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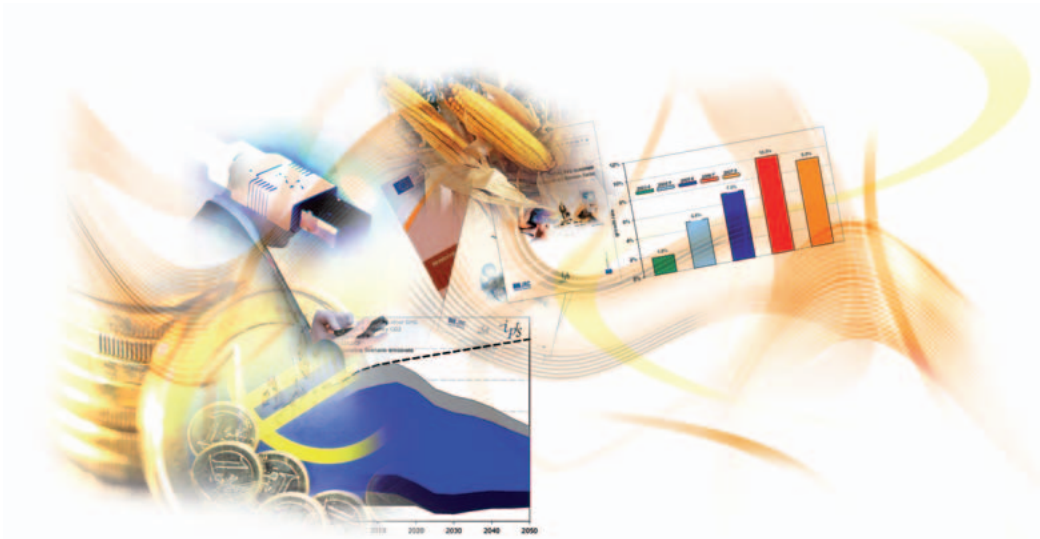
Born Digital / Grown Digital:
Assessing the Future Competitiveness of the EU Video Games Software Industry

Authors: G. De Prato, C. Feijóo, D. Nepelski, M. Bogdanowicz, J.P. Simon



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The mission of the JRC-IPTS is to provide customer-driven support to the EU policy-making process by developing science-based responses to policy challenges that have both a socio-economic as well as a scientific/technological dimension.

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Although these contributions were substantial, the responsibility of this final version clearly remains with the authors.

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Preface

Information and Communication Technology (ICT) markets are exposed to more rapid cycles of innovation and obsolescence than most other industries. As a consequence, if the European ICT sector is to remain competitive, it must sustain rapid innovation cycles and pay attention to emerging and potentially disruptive technologies.

In this context, the Directorate-General for Enterprise and Industry (DG ENTR) and the Institute for Prospective Technological Studies (JRC-IPTS)[1] have launched a series of studies to analyse prospects of success for European ICT industries in the face of technological and market innovations.[2] These studies, under the common acronym "COMPLETE",[3] aim to gain a better understanding of the ICT areas in which it would be important for the EU industry to remain, or become, competitive in the near future, and to assess the likely conditions for success.

Each of the "emerging" technologies (or families of technologies) selected for study are expected to have a potential disruptive impact on business models and market structures. By their nature, such impacts generate a moving target and, as a result, classical well-established methodologies cannot be used to define, observe, measure and assess the situation and its potential evolution. The prospective dimension of each study is an intrinsic challenge that has to be solved on a case-by-case basis, using a mix of techniques to establish lead-market data through desk research, expert group discussions, company case analysis and market database construction. These are then combined with reflection on ways and means to assess future competitiveness of the corresponding industries. This process has resulted in reports that are uniquely important for policy-makers.

Each of the COMPLETE studies illustrates in its own right that European companies are active on many fronts of emerging and disruptive ICT technologies and are supplying the market with relevant products and services. Nevertheless, the studies also show that the creation and growth of high tech companies is still very complex and difficult in Europe, and too many economic opportunities seem to escape European initiatives and ownership.

COMPLETE helps to illustrate some of the difficulties experienced in different segments of the ICT industry and by growing potential global players. Hopefully, COMPLETE will contribute to a better understanding of the opportunities and help shape better market conditions (financial, labour and product markets) to sustain European competitiveness and economic growth.

European industry needs, of course, to keep pace with emerging ICT and use it to innovate. In order to support this process, the purpose of COMPLETE[4] is to analyse the technological and market potential of a set of selected emerging technologies – in this case, for mobile and video games - to assess the impact of

1 IPTS is one of the seven research institutes of the European Commission's Joint Research Centre (JRC).
2 This report is one out of a series, part of the umbrella multiannual project COMPLETE, co-financed by DGENTR and JRC/IPTS for the period 2007-2010 (Administrative Arrangement ref. 30667-2007-07//SI2.472632).
3 Competitiveness by Leveraging Emerging Technologies Economically.
4 Please refer to the Project website: http://is.jrc.ec.europa.eu/pages/ISG/COMPLETE.html

these technologies on the competitiveness of EU industry, and to evaluate the positioning of EU industry, as both a producer and a user.

This report reflects the findings of the JRC-IPTS study on the video games industry, and focuses on two specific activities: online and mobile video games.

David Broster
Head of the Information Society Unit
JRC-IPTS

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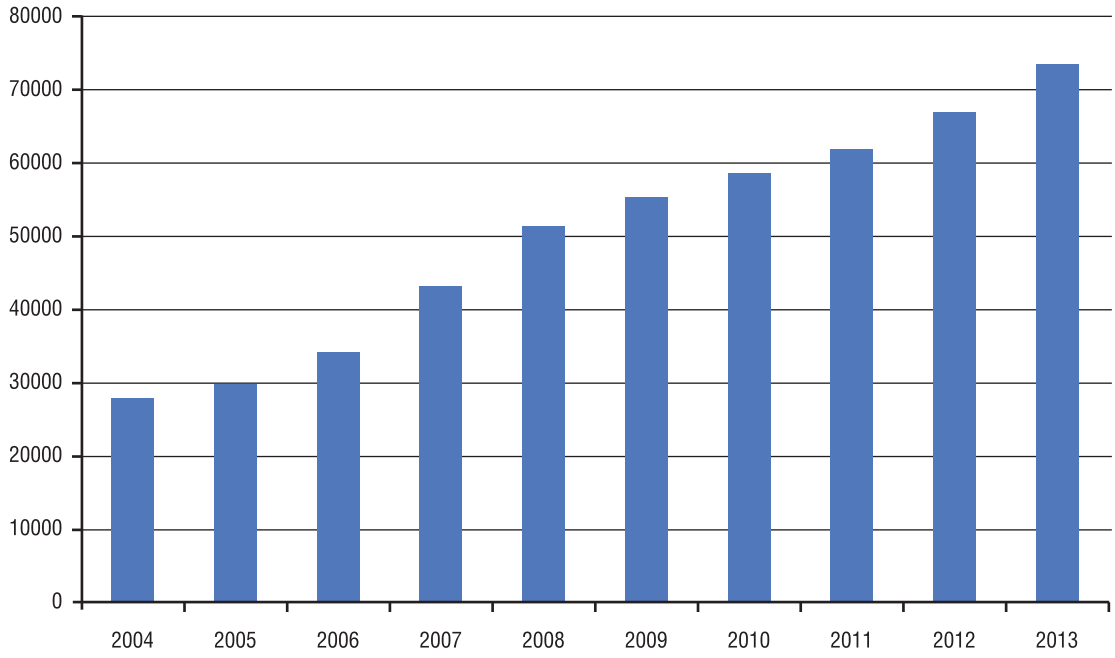
Executive Summary

The present study analyses the video game software industry, its market potential, its value chain organisation and business models and its current line of evolution, so as to outline major emerging technologies and to investigate their disruptive potential. It also assesses the strengths and weaknesses of EU firms, in order to highlight drivers, opportunities and challenges for improving the future competitiveness of the EU video game software industry.

I. Mapping a very young industry

Video games, though comparatively new, already form a significant and growing share of the media and content industries. The global video game market was estimated at some €45 - 50 billion in 2009, and is expected to grow four times faster than the media and entertainment market[5] as a whole. The former is expected to grow by almost 70% by 2013, whereas the latter is expected to grow by only 17%. In the UK, the video game market outgrew the cinema market in 2009[6] and playing games online is now as popular as downloading music and video.[7]

Global video games market, million US$, PWC 2009



5 Media & Entertainment includes: internet access fees, internet advertising, TV fees, TV advertising, Recorded music, Filmed entertainment, Video games, Consumer magazine publishing, Newspaper publishing, Radio, Book publishing, Business-to-business publishing. Source: PWC.

6 Cinema market: theatres and DVD. BBC News, Wednesday 24 March 2010: *"Rupert Clark, an analyst from consulting firm Deloitte, said that the global games industry now makes more money than the box office".*

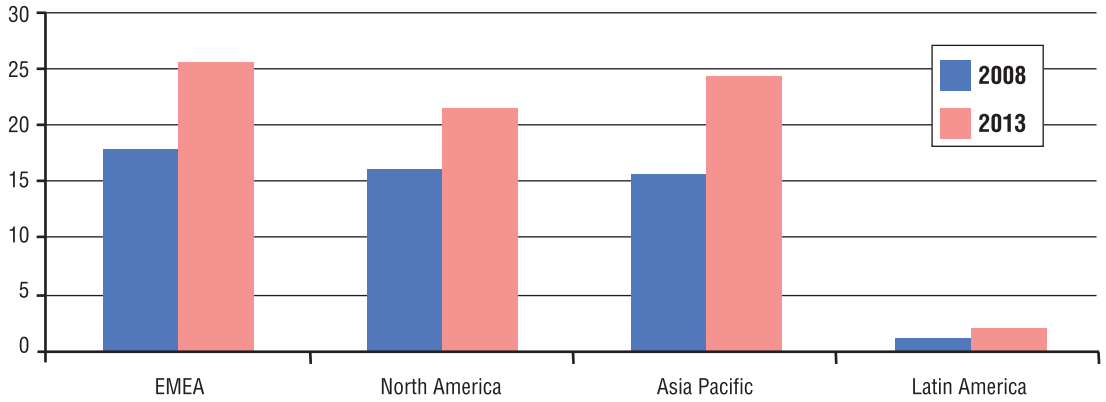
7 Ofcom Communications Market Report, August 2010. Available at: http://stakeholders.ofcom.org.uk/binaries/research/cmr/753567/CMR_2010_FINAL.pdf

Global video games and global media and entertainment market (2007-2013, million US$)

	2007	2008	2009	2010	2011	2012	2013
Total Video Games	43,460	51,390	55,089	58,383	61,604	67,026	73,513
Total Media & Entertainment*	1,373,941	1,408,950	1,354,068	1,359,495	1,411,788	1,506,409	1,613,173

Source: - PWC 2009.

Video games market size (billion US$), by geographical area, PWC 2009



Source: - PWC 2009.

The Europe, Middle East and Africa (EMEA)[8] region is the biggest market for video games: in 2009, France, Germany, Italy, Spain and the UK accounted for US$15.2 billion, which is equivalent to nearly 30% of the global video games market. Within this market, the console game segment is the biggest component of the EU market and is now eight times the size of the one-time market leader, PC games. One analyst predicts that this size gap will grow by ten times by 2013.[9]

The past two decades have seen the mass production and distribution for retail sale of video games for use on personal computers, advanced games consoles, including portable devices, and mobile phones. In today's industry, game developers and publishers work together to make available a wide range of games. All of these games have one thing in common - they are essentially computer programmes or software. As computer programmes, video games process the data entered by players to explore the 'plot'.

The video games software industry appears to be one of the most innovative labs for the coming Digital Economy and this aspect may be even more important than its size and its growth rate. It is developing and experimenting with new digital services (online, offline and mobile) that are managing to reach a growing share of the population. Born digital, the industry shows growth that is taking advantage of many opportunities to offer user-friendly, intuitive services on a very large scale. Such services, mainly based on software development, are progressively invading other areas in the sector such as casual games,[10] advergames[11]

8 Europe is the core market of this region.
9 Price Waterhouse Coopers, *Global entertainment and media outlook*; 2009-2013.

