase, however, all dimensions have a chance to succeed.

d) Shift to the edges of the mobile ecosystem: evolved mobile device suppliers and application providers will be the players with the greatest influence in the development of the mobile content domain

The erosion of the walled garden and the increasing importance of users are the major factors causing the shift from an operator-centric model to a model where the edges of the map of activities that take place in the mobile content ecosystem matter more. The first signals (players strategies, new offering, movements in the value chain, users' behaviour, ...) are already present.

e) Different behaviours and chances for different mobile market segments

Mobile music and mobile gaming will be the prime examples to measure the possibilities of a more conventional approach to mobile content markets, noting besides that EU has a much stronger position in mobile gaming than in mobile music. However, prospects regarding mobile television are clearly divided: they range from enthusiastic to pessimistic. The scenarios of mobile television usage are the main point of disagreement; the only common perspective being the possible delays in its adoption with regard to other mobile market segments.

f) Learning from users: the personal involvement with mobile content is largely unexplored, particularly for richer media and augmented mobile content. There is a supply – demand mismatch in mobile content

The personal involvement with mobile content means that mobile content must have a personal usefulness, a personal value for users. From here, it is easy to grasp that there are many different possibilities to improve everyday (or even new, or exceptional) routines with the use of mobile content. However, routines, and in general user behaviour, motivations and expectations, are influenced by culture, education, age, income, or gender. Therefore, it is also argued that detailed demographics have an enormous influence in the success of each type of mobile content. Even more, with richer media or augmented mobile content it would be logical to have the same or increased effect. However, this mobile content personal realm is largely unexplored and requires further research efforts to establish the origins of the supply – demand expectations mismatch in mobile content.

Personalization, thus, goes beyond the conventional concept of services of choice delivered through the mobile device to satisfy anyplace/anytime connectivity needs. Now it encompasses the merge of the virtual and the physical world with the personal perspective of the user as the mediator.

As an overall summary, mobile content success will require a very insightful approach to needs and a continuous process of interaction and learning with the users.

g) Mobile content is a heterogeneous and fragmented digital ecosystem

As it has been shown through the preceding sections, the mobile content domain consists of a heterogeneous and fragmented digital ecosystem. In contrast, mobile voice, still the dominant paradigm for mobile communications and the mirror to measure mobile content success, features a much simpler topology, offers a rather homogeneous service and addresses a better understood user need. The complexities around mobile content can be put in perspective when taking into account short messaging service. This apparently simple and limited mobile application was an unexpected success, and it has taken a decade for the mobile industry to fully understand and exploit its possibilities¹⁰⁰. This example proves the difficulties in anticipating users' preferences, much more with richer applications that allow more complex behaviours.

The structure of the mobile content ecosystem derives from four main sources: the diversity of content suitable for mobile usage, the production-delivery-consumption structure of content businesses, the players' different origins and cultures, and the diversity of situations where this usage can take place. Heterogeneity is expected to decrease in the near future when the mobile platform would be able to unify players' approach to mobile content and also simplify today's extremely complex topology of the mobile content domain. However, the first and fourth sources of heterogeneity in the ecosystem would remain unchanged: the diversity of content types and the diversity of personal involvements with mobile content.

h) There are higher transaction costs than other competing channels due to the extraordinarily complex topology of mobile content distribution

The complex topology for mobile content delivery shown throughout the report poses some questions about its possible lines of evolution compared to other competing distribution channels. Considering in particular Internet, the mobile content domain is well behind in the existence of (open) standards, in the entry barriers that exist, in the transaction costs involved in the business, or in the difficulties for extending Internet-like applications to the mobile realm. Ultimately, each of these issues refers to mobile content fundamental problems: potential market failures; possible difficulties for innovation in mobile content provision due to the above complexity; and the additional costs it imposes to users, resulting in demand contraction and delay. Asymmetric information situations and silo models are also being promoted indirectly as

¹⁰⁰ See Jenson (2005) or Kasesniemi (2003) for a complete perspective on the subject

a consequence. On the other side of the coin, mobile content complexity attracts innovative companies that seek to profit from niche opportunities and from inefficient transaction costs.

i) A necessary but not sufficient condition: availability of affordable and adequate mobile devices and infrastructures

There exist, however, some common elements of importance for the mobile content domain as a whole. Mobile content consumption and interaction, or even creation in the form of user generated content, takes place in the handset independent of the content format. Mobile carriers, with the possible exception of mobile television, provide the infrastructures and the basic services to deliver every type of content to users. Therefore, the improvements in infrastructures and devices affect market performance independently of the type of content.