10 Casual game: ease of use games (to learn, to access and to play) spanning all genres.
11 Advergames: a subset of the so-called serious games (i.e. allowing for other uses than entertainment), sponsored and distributed for free to advertise a product or an organisation.

or edutainement,[12] multiplying the supply-side actors. The potential audiences have grown, worldwide communities have been reached, and access platforms have been added (consoles, portals, mobile handsets, etc.). One might expect these quasi-experiments to offer essential core lessons to sectors such as eGovernement, eHealth, eCulture and eEducation, which are seen as more serious than Games, but they have failed up until now to meet their targeted audiences with well adapted offers of e-services.

II. The traditional value chain

The following is a traditional view of the value chain, adapted in particular to the specifics of the video games industry. It is useful as it describes, in a static way, the roles and positions of the various actors in the value chain. But it fails to capture the dynamics at stake.

development studios. This dominant position creates tensions with the complementary need to develop an active community of developers. Developers are usually small studios, gathering multidisciplinary teams around the creation of the games.

Second, publishers occupy a position of strength in most types of games development, partly because the production of video games and all digitalised creative content goods is characterised by high fixed costs and low marginal costs. Though the initial financial investment to create the first "copy" is extremely high, once made, the additional copies can be (re)produced (but not necessarily distributed and sold) as at almost zero cost. This creates a need for investment in the early stages that affects power relations in the value chain, and leads to the emergence of the publishers as the financing, and therefore dominant, actors. These publishers,

In this value chain, the platform hardware owners (Sony, Nintendo, Microsoft) develop their strategies within a strongly oligopolistic market, both for home and handheld consoles. These strategies are reinforced when one considers the proprietary characteristics of the operating systems running on those consoles. The vertical integration of the industry further supports these strategies. In particular, hardware owners often also act as game publishers and have their own

some of which are also the platform owners (Microsoft, Nintendo, Sony), interact within an oligopolistic market.

Publishers and platform owners tend to dominate but these segments are more stable than other segments. Oligopolistic markets are a feature of the platform hardware and publishing segments.

At the same time, small studios, employing multidisciplinary teams working on games creation characterise the developer segment.

12 Edutainement: games with educational outcomes targeted at specific groups of learners.

These companies are numerous and hence the developer segment is highly fragmented, a feature shared by most of the creative industries for the "creative" side. Development can be carried out by in-house development companies fully owned by publishers but also by independent companies. Alternatively, some developers publish their own games and therefore can be regarded as publishers and developers, as is the case for the majority of Norwegian developers, for example.

In the software production process, the video game software industry needs to work out its position taking into account the central role of middleware, which serves partly as a "game engine", enabling game development, or adding capabilities to games,[13] enabling networking. It allows improved performance or more effective development. Middleware is crucial as it enables portability among platforms and thereby permits platform independency, and allows third parties to develop applications faster and more effectively. It is the access, the modularity, the functionalities and the portability of the middleware that will largely determine a game's software development and its market potential. Higher level applications, the game itself, are developed on top of these game engines, by the studios and the developer teams.

III. Trends

The industry produces entertainment software for use on personal computers, video consoles, portable devices and mobile phones and is characterised by creativity and constant innovation. This has led to the continuous development of new forms of entertainment, and an increasing number of devices upon which interactive software may be enjoyed. Increasingly games are played online and the majority of new games being developed are for online play at all levels of dexterity. Technological achievements and gaming diffusion across ages, as well as competitive pressure, are changing the market.

One of the disruptive trends in the video games business is the emergence of new actors from different businesses, who may be able to bypass actors currently in dominant positions. The structure of the industry is still fluid and is expected to keep evolving: the relative position of each player in the value chain is not stable (hardware producers, game developers, publishers, software producers). Online and mobile opportunities may give new companies the chance to become essential intermediaries in the video games value chain, such as online portals (MSN, Google, Yahoo, pogo.com), Internet service providers, social networks (Facebook, MySpace) or even telecom operators (e.g.. Vodafone) or handset manufacturing companies (e.g. Nokia). New market dynamics are created as these opportunities also allow the formation of new partnerships with other organizations (movie industry, sports organizers…) and more lifestyle partners, opening up new experiences.

These dynamics result in further changes in already differentiated business models, and the end result is still an open issue. Who benefits, now and in the future, in economic terms, from the growing video games market – currently a battlefield - remains to be seen.

Meanwhile, the video games market is growing, in terms of both value and audience. The demand has changed under pressure from a variety of factors such as technological ease, the emergence of social computing and communities, and the supply of simple and short games, capturing an up-until-now unsatisfied demand across age categories, socio-economic classes, or gender.

Finally, really innovative technologies are potentially disruptive, as has been seen with improved human-machine interfaces (i.e. the use

13 Physics middleware: physics engines are taking care of the simulation of physics models, thus providing to the game with the management of effects such as mass, velocity, wind resistance, etc.

of sensors in the Wii example). Technological progress could still influence business trajectories.

In this moving context, online and mobile video game markets are expected to increase most, surpassing the markets for offline PC games, handheld video games, trailing only console games in the medium term. The growth of the video games software market is expected to be primarily driven by online and wireless game software, while hardware would proportionally decline in terms of revenues, hence changing hence the rules of the game. It is forecasted that, in the long run, the online space will substitute the boxed products currently available

IV. Where does Europe stand?

At the moment, European actors appear to be present at all stages of the games value chain but to different extents:

- While they are absent in the console hardware segment, they are challenging the incumbents in the mobile segment (for example, Nokia with the Symbian operating system environment).
- There are only a few European representatives among the major publishers - in particular, Ubisoft, one of the top world video games publishers (since Atari European operations were bought by Namco Bandai[14]).
- The European industry supplies a large share of world's middleware needs. Middleware (games engines) is playing a central role in the new era of modularised engines. Middleware from Unity3d (a Danish firm) is used by 10 to 20% of the top 100 games.[15]
- Europe hosts a large population of developers' studios, often the creators of major market successes. These highly creative small development studios can be found mainly in the UK, France, Germany, the Nordic countries and, to a lesser extent, Spain.

The EU market is likely to grow strongly[16] over the next few years and will increasingly be focused on the online market as new broadband penetration stimulates growth and as more and more consoles offer online gameplay options. This growing role of the online segment opens up opportunities, especially for European stakeholders and SMEs.

V. The coming of an era: online and mobile games

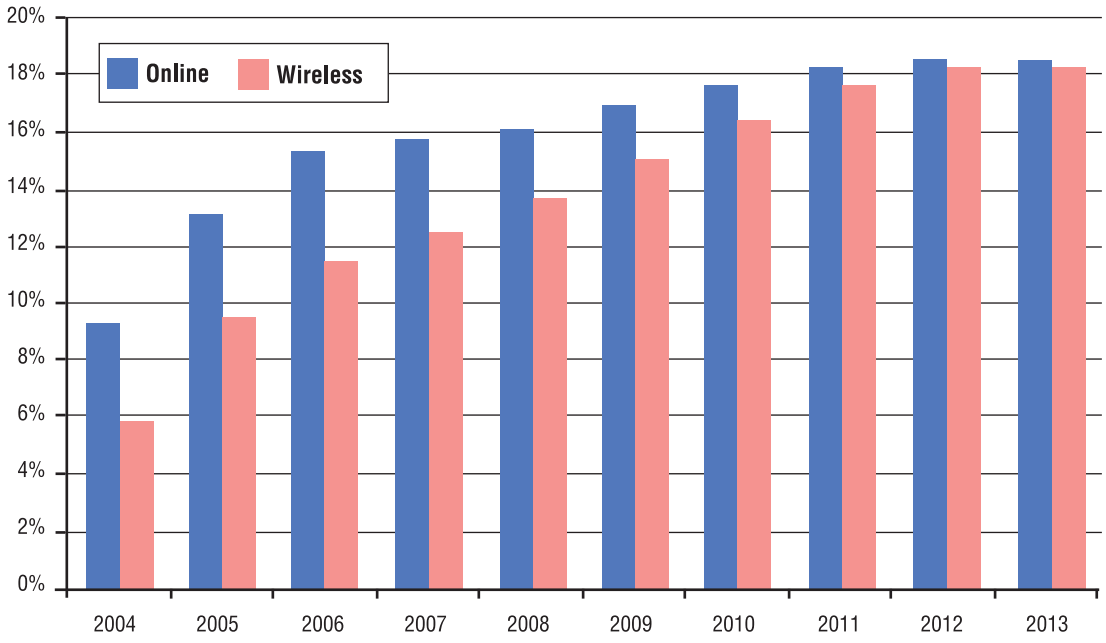
Market figures indicate the relevance of the video game market and its segments related to software. Another key aspect of this industry, its capability to invest in the development and introduction of disruptive technologies, further strengthens this relevance. Our analysis suggests it is likely that disruptive technologies will emerge in the online and mobile games market.

Several trends are expected to affect the current and future dynamics of the video games software industry. For example, mobile games are challenging the monopolies of existing operating system owners and are offering a new distribution channel to developers. Moreover, online games (Massively Multiplayer Online Games - MMOGs - and also easier to play browser-based, single user online games) are offering users a new role, which could bypass the publishers and create different revenues streams. These emerging trends offer a key to the interpretation of foreseeable changes in European video games software industry competitiveness.

Though the Asia-Pacific region is the biggest market for online and wireless video games,

14 A Japanese company. See Table 6: Top Game Publishers.
15 According to Steffen Toksvig, Unity3d. Presentation at the June 2010 validation expert workshop.
16 By a compound annual rate of 6.9% from 13.5 billion Euro to 18.8 billion Euro. *Source:* Price Waterhouse Coopers, *Global entertainment and media outlook*; 2009-2013.

Online and wireless video games share in the total video games market, advertising included, 2004-forecast 2013, in %



Source: PWC 2009.

this segment is expected to grow by double digits annually until 2013 in the EMEA region. Moreover, the fact that EU is strong in telecom services, especially mobile services, should not be overlooked.

In this context, it is important to understand how different European actors will benefit from the upcoming transformations of the video games industry.

Online value creation

Video games, which normally allow a non-linear interaction with the user (linear interaction is, however, the case for music and movies) are making the most out of their online possibilities. Going online enables them to exploit the promises offered by massive multi-player interaction: the creation of persistent virtual worlds and characters, multiple entry points and continuously updated plots enriched by the inclusion of user-determined content.

In fact, online games share with the video game sector in general most of the particular characteristics of its production process: for example, the high ICT intensity and the highly technical nature of the creative activities leading to the production itself. However, online games therefore share the difficulties in measurement, observation, and identification of suitable indicators which affect software in general. The additional characteristics of online games complicate the picture even further.

If in principle browser-based games are rather simpler than client-based online games, evolution in available software engines is supporting the progressive increase in the range and capabilities of browser-supported applications, making multiplayer interactions already possible for these games. Nowadays, multiplayer browser-based games are available, which allow all types of multiplayer game flow: not only turn-based games where users execute their tasks in turn, but also real-time games where users have a real amount of time to act.

Casual games (not very complex, easy-to-use games) constitute an important and rapidly growing subset of online games. They are now greatly increasing the numbers of gamers and also stimulating a market for associated advertising.

In the past years, the distribution of online games has been progressively concentrated on some internet portals serving the PC-based side (like, among many others, Valve's Steam Service or Manifesto Games), and on a few, very powerful, network platforms for console games, each controlled by the console's hardware provider.

Independent application stores are growing rapidly,[17] providing online games access to PC users together with the possibility to download not only games but also movies, music, and additional content. In the same way, console-oriented gateways are also increasing their importance and audience by differentiating the type of content and services made accessible to users. Having started as gateways for accessing video games, and related contents and communities, they are more and more offering different kinds of digital contents and resources.[18]

Online games have a role in the digital content convergence process. This is in line with the process of digital convergence which has been already acknowledged in the literature (Screen Digest Ltd et al., 2006), and which is based on digital distribution of different types of content on the one hand, and on the diffusion of the availability of interactive capabilities to the consumers on the other. This phenomenon is not only affecting the video game industry, but also the movie, video, music and mobile communication industries and the whole publishing sector in general.

Going mobile

It also appears that the necessary conditions for the success of mobile content and applications, mobile games in particular, have already been met in most developed countries. Broadband mobile data networks are increasingly available and affordable. This is also the case with smartphones –and other smart devices- as they are becoming the standard handset in many markets. In addition, the mobile platform offers a number of particular features, very suited to the massive adoption of gaming: wide demographics; ubiquity; personal devices able to maintain close links with the social network for multi-player gaming, community involvement and allowing users to become co-creators of content; and, eventually, the ability to supply games adapted to the context of the user (context awareness).

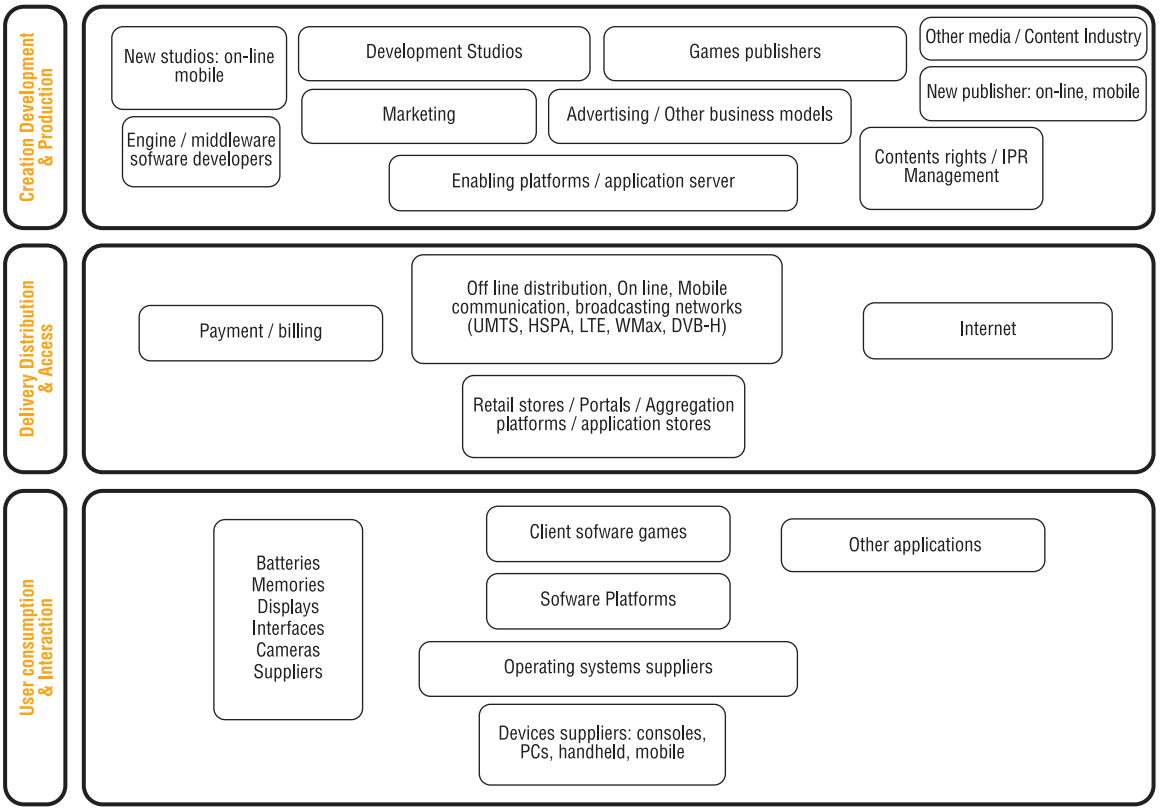
However, mobile gaming also faces a number of challenges, ranging from technology and economics to the institutional/ regulatory framework. Enabling innovation in this field is all the more relevant for Europe as the region relies on a powerful mobile industry -device suppliers, network suppliers and mobile operators- and, logically, considers the cultural aspect of games as a differentiating asset.

Observing these two emerging trends - online and mobile gaming – points to the expansion of the video games industry in terms of supply-side actors (and issues), demand (across various demographic variables), technologies (and their accompanying technological and non-technological challenges, and business models (largely beyond advertising). This invites the analysis to move from a traditional view of the value chain, to a more dynamic view of the "ecosystem" of the video games industry, seen as a laboratory of ideas and achievements within the broader realm of the emerging eServices domain. The following picture attempts to capture this new - still not measurable – reality.

17 For instance in Germany in 2009, two browser-based game companies (Bigpoint, Gameforge) were among the five fastest growing IT companies of the country. Source: http://www.deloitte.com/view/de_DE/de/branchen/article/5bcc6816ec574210VgnVCM100000ba42f00aRCRD.htm

18 The key dynamics of video games in general are described in a more general framework in Mateos-Garcia et al. (2008).

Building blocks of the video games software industry ecosystem (inspired by Claudio Feijoo)[19]



VI. Are policies needed?

The sheer size and rapidity of the growth rate of the video game market indicate that its relevance and that of its segments related to software is of outstanding interest. Moreover, this market is expected to grow in the coming years. This interest is likely to be strengthened by this industry's capability to invest in the development and the introduction of disruptive technologies. Through technology transfer, other (service) industries can benefit from research and development, experiments and large-scale implementation which take place in the framework of video game-related products. This 'digital native' may turn out to be the living lab of the digital economy.

Among the features of this living lab, instability and some turbulences between players, linked to the lack of maturity of this market, should be noted. As already mentioned, the structure of this industry is still work-in-progress, as is an agreement on its core definition (entertainment, education, culture, etc.).

These changes and turbulences are generating different expectations and triggering tensions. For example, there are opposed views on how to label games: as software or as cultural products. The Interactive Software Federation of Europe (ISFE) favours the term software, as does the ESA in the US. The European Games Developer Federation (EGDF) backs the use of the wording "cultural content". This is not just a theoretical debate. It has implications for regulation, funding and WTO trade negotiations to name but a few. Indeed, video games are not subject to, or regulated by, any legislation applicable to audiovisual works.

Ever since the computer game as a digital artefact has existed, one of the main threats to existing market structure appears to have

19 See Chapter II.2 at 123.

been piracy. However, the industry is, first and foremost, relying on its capability to invest in the development and introduction of disruptive technologies, rather than on litigation. Online and mobile games are not only bringing new business models but adding "new pirate-proof opportunities".

If games are now among the most advanced, sophisticated resource-demanding types of software applications, then they may constitute a strategic area for EU expertise. From a policy viewpoint, it is therefore all the more important to understand where the EU stands. Some necessary conditions seem to have been met as regards providing a sound basis for the competiveness of the EU video games software industry:

- The EU benefits from a rich milieu of developers and an important population of middleware producers,
- The EU is strong on telecom services, especially mobile, and has seasoned customers.

However, these positive conditions may not be sufficient to overcome the weaknesses in the publishing and device segments. Here, specific enabling policies could play a key role: for instance, the deployment of the next generation of broadband (wireline and wireless) or adequate business conditions for creative developers (funding, venture capital…).

As often highlighted by the relevant players, the European video games industry has flourished without any focused EU policies beyond some broader horizontal policies (e.g. e-commerce). Indeed, some parts of the EU regulatory framework such as copyright, data protection, privacy law, consumer protection, the protection of minors and the e-money directive are often quoted, mainly as barriers. In this fragmented environment, it remains difficult to get a precise notion of what is really necessary and what is really a hindrance. What constitutes a hindrance for some may be a welcome enabler for others, as the debate over the "cultural" aspect illustrates.

In spite of this lack of agreement on topics, some concerns are shared within the industry. The lack of an integrated digital market is one; the "misperception"[20] of the industry is another. This industry considers itself almost grown-up after twenty years. It went through the continuous development of new forms of entertainment, and of an increasing number of devices upon which interactive software may be enjoyed. Online and wireless/mobile games are expected to be the segments of the EU market that will grow the most over the next few years and are respectively the second and third biggest segments of the industry. Casual games, as shown in this report, are an important and rapidly growing subset of online games and are now greatly increasing the numbers of gamers across various demographic variables. Furthermore, the gaming industry may have promising potential not only for the entertainment it offers, but also for education and training.

Video games are not technology driven, but technology enabled. Nonetheless, technology can still be a wild card. For instance, will "natural user interfaces" revolutionize gaming and entertainment in the home? It remains to be seen to what extent such enabling technologies will remove one of the barriers to gaming and entertainment, i.e. the controller, freeing consumers to have the experience they want with technology they will perceive as "natural".

Some players are still optimistic and of the opinion that there is the room and the means to grow large global European companies rapidly in the video games arena. However this may require some intervention or at least more focused attention. Most of the segments are faced with difficult access to funding and, as could be expected, little risk willingness from potential finance providers. The new digital agenda may open up some new avenues.

20 This segment of the media and content industries is often perceived as the *"unacceptable face of entertainment"*.

A cross-comparison with the two most prominent cases of direct intervention by governments (Canada and South Korea) to support this industry (and attract "creative industries") shows policies consistent with these governments' historical approaches. In the Canadian case, government interventions since World War II helped to create the basis of a national cinema. In the South Korean case, the emphasis on the ICT sector dates back from the attempt to recover from the 1997 economic crisis. In both cases, the policies are rooted in national policies aiming at long-term rather than short-term solutions.

Introduction

The report starts by introducing the technologies, their characteristics, market diffusion and barriers to take up, and their potential economic impact, before moving to an analysis of their contribution to the competitiveness of the European ICT industry. It concludes by suggesting policy options.

The research is based on internal and external expertise, literature reviews and desk research, several workshops and a synthesis of current knowledge. The results were reviewed by experts and at dedicated workshops. The report concludes that the general expectation for the coming years is an accelerated migration of contents and services to digital, in a scenario of rapidly increasing convergence of digital technologies and integration of media services, taking advantage of improved and permanent network connections. The role of the creative content industry is expected to increase accordingly. Communication services and the media industry will co-evolve in the playground of the Internet of services, along with a *product to service* transformation of the software market in general. In this general context, the video games software industry is expected to play a major role. The games industry may become a major driver of network development, as it was in the past for computer hardware development.

This report documents a series of core insights into the video games industry that allow us to understand the market, its industrial structure including the main actors and activities, the aspects that determine the major tensions and power relations among actors, and also the potential disruptions.

In spite of being a very young industry, video games already makes up a large and growing share of the media and content industries. Important spillovers have been generated by the video games industry, as technology originally developed for video games is increasingly used in other applications and applied to different sectors. Digital contents are also drivers of global technology markets, both for consumer electronics manufacturers and PC vendors[21] (OECD, 2005). Finally, video games are seen as "an additional platform for content distribution by the entertainment industry, complementing music, films, TV and books" (OECD, 2004). In addition, along with increasing interconnection and communication among devices, video games will be affected by the same trends as mentioned above: connectivity becoming permanent, products converting into (online) services, and progressive integration of media services and technologies.

The market for video games is rapidly changing in parallel with the above mentioned trends for integration and convergence. These dynamics result in further changes in already differentiated business models.

The perceived negative downsides of gaming may have deflected the attention of industrial policy makers away from the European video games industry, even though it appears to have influence on the global scene. Increased attention, however, could result in indirectly supporting technological improvements with positive spillovers to other sectors, while creating a favourable environment for the development of the cultural and creative sector.

The first part of the report is structured around the industry's three most significant

21 An introduction to digital music evolution dynamics is available at: http://smcnetwork.org/node/244 (last accessed: Sept 8th, 2009).

characteristics: the platform-based organisation of the video games industry, its value-chains and economic size, and the structure of its software layers. It does justice to a part of this industry which, up until now, has received little attention, namely the software layer, as most studies have concentrated on the platform side (hardware).