In the case of infrastructures the key developments refer to the the data rates available per user and the price of mobile data transmission, that, in turn, depend on the deployment of more capable and flexible mobile next generation networks and better spectrum management. The developments in the devices refer also to their capabilities (battery life, displays, interfaces, integration of sensors, cognitive technologies, ...) and their affordability.

However, making the mobile content market behaviour exclusively dependant on the progress in these elements is too simplistic a vision. It would be equivalent to consider that pure supply side enhancements will be enough to succeed in mobile content.

h) Connectivity retailing and wholesale content provision could support mobile infrastructure deployment, but mobile advertising is dubious to be scalable in its present format

Available studies suggest that connectivity fees could support the deployment of mobile next generation infrastructures. Connectivity model could be supplemented by a superstore model, where operators facilitate wholesale services for content provision. Mobile advertising has the chance to grow steadily during the next years, but will confront scalability issues in the medium term, including a strong dependence on users' response.

The pace of the infrastructure deployment will depend on supply factors (technology evolution, re-use of legacy infrastructure, particular situation of the operator, ...), demand factors (users response to mobile broadband, and to mobile content and applications), market factors (competition, business models success) and external factors (overall behaviour of the economy).

j) Mobile content supply-side entry barriers and development roadblocks are still in place, particularly those related with economies of scale

Although some of the difficulties identified in past reports about the situation of the mobile content domain have lost momentum such as digital rights management or wireless broadband availability (due mainly to the evolution of related domains), a majority of the issues already known remain, specially those related with the creation of economies of scale: complexity and territoriality of rights, licenses and regulations, prices and difficulties in data roaming, or meta-content harmonisation.

13. CHALLENGES AND PRIORITY ISSUES

(To be completed after the workshop)

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ADDITIONAL WEB SOURCES

NB: For exact details on materials used, consult the tag "mobile" and similar in "claud10" del.icio.us account

Arstechnica arstechnica.com

BBC Technology News www.bbc.co.uk

Broadcast Buyer www.broadcastbuyer.tv

BusinessWeek www.businessweek.com

Deloitte & Touche www.fast500.com

Digital Media Wire www.dmwmedia.com

DVB-H www.dvb-h.org

EETimes www.eetimes.com

EJL Wireless Research www.ejlwireless.com

El País Tecnología www.elpais.com

EurActiv www.euractiv.com

FierceWireless www.fiercewireless.com

Global Mobile Suppliers Association www.gmacom.com

Global Telephony <http://telephonyonline.com/>

Informitv www.informitv.com

iSuppli www.isuppli.com

Juniper Research www.juniperresearch.com

Marketwire www.marketwire.com

Mobile Europe www.mobileeurope.co.uk

Mobile Marketing Magazine www.mobilemarketingmagazine.co.uk

Mobminds www.mobminds.com

Nellymoser www.nellymoser.com

NetworkWorld www.networkworld.com

PaidContent www.paidcontent.org

PC Pro www.pcpro.co.uk

Research Analysis research.analysis.com

Research and Markets www.researchandmarkets.com

Synovate www.synovate.com

Telecommunications Online www.telecommagazine.com

TelecomRedux www.telecomredux.co.uk

TelecomsEurope www.telecomseurope.net

The Economist www.economist.com

Yahoo News news.yahoo.com

ANNEX: DATA FOR MOBILE CONTENT FORECASTS

The following table presents the data used for mobile content providers forecasts. The data refer to world revenues of different types of mobile content. Calculations are based in averaging data published by Informa Telecoms & Media (2007), iSuppli (2007), Juniper Research (2007, 2008), Gartner (2008) and Strategy Analytics (2007). Data have been linearly extrapolated for those years not presented originally in the forecasts.

Table 5: Data used for world forecast of mobile content provider revenues (billions of \$). Source: own elaboration from data and forecasts of Informa Telecoms & Media (2007), iSuppli (2007), Juniper Research (2007, 2008), Gartner (2008) and Strategy Analytics (2007)

	2006	2007	2008	2009	2010	2011	2012
Mobile television	0,91	1,40	2,15	3,31	5,08	7,81	12,00
Mobile advertising	0,63	1,09	2,07	3,20	5,89	9,87	17,12
Mobile gaming	2,36	4,57	5,41	6,61	7,76	10,10	16,00
Mobile music	6,81	8,58	9,62	10,53	11,34	13,28	17,60
Mobile gambling	2,52	2,53	4,99	6,09	6,93	8,92	11,49
Mobile personalization	4,64	4,76	4,70	4,55	4,40	4,26	4,18
Mobile adult	1,26	1,65	1,89	2,15	2,35	2,51	4,60
Mobile user generated content	0,37	0,58	0,92	1,45	2,29	3,63	5,74
Total	19,49	25,16	31,74	37,89	45,74	60,38	88,74