In Part 1, the first chapter briefly outlines the history of the video games industry. Chapter 2 presents a classification of video games. Chapter 3 investigates the roles of different actors in the value chains and business models on which revenue schemes are based, stressing the essential role of hardware owners in the industry. Chapter 4 introduces the available data on the market's economic dimension. Finally, Chapter 5 helps us to identify the locus of the study by pointing at the most relevant software layers in the European video game industry.

The second part of the report focuses on two major disruptive trends, mobile and online gaming, and the future competitiveness of the European video games software industry is discussed. Part II investigates the position of the European industry with regard to two emerging software-related areas. In the last section, several policy recommendations are made which could help to position the European video games industry better in the future.

Chapter 6 proposes a definition of online games, followed by the description of the online games ecosystem, the characteristics of the production process and the value chain organisation in the online video games industry. The overview of market data shows the business activity and dynamics and is accompanied by a stylised description of the main techno-economic models currently ruling the production and distribution of online games. Then, it looks at successful European companies in order to analyse the main strengths and weaknesses of European firms. Finally, the main short-term challenges to European companies are identified.

Chapter 7 analyses the status and future prospects of mobile gaming in Europe with a view to understanding its competitive position and the potential measures to improve it. After a brief history of mobile gaming, the mobile games ecosystem is described: main actors and activities, links with the mobile and software game industries, the main techno-economic models, players' strategies, users' perspectives and some market data and forecasts. In the following part, the success factors and limitations –challenges ahead- for its evolution into a potentially dominant game platform and the possible disruptions along this road are discussed. Finally, the case study concludes with possible ways in which this industry may evolve, and some ideas are given on designing European policies to help develop it.

Chapter 8 underlines the main challenges and sums up some of the current debates that are splitting this industry. It gives examples of policy intervention by governments outside Europe (Canada, and South Korea). Some elements of the EU framework are reviewed from the vantage point of the industry.

Part I. The Video Games Software Industry

1. Video Games: A Brief History

Many attempts have been made to identify the first video game.[22] These trace the first interactive computer game back to 1961 when *Spacewar!* was created by MIT student, Steve Russell on a mainframe DEC PDP1.[23] Nolan Bushnell later produced an arcade version of the same game.[24]

However, the birth of the modern video game is usually seen as 29 November 1972, when the game *Pong* was launched in Sunnyvale, California, though sometimes this claim is made for the (less known) Odyssey console of Magnavox (see Box 1). Pong was a machine-based game built by Al Alcorn, an engineer working for *Atari*. This company had been founded a few months earlier by the young engineer Nolan Bushnell and Ted Dabney.[25] The diffusion of coin-operated arcade games followed soon after, reaching a peak in 1978, largely due to the successful release of *Space Invaders,* followed by the first colour games.

Between 1971 and 1976, *"first generation"* video game consoles, based on dedicated logic circuits without any microprocessors, started to be distributed.

In 1974, Philips bought Magnavox, which produced the console *Odissey* (which already used cartridges, albeit non programmable ones[26]). In 1975, Magnavox released a console with a home version of *Pong* which became popular, and Atari followed suit.

Box 1: MAGNAVOX - a 1st generation console milestone

1972: The Magnavox Odyssey is often considered as the world's first home video game console. It was demonstrated on 24 May 1972 and released in August of that year, pre-dating the Atari Pong home consoles by three years. The Odyssey was designed by Ralph Baer, who began around 1966 and had a working prototype finished by 1968.

Sales of the console were hurt by poor marketing by Magnavox retail stores. A few months later, many consumers were led to believe that the Odyssey would work only on Magnavox televisions. For that reason, later "Pong" games had an explanation on their box saying "Works on any television set, black and white or color".

Baer went on to invent the classic electronic game Simon for Mattel in 1978. Magnavox later released several other scaled-down Pong-like consoles under the Odyssey name (these did not use cartridges or game cards), and, in 1978, a truly programmable, cartridge-based console.

Adapted from Wikipedia at http://en.wikipedia.org/wiki/Magnavox_Odyssey
Last consulted on 15 December 2009

22 Among others, Barton M. and Loguidice B. (2009) and again in Barton M., Loguidice B. (forthcoming), as well as in Kent (2001).

23 For all references see Bibliography, at the end of the report.

24 For the sake of completeness, less famous and epoch-making forerunners were the *Cathode-Ray Tube Amusement Device* patented in1947 and the *Tennis for two* conceived to be played on an oscilloscope in 1958.

25 A critical history of the video game diffusion and of its implication in a sociological perspective in Williams, 2003. Other detailed attempt to track the main passage in the history of video games in Sheff 1999, Kent 2000; Poole 2000.

26 Later consoles made use of programmed cartridges containing read-only memory (ROM) chips, each allowing to upload and use a different game. Non programmable cartridges only permitted to differently configure jumpers, thus changing settings and altering the circuit logic.

In 1976, Fairchild released its Video Entertainment Systems (VES), the first *second generation* console. This was equipped with a general purpose processor able to read cartridge memories and to execute the stored game. In the same year, Nolan Bushnell sold Atari to Warner Communications, after Atari started distribution of its version of a flexible video game console, the *Atari 2600* (also called VCS, Video Computer System), which allowed users to play different games by means of interchangeable cartridges. The two competitors of VCS were Intellivision by Mattel (1980) and ColecoVision (introduced 1982). By around 1980, it was already common practice to release home versions of games which had been successful as arcade games, as happened with the famous *Space Invaders* by Atari.

Box 2: FAIRCHILD Video Entertainment System (VES) - a 2nd generation milestone

1976: The console that changed home games as we know them, the Fairchild Video Entertainment System (VES) revolutionized an industry (…). By 1976, the Pong-driven game industry was starting to decline in popularity due to market saturation, caused by "me too" companies flooding the market with cheap imitations. At this point, Fairchild entered the market with a new machine that wasn't a "me too" device at all.

This was wildly different than the normal, still-evolving, Pong systems, which were dedicated to only playing simple games with a multitude of variations at the flick of a switch. Fairchild's new console featured plug-in cartridges that contained ROM chips with actual microprocessor code, rather than dedicated circuits like those used in the plug-in cards of the original Odyssey game system. So instead of the short shelf-life common to Pong systems, Fairchild's console could now be continuously renewed by simply plugging in game cartridges, which they called "Videocarts." With the possibility of new Videocarts released at any time, the potentially long lifetime of the console seemed very attractive to Fairchild.

(…)This was THE first cartridge system, and it established a format that was to be used by almost every game company for years to come. Even today, when cartridges are finally being phased out in favor of CD-based consoles, they are still the de facto standard for handheld gaming systems, such as Nintendo's Game Boy series.

Source: ClassicGaming Museum[27]

The second generation of video game consoles came to an end with "the North America video game crash of 1983". This was the end for a number of companies and the development of this type of console was abruptly blocked. The reasons for the crash are usually found in the saturation of the market by a number of low quality consoles and video game titles.

For a couple of years, future development of the video game industry was in doubt, leading the media industry's big players to postpone their investment in the segment (Williams, 2003; Kent, 2000). This eventually took place some years later, with the appearance of new actors. The Japanese corporations, Nintendo and Sega took control of the market and launched the *third generation* (8 bit CPU) console. These corporations exploited the advantage of vertical integration through every stage of the industry, playing a more and more relevant role in the market. Meanwhile, a number of different consoles attempted to achieve the position of dominant industry standard and, at the same time, both the content of games and the age and typology of users rapidly evolved.

27 See at: http://classicgaming.gamespy.com/View.php?view=ConsoleMuseum.Detail&id=6&game=12. Last accessed on 15 December 2009.

Table 1: Generations of consoles

Generation	Period	Characteristics
1st	1972-1976	Logic circuits, no microproccessors
2nd	1977-1984	Early 8-bit[10] era; ROM cartridges flexibility
3rd	1985-1989	8-bit era, Nintendo NES vs Sega MegaDrive
4th	1990-1995	16-bit era, Nintendo, Sega, handhelds
5th	1995-2000	32-bit era (then 64). Sony PlayStation, Sega Saturn, Nintendo 64.
6th	2001-2005	128-bit era. Sega exited; Microsoft Xbox, Sony PlayStation2, Nintendo GameCube, Sega Dreamcast.
7th	2005-	Microsoft Xbox 360 (released 11.2005), Sony PlayStation 3 (rel. 11.2006), Nintendo Wii (rel. 11.2006). Current generation. High-definition graphics, controllers with movement sensors, wireless controllers. Handhelds (Nintendo DS, PSP) with Wifi connectivity.

In the second half of the 80s, personal computers[28] started to become available, and video games dedicated to them were deployed. This trend was further supported, at the end of the decade, by the diffusion of CDs. The fast evolution of home video games consoles on the one hand, together with the spread of PCs on the other, rapidly succeeded in sweeping away coin-operated arcade games. Customised chips for graphics and music, constituting the last advantage of arcades, were finally overtaken by the improvement in PC-related technologies in the 90s and by better low cost microelectronics for consoles. These improvements have produced, up until the present day, many new genres[29] of games (for example, first-person shooter games), made possible by the availability of high quality graphics, and increasing computing power at decreasing costs. [30]

By the 90s, the video game was already considered part of the mainstream entertainment and media industry, due to the involvement of the industry's main corporations (after Warner's early attempt,[31] Sony and others followed), to the rise of new big actors (in addition to Atari and Commodore International, Nintendo started consolidating the dominant position it still holds), and to the size of the sales and profit. Multimedia capabilities were introduced into video games, while business models kept differentiating among segments depending on the size of the producers.[32]

Even though it was not the first, the Nintendo *Gameboy* distributed from 1989 opened the way to the diffusion of handheld console-based video games. Sega, founded in 1940 in Honolulu (Hawaii, US) later moved to Japan, where it became the leader in the arcade game market. It entered the home games console market in the mid 80s, and by 1989 had consolidated its position as a major console producer.

28 Commodore 64, Sinclair ZX Spectrum, Atari 800 started diffusing since 1982, allowing good graphic output on a TV; Apple II arrived earlier and was substituted in the late 80s by the Macintosh while also the first IBM PC compatibles started reducing prices and increasing power and graphic capacity.

29 About games "genres", see Annex 3.

30 The number of bits mentioned refers to the CPU word size. Bit rating for consoles have been used by hardware producer to show power. This served as benchmark until the 64 and 128 bit words stage. After that point other factors (processor clock speed for example and of course memory size) were affecting performances more than the CPU word size.

31 Warner Communications bought Atari in 1976 from Nolan Bushnell, then in 1984 sold the home computing and game console division of Atari itself, under the name of Atari Corp., to the former fonder of the competitor Commodore International.

32 To give an example, small independent producers, as they had reduced financial power and were consequently limited to smaller scale projects, were active mostly in the PC-based segment, releasing freeware games. In the console and then in the handheld segment, the high barriers to entry, and also the early technological and business choices made by initial big players which led to non interoperability, contributed to dynamics typical of oligopolistic markets (Williams 2002) with a very small number of powerful actors.

In parallel, a *fourth generation* (16 bits CPU) home console, with Sega and Nintendo still the market leaders, evolved into a *fifth generation* (32 bits CPU), accompanied by the return of Sony and by further increments in the CPU word size. The *sixth generation* (128 bits CPU), emerging in 2000, was the last for which bit rating mattered. The three dominant players further consolidated their position.[33] Microsoft, Sony and Nintendo controlled the whole home consoles market. Nintendo also managed to maintain absolute dominance in the handheld market (with Nintendo DS in its various releases), only challenged by Sony (with the Play Station Portable, PSP, series).

The *seventh generation* of home consoles rapidly followed after 2005, reinforcing the dominance of these three console producers: Microsoft's *Xbox*, Nintendo's *Wii* and Sony's *PlayStation*. Almost surprisingly, Nintendo succeeded in pushing a disruptive innovation and the necessary technology: i.e. the introduction of motion control as the standard method of interaction. This also allowed for further evolution in content and categories of best seller games.

However, other novelties have emerged in this dynamic market, which have challenged the three dominant major players:

In 2003, Nokia released the first platform for mobile gaming. Despite the fact that this first attempt was not a complete success, it opened the way to a new stream of games (see more on this in Chapter 7). The further emergence of smart phones accentuated this trend.

At the same time, broadband connection diffusion allowed for an impressive proliferation of online gaming and the development of collective, massively-distributed games.

In addition, games with limited complexity, designed for extemporaneous usage, became sufficiently widespread to open up a new sub-sector of *casual games*. This sector is becoming more and more important in market analysis as user numbers are increasing rapidly.

These recent moves in the market, which could affect both the dominant companies and the competitiveness of the European industry, will be further analysed in the second part of this report.

Box 3: Nokia

Nokia, founded in Finland in 1865 and incorporated in 1871, opened an electronics sub-division in 1960 and started producing electronic devices in 1962, the first digital switcher for telephones being produced in the '70s and the first fully-automatic cellular phone of the first generation in 1981. Nokia supported the development of the GSM(Global System for Mobile telecommunications) standard, adopted in 1987 as European Standard for mobile technologies. It is since long the first world manufacturer in terms of market share, holding the 52,38% against the 15,98% of Son- Ericsson, 7,13% of Samsung, 2,9% of LG, 2,79% of BlackBerry and 1,54% of Motorola (Manufacturer Market Share data, November 2009, GetJar data collected through wapalizer.com). Nokia Communicator released in 1996 marked, together with IBM's Simon in 1993, the beginning of the smartphone era, smartphone being a still loosely defined category of mobile telephone with extended capabilities and some PC-like functionalities. Nokia then release Nokia 7650, referred to as "smart phone" in the media, and kept its supremacy with N-Series of 3G. In 2008, while Google released the cross-platform operating system Android, Nokia bought the independent non-profit organisation Symbian Foundation, supporting the deployment of the Symbian operating system as royalty-free open source software, Symbian being the most diffused operating system for smartphones (data Canalys 2009).[34]

33 Before the end of the period, Sega left the hardware market and focused only on game development.

34 Please refer to Chapter 5, Section 5.2.4 for smartphone operating systems.

2. Video Games: A Definition and Taxonomy

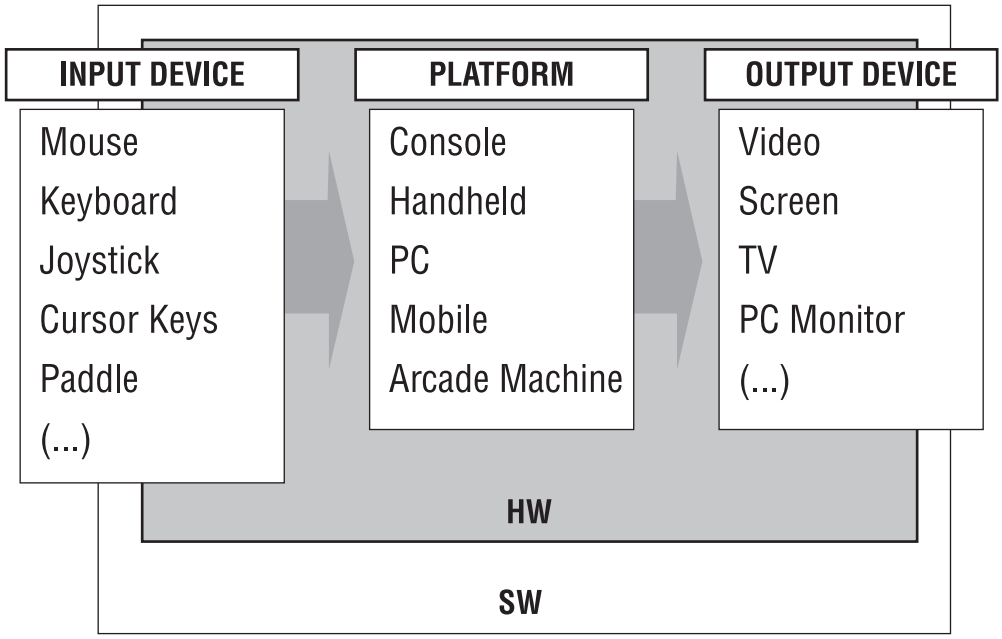
2.1 Video games components

The most common definition describes video games as "an electronic or computerized game played by manipulating images on a video display or television screen[35]". What a video game is can also be explained as "a game that can be played by using an electronic control to move symbols on the screen of a visual display unit[36]". A key element is, of course, the fact that the game is controlled by software, and therefore the game itself must be played on a video game console or a computer. A video terminal, a television screen or any form of a screen is necessary as an output device, and also one or more tools as input devices must be present to allow the user to control and interact (a paddle, joystick, mouse, cursor keys or a combination of any of these input devices).

2.2 Electronic games vs video games

Having explained what is meant by "video game", it is worth mentioning that there is still no general agreement as to whether this general definition should apply to all sub-categories. The expression "video game" is indeed most often intended as a general category, under the umbrella definition of electronic games. Electronic games are considered a wider category also including, for example, electronic pinball machines and any other entertainment machine that has some kind of electronics but not a screen as the output

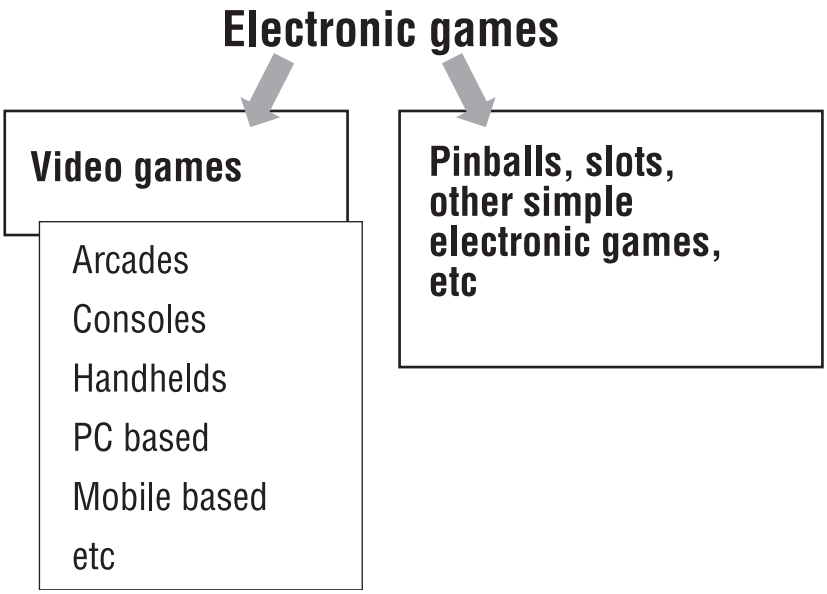
Figure 1: Video games: components



35 The American Heritage Dictionary of the English Language, Fourth Edition, 2000 by Houghton Mifflin Company. Updated in 2009.

36 Collins Essential English Dictionary 2nd Edition 2006 HarperCollins.

Figure 2: Electronic games and video games: a platform-based classification



device. In most of the literature, the category ' video games' is considered as grouping all the subcategories such as arcade games, console games, and PC-based games.

This type of categorisation implicitly refers to the platform on which games are based, and in the next sections a classification of platforms will be presented in more details.

Here, only a brief introduction to the above-mentioned subcategories is proposed:

- Arcade games are defined as coin-operated entertainment machines (they are usually very specialised electronic devices, equipped with a monitor or screen and a series of input tools, contained in a cabinet and typically designed to play only one game). This kind of video game was extremely common at a certain stage in the development of the games industry but is progressively disappearing, because of the impressive diffusion of "personal" gaming devices (consoles, handheld devices, PC equipments).
- A PC-based video game (also referred to as "platform gaming products", causing some confusion) is a game which involves a player interacting with a personal computer connected to a high-resolution video monitor, by means of a specific software programme.
- Console-based games are played on specialized electronic devices that connect to standard television apparels or to composite video monitors.
- Handheld games are played on (handheld) gaming equipment, a self contained electronic device that is portable and can be held in a user's hands.
- In the case of mobile games, the video device is obviously not dedicated to such a task, but they are nevertheless able to provide the output for gaming activities, which are played on mobile phones, smart phones or personal data assistant (PDA) devices.

2.3 A platform-related classification of video games

The most-used definition of platform is the one provided by Gawer and Cusumano (Gawer & Cusumano, 2004), which describes a platform as made up of several physical and / or software modules linked by interfaces. The concept of platform is connected to the presence of "foundation products" that work as the core of a system of components, enabling

the interoperability and thereby increasing the platform's value. With the pervasive diffusion of ICTs in the past decades, platforms have been playing an increasingly central role in aggregating ecosystems of firms (Baldwin and Woodard, 2008), through the way they manage to connect multi-product systems. From the point of view of economics, the existence and behaviour of such platforms is often connected to the presence of multi-sided markets. As stated by Baldwin and Woodard (among many others), "platform architectures are modularizations of complex systems in which certain components (the platform itself) remain stable, while others (the complements) are encouraged to vary in cross-section or over time". The modular interfaces mediating between the platform and its complements are bound to be stable elements, their stability being necessary to provide the stability of the whole system of products (or services). In other words, the development of complement modules has to abide by the constraints and rules provided by the platform architecture. Early studies on technology strategies pointed out that platforms can be seen as points of control in an industry, for example the computer industry evolved around a small number of dominant platforms (Bresnahan and Greenstein, 1999). In this framework, Intel, Microsoft and Cisco have been taken as examples of platform leaders in production systems subject to fast evolution (Gawer & Cusumano, 2004).

By grouping video game products by the platform they depend on it is possible to identify at least three categories, each of which can be linked easily to a specific market segment. Each category is moulded by the constraints and opportunities given by the specific platform. There seems to be almost general agreement in both business and academic literature (apart from some terminology differences[37]) on this classification, and also on the importance of analysing each market segment separately in order to avoid a distorted perspective of the industry in terms of market share, competition and product (Williams, 2002). Nevertheless, despite being unique in their characteristics, all the above-mentioned segments are obviously interrelated.

We will describe the structure of each of the markets around each platform in the following chapter as the hardware component of this industry.

2.4 Further classifications of video games

2.4.1 Content-based taxonomies: the "genre" taxonomy

In slightly more modern wording, video games are described as a specific kind of digital entertainment, in which the player "interacts with a digital interface and is faced with challenges of different kinds, depending on the plot of the game" (Walfisz et al., 2006). Technological improvements have made video games, "the most complex toys ever built" (Sutton-Smith, 1986).

A classification based on the content of the games themselves, which would lead to the identification and categorisation of video games "genres", is not relevant to the purpose of this report, though some information is given in Annex 2. Classification exercises of this type are quite common in games-related literature as video games have been differentiating and clustering into different strands, ever since the first games appeared.

2.4.2 Purpose-based taxonomies: core, serious and casual games

New labels have also appeared, now frequently used informally in specialised magazines, online published articles, policy-oriented documents, etc. These have become a

37 Sector websites like ieXbeta, for example, refer to "platform gaming" as to the specific category of PC based gaming product (http://iexbeta.com/wiki/index.php/Games) (last accessed on 7 September 2009).

diverse video games classification, which depends on the (perceived) purpose of the game.[38] There are three main categories generally referred to: core games, serious games, and casual games.

These categories, though still unstable, seem to be operational and specifically attractive in market analysis as they are associated with target audiences. This probably became the main objective of such categories when video games started finding their way into new target markets showing promising profit perspectives.

Core games

Core games is generally considered to be a label that identifies the old basic category of video games the market was already used to: those games mostly bought in shops, to be played on personal computers, home consoles or handheld devices by (usually young) players used to dedicating part of their free time to this kind of entertainment.

The increasing complexity of these games is a characteristic which is appreciated by demanding users and justifies the purchase price. This complexity distinguishes core games from casual games. Also these games vary according to the different degrees of involvement expected from the players.

Serious Games

Serious games are differentiated from the general group of entertainment games by the fact that these games have other uses than entertainment. This category would therefore be better described as *applied games*, as this would allow us to address the general use of games and game technologies for purposes beyond entertainment (Sawyer, 2007).

The objectives of serious games vary from professional training and educational[39] to propaganda, military training, or government awareness raising actions.

Pure serious games seem to be those designed to provide training simulations for professional workers. Their distribution channels and modality also differ, as these games are often not distributed to individuals but in many cases customised or even tailored to the needs of single companies, by specialised publishers. Therefore, in this market, the B2B business model is frequently the case (IDATE, 2008), and players are willing to adapt and customise the content of their products and directly target the consumer market.

Serious games have differentiated along a variety of segments. For example, it is questionable whether *advergames* can be considered as a subset of serious games. Their purpose, though aimed beyond entertainment, is completely different from that of training and educational games. Since they were first named in 2001, Advergames are generally sponsored and distributed for free to advertise a specific product or organisation, and keep attracting corporation interests due to the expected return from the extended stay of users on the company's webpage. Three types of *advergames* are identified as: Above The Line (ATL),[40] Below The Line (BTL),[41] and Through The Line (TTL), the latter being close to viral marketing. *Militainment,*[42] recruitment tools, and edutainment are generally recognised as BTL. *Exergames* (exercise – video games) take advantage of the new media peripherals which permit, for example, motion recognition.

38 For example refer to http://www.gdmag.com/homepage.htm (last accessed: Sept 24th, 2009) and http://www.gamasutra.com/php-bin/news_index.php (last accessed: Sept 24th, 2009), besides of course http://en.wikipedia.org/wiki/Video_game#Types (last accessed: Sept 24th, 2009).

39 A good reference to the educational value of games can be found at http://games.eun.org

40 The expression Above The Line refers to all promotional activities done by companies through mass media.

41 The expression Below The Line refers to promotions like sales promotions, consumer promotions, PR, events, point of purchase promotions, and all unconventional tools that marketers adopt. As an extension, the expression Through The Line refers to all marketing activities which mediates between the two more extreme positions.

42 Military entertainment: nowadays rather diffused, mostly by the US Army. They often come in two versions, a military and a civilian one, and can be devoted to specific training and simulation purposes, or rather to recruitment and public relations.

Box 4: Serious games and training

Other games, based on serious games[43] developed as part of specific business strategies, started being developed to support and improve e-learning programmes. These games set out to exploit the powerful experiences that new interactive digital media can offer to the user. In 2002, the Serious Games Initiative was founded to support serious games projects and studies on a number of topics like healthcare, productivity, visualization, science, training and education. However, previous studies had already identified the many new opportunities that serious games could open up for complex skills learning in higher education (Westera et al. 2008). These studies demonstrated, for example, the way games can involve active learners through exploration, experimentation, competition and co-operation. More and more frequently games are playing a role and are being incorporated into training programmes, and some studies have explored the connections between learning theory and the use of games for team training. The effectiveness of specific genres of games have also been evaluated and the characteristics of their design to promote team learning have been identified. For example, Massively Multiplayer Online Games (MMOGs) perform best in this role, because of their capacity to involve a huge number of players simultaneously (O'Connor et al., 2008).

Other studies show that games from the First Person Shooter genre, in which the player deals with a virtual environment in the first person and interacts with it by means of tools or weapons (for this reason they are generally referred to as "violent games"), are also suitable, with minor modifications, for effective training. They are starting to be applied, for example, in training in fire safety for the fire brigade.[44] By using the code used for commercial games, it is possible to build 3D virtual worlds to train people much more quickly, cheaply and effectively than by developing games through traditional virtual reality toolkits or by writing the code from scratch. Moreover, commercial games code has already been extensively tested.

Extensive experiments to integrate games into e-learning platforms are already taking place. The integration of virtual graphic adventures into online education platforms requires analysis of the educational and technological aspects games must have to complement traditional teaching. Recent studies (Moreno Ger et al., 2008) confirm that the graphic adventure genre is the most flexible and allows the greatest number of subjects or areas of knowledge to be covered. Fundamental characteristics in educational video games design are: the possibility for the evaluation of learners' performance, adaptability and ease of integration.

Casual Games

The main characteristics of *casual games* can be identified as: (i) their ease-of-use in terms of plots (searching, matching and time management exercises are the most common topics), which are not very complex, (ii) the accessibility with regard to the distribution of the games, which are most of time distributed by means of casual games portals.[45]

As a consequence, they differ from standard core games because of: (i) the number of target players, with a much wider audience; (ii) the age of target players, who can be children, adults or elderly people; (iii) the gender of target players (majority of female players); (iv) the average duration of play session (considerably shorter, making them possible to play for short breaks basically anywhere).

It is claimed that a revolution has taken place in the traditional video game industry, triggered by the emergence of casual games, and their capacity to attract people who are not usually video game players. The economic

43 Again, the expression Serious Games is used to refer to games applied to a purpose that is not of pure entertainment.

44 Refer for example to the experiment run at Durham University: http://www.dur.ac.uk/shamus.smith/fire/ (last accessed: 29 June 2009).

45 Casual game portals are available on the Internet and provide games that can be transferred to different platforms; there are also dedicated network portals, which can be reached by means of the connectivity facilities which consoles and handheld devices made available to their users.

consequences of this process are expected to affect not only the entertainment sector, but also the telecommunication sector. In fact, what at first appeared to be a minor market in the video game world, i.e. simple games usually distributed over the internet, is now seen as one of the most promising, mostly because it seems able to expand by attracting up to 70% of those who did not usually play video game (IDATE, 2008).

The number of such games which are straightforward in concept, easy to learn, and simple to access and play is growing fast. Nintendo was among the first to offer simple alternatives[46] to complex and almost inaccessible games produced by its competitors Sony and Microsoft, with the goal of reaching a much wider pool of potential users of all ages. The same simplification also applied, to a certain extent, to the Nintendo consoles, contributing to their success

The customer base for casual games has not only grown, it is now made up of players of all ages – both male and female. This is a new phenomenon in the video games market and optimistic forecasts predict that core games will be relegated to niche markets by casual games which will become a first-tier form of entertainment.[47]

Box 5: Characterising casual games

Though casual games offer shorter play sessions to users, they end up being "sticky" in the same way that standard core games do. A 2009 Nielsen[48] survey, investigating whether casual players return to their favourite games, shows that the recurring play rate of casual games is high and can even exceed that of non-casual games with high recurring game play. The same survey reveals that the average duration of play session is less than half that of core games.

As mentioned above, two demographic aspects of players are relevant: their gender and age. Nielsen (2009) indicates that females made up 58% percent of the players, almost the opposite of what happens in core games. eMarketer (eMarketer Digital Intelligence, 2007), quoting figures from an Ipsos Insight study commissioned by the Entertainment Software Association, reports that 62% of US core games players are male and 38% are female. A further study by Universal MsCann confirms a predominance of male players (58%) in US console games (eMarketer 2007). Indeed, various studies addressing the demographics of video games testify that their enormous diffusion and, more recently, their capacity to also reach women, is making games an effective "marketing tool".

Moreover, for casual games the dominant age group is between 25 and 54, and it is considerably wider than that of standard players. This further increases the importance of the casual games audience as a target for marketing advertisements.

Finally, the average hardware requirement for casual games is lower than for standard games, due to the limited complexity of casual games which translates into lighter features, simpler graphics and smaller dimensions.

All these aspects contribute to making them typically inexpensive to produce, or at least much less expensive that core games. Smaller companies can afford to develop these games, and the variety of the offer is fast increasing.

46 Actually, the game which is referred to as the first casual game is Windows Solitaire, coming by default with the Windows operating system standard installation; Minesweeper and other casual games were included afterwards in the set of games in the specific Windows folder. Nintendo's famous precursor was Tetris for the Nintendo GameBoy, delivered from 1989 as free pack-in game.

47 Refer John Welch, CEO of PlayFirst, in his keynote speech at the casual Game Summit 2008 in the framework of the GDC 2008 Conference: http://uk.gamespot.com/news/6186207.html?tag=result;title;0 (last accessed: 27 September 2009).

48 Nielsen bases its analysis on data from a sample of more than 185,000 US tracked PCs processed by the GamePlay Metrics Syndicate Service, a software-based metering technology identifying individual program executables and allowing to connect active windows and programs with demographic information. 847 PC casual game titles were tracked by the Metrics (Nielsen, 2009).

The pricing and underlying business models for casual games are rather differentiated, largely due to the fact that projects are smaller and hence need less investment. Nevertheless, the casual game segment is not only populated by small independent firms. By 2007, more and more big developers and publishers had already entered the casual games market, and the investments, as reported by CGA, were huge.[49]

Finally, it is worth noting the growing diffusion of casual games played (and to a certain extent even created) on social networks, and that the phenomenon of *social gaming* is gaining more and more relevance.

Box 6: Glimpses of demand: video gamers in Europe, 2010 (ISFE) - a summary of some surveys.

1. *Market Size*

The Numbers

- Across the 8 major European nations surveyed (UK, France, Italy, Germany and Spain (UFIGS) plus Poland, Sweden and the Netherlands), **25.4% of adults have played a video game in the last 6 months**
- This percentage varies from 38% in France to 17% in Italy and Poland
- Using this data, we estimate that **there are 95.2 million adult video gamers across all 18 countries covered by the Gamer Survey**
- Gaming is most popular among the young, however almost 30% of 30- 49 year olds play video games
- 31% of males and 20% of females are gamers; it is therefore not the male-only preserve often portrayed by the press

Gamer Commitment

- Since the launch of the new games consoles there has been a marked increase in the numbers of people enjoying gaming. However, many of these new gamers are less dedicated to gaming and they spend less time and money on gaming
- 68% of all gamers in the 8 countries surveyed are in the three least dedicated gamer groups; intermittent, marginal and dabbler gamers
- The most dedicated group, committed gamers, make up less than 7% of all gamers, but they buy many more games and play more hours than other groups
- Male and younger gamers are more likely to spend more time and money on gaming

2. Usage of video games

System Use

- Across Europe the PC remains the most used games system; it is the main system for 49% of gamers aged 16-49
- The Wii and mobile phones are the next most popular systems used as main systems for gaming by 14% and 10% of gamers respectively
- A lot of DS/DS Lite/DSi systems are used as secondary gaming systems and the PS2 still has significant use as a secondary machine (used by 29% and 25% of gamers)
- Mobile phones are important main systems in all regions outside the UK, France and Germany

Handhelds

- 54% of gamers use a handheld gaming device
- 41% of gamers mostly play games on handheld consoles at home, 26% mostly play while travelling and 17% mostly when waiting for someone

49 Among others, $83 million were invested by Big Fish Games (one of the world's biggest free-to-play online casual games) for the Japanese market and the Vancouver division, $20 million by Oberon Media for the Chinese market.

Multimedia Use
- Watching DVDs, listening to music, and watching films are the most popular secondary uses of games systems with multimedia capabilities
- 36% and 31% of gamers use the social networking and online chat services on their consoles

Hours of Gaming
- The inclusion in Spring 2010 of all gamers has led to the identification of intermittent gamers who do not play games regularly every week. 31% of people who play games do not play regularly for an hour or more each week
- The trend is towards less dedicated patterns of play; overall 76% of gamers play for less than 5 hours a week

Games Purchase
- Almost 40% of people who play games have not bought or been given a game for themselves in the last 12 months, but are playing games others have bought
- 14% of gamers buy more than 3 games a year; together this group account for 56% of all games purchases
- Numbers of purchases are highest in the UFIGS countries, purchases range from 2.7 games each in the UK to 1.4 games each in North Eastern Europe

3. Attitudes and preferences

Motivations for Playing Games
- The core motivations for playing games are fun (61%), relaxation (53%) and a positive way to pass time (53%)

Motivations for Playing on Handheld Systems
- Handheld are for many time fillers; “when I’m bored/to pass the time” is the main reason given for playing handheld game systems by 52% of the gamers that use them, and a further 8% say they see it as “a good use of spare time”
- “it’s fun” is much less likely to be the main motivation for gamers when they play console or online games (16%)

Reasons for Not Playing
- The main reason non gamers do not play games is that they do not consider the benefits sufficiently great and therefore do not make the time to play; 41% of non gamers say “I don’t have the time”;
- The second main reason is a lack of interest in or understanding of games; 23% say video games are boring, 9% say games are only for children

- 11% of non gamers do not believe they are worth the money and say they are too expensive
- Only 7% claim they do not play games because they are too violent

Encouraging Non Gamers to Play
- Most of the reasons given for not gaming by non gamers are issues that are not so much matters of fact as of opinion or knowledge; they want to “be able to play with my children”, “play for short periods of time” etc, things others believe games provide
- Therefore, the motivations of non gamers are similar to many gamers’ motivations for playing games. Barriers to play are more about non gamers disinterest and lack of appreciation of what games offer. More people may be encouraged to play if the ability of games to meet their interests can be communicated to them effectively
- The success in recent years of the new consoles and new games like Wii Fit, Guitar Hero and Dr Kawashima’s brain training to attract new people to gaming demonstrate the further possibilities of expanding participation in games.

4. Video games among other leisure activities

Gamers Other Leisure Interests

- In 2010, simple social activities like chatting with friends are a universally popular pastime (92%)
- Shopping (78%) and eating out (77%) are also enormously popular
- Exercising outdoors has the highest proportion of people who claim this is their favourite activity, both in absolute terms and in relation to the overall popularity of the activity

Time Spent on Leisure and Entertainment

- The broadening of the gaming audience is reflected in the fact that gamers as a group now have many diverse interests; they are as likely to be playing sport or reading books as gaming
- The dominant pastimes remain watching TV, socialising and spending time on the internet

The Benefits of Video Gaming and Other Media

- Despite the 2010 sample covering a broader group of gamers, they believe that games are the best of the 3 media for keeping you mentally and physically fit
- More gamers now agree that games:
  - keep you mentally fit (50% + 8%)
  - allow you to spend time with the family (35% + 6%)
  - keep you physically fit (18% + 7%)
- A lower proportion of gamers identify games as: a fun way to spend time (55% 17%), stimulating your imagination (45% - 12%)

5. Online gaming

The Prevalence of Online Gaming

- 71% of gamers have played some form of online game in the past 3 months
- Free online games make up a large volume of the online games played; 19% of gamers play paid-for online games, 68% of gamers play free online games
- Free games on games websites (55%) and games of social network sites (37%) are the most popular kinds of free games.
- Games you buy and then play free online are the most popular kind of paid-for online gaming

Genre of Online Games

- Puzzle/Board/Game Show/Trivia/Card games are the most played online games; 58% of gamers play these games online
- 26% of gamers play MMO games

Who Gamers Play Online Games With

- The large increase in free online games now available via browsers and social networking sites, means that 37% of gamers now report playing games online on their own
- Among gamers who do play games with others, 20% of online gamers play against people in the same room

Where Gamers Play Online

- 95% of online gamers play games online at home
- 21% play games online at friends' houses
- Playing games online whilst travelling has increased to 9% in 2010, possibly a result of more online games being available for the handheld systems and mobile phones

Why Gamers Play Online

- "It's fun" is the most quoted reason for playing gamers online (49%),
- Other important reasons include: to relax/destress (40% 19% as a main reason), the challenge of the game (23% 7%)

6. The Socio-Demographics of Video Gaming Behaviour

System Use

- Females show a higher profile of users on the DS/DS Lite/DSi and the Wii than males
- the ratio of female to male users of the DS is 5.2: i.e. more than double
- All of the Sony platforms show a higher profile of male users than female
- PS3 has a male to female user ratio of 3:1
- Xbox 360 also shows a strongly male profile (5% of males are users and 3% of females)
- Males and younger gamers are more likely to spend longer gaming and buy more games
- Handheld gamers buy more games, phone gamers the least games
- Female gamers are much less likely to buy discounted games

Attitudes and Motivations for Video Gaming

- Similar proportions of both genders emphasise the same main reasons for gaming, however there is greater diversity in the secondary reasons for playing. Males are more interested in: passing the time (35% main 27% other), the challenge of the game (24%14%), playing with others (14%7%)
- Females give fewer secondary reasons but are slightly more likely to emphasize "relaxation/ distressing"
- More committed gamers are more likely to emphasize positive game aspects
- Reasons for not gaming also vary little by gender

Video Games in the Family

- Gamers who spend the most time gaming (committed and loyalist) also spend the most time playing games with their children (79% and 76%)
- Female gamers are most likely to always "monitor" the games their children play

Video Gamers Broader Activities and Interests

- Generally there is little to distinguish between gamers in their other leisure interests
- Females are more likely to prefer shopping, males are more likely to prefer sports and exercise
- More dedicated gamers are also more interested in other entertainment like the movies, or going out for a dance or to a gig etc (though the differences are not large, they clearly disprove the view that committed gamers as a group focus only on gaming)

Online Gaming

- 16-19 year olds are most likely to play online (83% have played at least one type of online game in the last 3 months)
- 24% of males play paid online games in comparison to 12% of females
- PC gamers show the highest level of gaming activity by system user types
- Puzzle games are the most popular type of online games for females and those aged 40 49

Source: study prepared by Gamevision Europe Nielsen for the ISFE[50] (our emphasis).

The survey provides an estimate of the number of video gamers in 8 key European markets. Data on the five largest European territories UK, France, Italy, Germany and Spain (UFIGS) has been provided from the Game Vision European Market Sizing Study, Spring 2010 which uses a face-to-face sample of 2,000 16+ adults in each country.

Estimates in the other three countries are based on omnibus research commissioned specifically for this report. 1,000 face-to-face interviews in Poland and 1,000 CATI interviews in Sweden and Netherlands.

50 The results of ISFE survey are available online: http://www.isfe-eu.org/index.php?PHPSESSID=uq9cthglq7iob2bggo1d2jj9b7&oidit=T001:662b16536388a726092159932136 5911 (last accessed: 28 July 2010).

3. Value Chain in the Video Games Industry

If we follow Mateos- Garcia and al. (2008),[51] this sub-sector has some specificities *"such as the technical, ICT-intensive nature of the creative activities undertaken inside it, or the existence of a diversity of markets for video games, linked to the diverse platforms where they are played, each of which is characterised by different industrial and technical infrastructures and dominant business models"*.

The value chain is influenced by the role of the 'developer' as a *"new actor that creates or licenses content as part of its technical development activities, using middleware (tools and components) which result in a software product which is published and distributed through a diversity of channels, finally reaching users (gamers) who play it in a hardware platform purchased from a suitable provider"*.

3.1 The main platforms

We will successively describe PC-based platforms, handheld and home consoles and mobile platforms in the following sections.

3.1.1 PC games platforms

70% of home computer owners are PC gamers. 40% of the population as a whole have home PCs, similar to the percentage who have home consoles. The player profiles for PCs, consoles and handhelds are similar in terms of frequency, hours per day and time of day.[52]

When taking into account the video games industry as a whole, the PC-based market is smaller than the mainstream one, represented by that of consoles. Nevertheless, it holds some peculiar characteristics, mostly related to the fact that it is on this platform that imaginative programming and risk-taking perform best (Williams, 2002).

Figures on the dimension of the PC games market in terms of units of games sold are necessarily more difficult to collect, due to the much bigger number of producers, to the loose linkage with the hardware architecture, and to the much more fragmented market in general. A list of PC game titles which sold at least 1 million copies comprises 96 PC games, without taking into account different sub-releases of the same game.[53] The first three of them, namely The Sims, The Sims 2, and StarCraft, shipped respectively 16 million units, 13 million units, and 11 million units.

It can be easily understood that products and economics differ from those of consoles and handhelds segments: in the case of the PC, a common standard is available for the architecture, which can also host different peripherals and powerful additional devices. Microsoft still holds the biggest share of operating systems installations. This implies that third party hardware manufacturers on one side, and independent developers on the other, have a well known and rather stable environment in which to operate.

The PC business context reflects low entry barriers which are free from proprietary restriction (Williams 2002) and manufacturers' licensing fees,

51 Mateos-Garcia J., Geuna A., Steinmueller W.E., 2008. The Future Evolution of the Creative Content Industries- Three Discussion Papers, pp.16-17. Fabienne Abadie, Ioannis Maghiros, and Corina Pascu, (Eds). IPTS, Sevilla, p.34, 35. Spain.

52 Nielsen, 2009 for the US market.

53 Built on data collected online from different sources at company level. The list is approximate.

and benefit from lower development costs (no need for specific –and highly expensive- software development kits, very low costs of duplication and deployment). These conditions allowed for the exponential increase of game titles: Williams (2002) reports that, in 1998, 4,704 PC titles were available, versus only 44 for the Nintendo 64 (handheld) and 399 for the PlayStation console (NPD Group data).

3.1.2 Console and handheld games platforms

Consoles and handheld game platforms are currently the best known set of products in the video games industry, with console products such as the Playstation (Sony), the Xbox (Microsoft), the Wii (Nintendo) and handheld devices such as the Nintendo Ds and PlayStationPortable.

Handheld video game systems have represented for many years a market exclusively devoted to young pre-teenagers, offering limited-complexity games. This market is dominated by the almost monopolist Nintendo,[54] by means of the long lasting sales success of the GameBoy. By the end of March 2009, 878 million units of GameBoy and its variations had been sold. For the current generation Nintendo DS handheld devices, 596 million were sold. The number of units sold for the recent Nintendo DS are 101.78 million (Nintendo, 2009).

The following table shows the cumulative number of units sold for the most diffused handheld game devices.

Supply has always been highly concentrated in a very small number of producers, as can be clearly seen when the total number of handheld devices sold is regrouped per platform owner, as shown in Figure 3:

As regards consoles, the situation is similar. The following Table shows the cumulative number of units sold for the most diffused home console devices.

The total number of home consoles sold from 1977 to date is estimated at more than 664 million units. Figure 4 shows the total number of home consoles sold regrouped by platform owner. Even though the number of actors is a higher than that of handheld manufacturers, the supply is still very concentrated.

In terms of structure of the market and of behaviour of the supply actors, console and handheld systems show pretty similar situations and dominant players.

Table 2: Handheld - units sold by manufacturer and platform (in million of units sold)

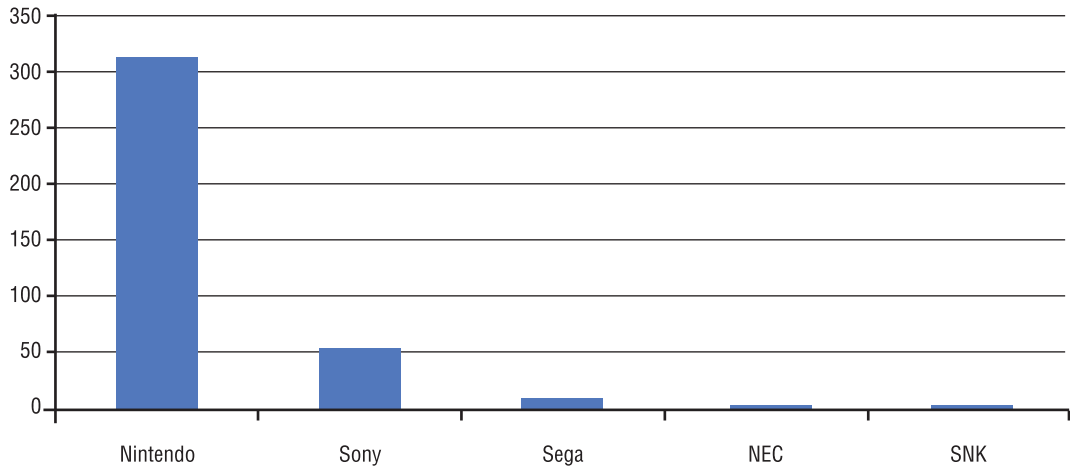
Manufacturer	Platform	Year of rel.	Million units sold
Nintendo	Game Boy and Game Boy Color	1989 and 1998	118.7
Nintendo	Nintendo DS	2004	113.48
Nintendo	Game Boy Advance	2001	81.47
Sony	PlayStation Portable	2004	55.9
Sega	Game Gear	1990	11
SNK	Neo Geo Pocket and Neo Geo Pocket Color	1998 and 1999	2
NEC	TurboExpress	1990	1.5

Source: Authors elaboration on data by manufacturers available on the Internet.[55] Data available as of August 2009.

54 Williams (2002) recalls the long-term near-perfect market share of Nintendo and annual sales at around US$1.2 billion in 1999.

55 See previous note.

Figure 3: Handhelds - units sold by manufacturers (in million)[56]



Source: Authors elaboration on data by manufacturers available on the Internet. Data available as of August 2009.[57]

Table 3: Consoles - units sold by manufacturer and platform (in million of units sold)

Manufacturer	Platform	Year of rel.	Million units sold
Sony	PlayStation 2	2000	138
Sony	PlayStation (* units shipped)	1994	102,5
Nintendo	Nintendo Entertainment System	1983	61,9
Nintendo	Wii	2006	52,6
Nintendo	Super Nintendo Entertainment System	1990	49,1
Nintendo	Nintendo 64	1996	32,9
Microsoft	Xbox 360	2005	30,2
Atari	Atari 2600	1977	30
Sega	Mega Drive/Genesis	1988	29
Sony	PlayStation 3	2006	24,6
Microsoft	Xbox	2001	24
Nintendo	Nintendo GameCube	2001	21,7
Sega	Saturn	1994	17
Sega	Master System	1986	13
Sega	Dreamcast	1998	10,6
NEC	TurboGrafx-16	1987	10
Coleco	ColecoVision	1982	6
Sega	Sega CD	1991	6
Mattel	Intellivision	1980	3
Panasonic	3DO Interactive Multiplayer	1993	2

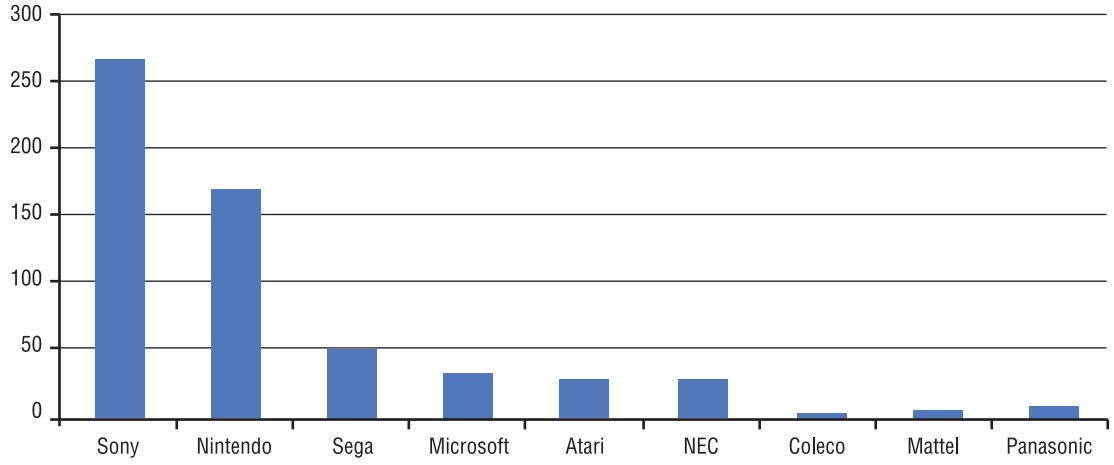
Source: Authors elaboration on data by manufacturers available on the Internet.[58] *Data available as of August 2009.*

56 Figures for a specific platform by Sony (PlayStation) refer to unit shipped rather than sold.

57 See previous note.

58 See previous note.

Figure 4: Consoles - units sold by manufacturers (in million)[59]



Source: Author's elaboration on data by manufacturers available on the Internet.[60] *Data available as of August 2009.*

Technological achievements, gaming diffusion across ages and competitive pressure have changed the market. However, high entry barriers still limit the competition in the handheld market to two big players: Nintendo and Sony. In the console market, the main actors are basically three: Microsoft joins the two other giants of handheld devices games.

The oligopolistic position of companies in handheld and console segments is evident from the above tables and figures, and is frequently reported in the literature.[61] The reasons can be identified as the high market entry costs related to technology, distribution and the investment needed to develop prototypes. This role of the console is all the more important as the console is the platform managing the network effect in this two-sided market[62] (connecting the two groups of users: developers and players) (Bounie, D., Bourreau, M., 2008).

Besides offering a choice of successful games, key aspects to maintain the leadership seem to have been the capacity to reduce costs, successful design, availability of best developers and publishers, high sales capacity, etc.

In the handheld market, the main competitors are putting considerable effort into innovation in a high-risk environment. On the one hand, Nintendo is about to produce the first game executable exclusively on Nintendo's new model of handheld console (DSi). Nintendo could be making a disruptive move, as this would be the first software game that would be *incompatible* with any previous version (DS) of the handheld equipment. Sony, on the other hand, has eliminated the disc-based UMD model in the brand new Sony model PSPgo, opting for a *download-only* solution. Despite the fact that Sony is possibly planning to support both disc and digital formats for all its future PSP games, this would appear to be a major step.[63]

59 Figures for a specific platform by Sony (PlayStation) refer to unit shipped rather than sold.

60 Data and references are collected in Wikipedia: http://en.wikipedia.org/wiki/List_of_best-selling_game_consoles (last accessed: Sept. 14, 2009).

61 See for example: Williams JMM 2002.

62 For two-sided markets see Rochet, J-C & J. Tirole (2003), "Platform Competition in Two-Sided Markets", *Journal of the European Economic Association*, Vol.1 p.990-1029.

63 Some market initiatives are being carried out in order to support consumers and to convince them to upgrade to the upcoming new model of Sony handheld console. On the other hand, transition is expected to be slow, because of the huge number of owners who have invested in a library of discs for the previous model. See for news on special market initiatives: http://www.gamasutra.com/php-bin/news_index.php?story=25394 (last accessed: 23 September).

Applications for consoles and handhelds used to share a characteristic which differentiated them from PC applications: it used not to be possible to retroactively fix bugs in software applications for console and handheld devices by means of 'patches', while this was common in the case of PC applications. This implied that imperfect products needed to be returned. The diffusion of downloadable games has partly solved this limitation, which in the past represented the source of high risks and costs to producers.

The most relevant fact in both markets is related to the proprietary characteristics of the devices: each manufacturer defines the technical features and characteristics of its device and the technologies adopted, and, due to the quasi monopoly it holds, is able to impose its solution. The manufacturers control the decision about allowing external developers ("third parties") to develop applications for their devices and hence a common standard is lacking. This, in turn, makes platform interoperability and portability of applications impossible.[64] The need to deal with different hardware platforms also increases the development costs and, as a consequence, the barriers to entry.

3.1.3 Mobile platforms

The demand for mobile-based video games is relatively new and rapidly evolving, being represented by users of mobile phones and, most of all in recent years, of smartphones.

The 2009 ITU Information Society Statistical Profiles mentions that "the European market, with around 10% of the global population, accounts for more than 18% of the world's mobile cellular subscriptions" (ITU, 2009). According to the 2009 implementation report: "The average EU penetration rate continued to grow and has now reached 119%. There are now only 4 Member States that have not exceeded 100% penetration".[65]

Mobile cellular subscriptions per 100 inhabitants were in France 69.24 in 2003 and 93.45 in 2008, in the UK 90.93 in 2003 and 126.34 in 2008, in Germany 78.72 in 2003 and 128.27 in 2008. But in 2008, they were 147.11 in Luxembourg, 151.24 in Lithuania and 151.57 in Italy, pushing the European average to 117.86 mobile cellular subscriptions per 100 inhabitants.

In the third quarter of 2008, the smartphone market was 39, 850 million units, while in the third quarter of 2009 it reached 41,444 million units (Canalys, 2009).

Games started to appear on mobile handsets (mobile phones) about a decade ago (Nokia started installing *Snake* in 1997), and did not at first raise much interest. In recent years, the rise in the number of developers has been much faster, following the creation of specific mobile game subsidiaries by traditional video game publishers. The investment by telecoms operators has intensified as well, and has differentiated in a number of business activities (publishing, aggregation, distribution, platforms, licensing, etc.).[66]

Two relevant milestones have to be mentioned: in 2001 the first downloadable games were made available, and in November 2003, the n-Gage mobile device with game cartridges was commercialised. Another milestone was the release of iPhone by Apple

64 The availability of middleware software allowing cross-platform portability of applications will be addressed in Chapter 5.

65 Progress Report On The Single European Electronic Communications Market ((14th Report), Brussels, 30.7.2009, SEC(2009)376/2, Volume 1 part 1, p.12.

66 In the mobile game subsector, the interaction between manufacturers and telecom providers is likely to deeply influence the evolution of the industry, in the battle to hold a gate-keeping position.

Inc. in 2007, which combined the previous experience of Apple with iPod with improved touch screen technology and many conceptual and technological novelties, opening up a completely new perspective for mobile-based video gaming.[67] Since then, increasing convergence of content and services and greater acceptance of online delivery of services has continued to develop.

Consumers learned, and have kept on learning, to expect from their mobile telephone handset more and differentiated functions. Fast technological evolution has provided handsets with extended capabilities and they are now able to deal with several differentiated services.

Telecom operators are maintaining the privileged position of being favourite gatekeepers for provision of services to customers, and are preserving their revenues by updating business models towards mobile business.

Box 7: Nokia N-GAGE

In the late 1990s, Nokia spotted an opportunity to combine mobile phones and handheld consoles. They developed the N-Gage, a device that integrated these two devices. Instead of using cables, multiplayer gaming was accomplished with Bluetooth or the Internet (via the N-Gage Arena service). The N-Gage also included MP3 and Real Audio/Video playback and PDA-like features into the system.

The initial poor sales performance of the N-Gage is attributed to the poor selection of games compared to its competitors and its cost at launch. It was more than twice as expensive as a Game Boy Advance SP on release day. The device also suffered from a Memory Management issue ("White Screen of Death"). Poor sales were amplified by game media being standard MMC memory cards and, as with most consoles, piracy did become an issue.

Besides its gaming capabilities, the N-Gage was a Series 60 smartphone, running Symbian OS 6.1, with features similar to those of the Nokia 3650 (…). It was able to run all Series 60 software (other than those that require a camera), and Java MIDP applications as well. Its main CPU was an ARM Integrated (ARMI) compatible chip (ARM4T architecture) running at 104 MHz, the same as the Nokia 7650 and 3650 phones.

While the N-Gage didn't have any significant financial successes, it did have a handful of critical successes with self-published games, receiving a handful of glowing reviews. These games came perhaps too late to have much effect in improving the perception of the N-Gage hardware itself in the eyes of consumers or press.

In 2004, Nokia claimed in a press release that it had shipped its millionth deck, represented as a company milestone despite falling short of the company's initial projection of six million decks by the end of 2004. However, this number shipped doesn't give a reliable picture of the actual sales of the deck.

February 2005 saw Nokia appoint Gerard Wiener, formerly of Sega Europe, to the post of Director and General Manager for Games at Nokia. Wiener steered Nokia away from looking at the N-Gage as primarily being a games console to "this is a mobile phone that is great for playing games on." This strategy, along with targeting niche franchises such as the table-top Warhammer 40,000 series, the Rifts RPG series, and the Settlers of Catan board game, has kept sales of the N-Gage healthy (…). It should be noted that this change coincided with the initial releases of the Sony PSP and Nintendo DS.

67 Please refer to Part II, chapter 2 for a wider coverage of the consequence of the iPhone introduction with regard to mobile gaming, and of mobile platform in general.

There is some disagreement in sources about the actual number of N-Gage decks sold. Nokia initially claimed 400,000 sales in the first two weeks the deck was available. However, independent market research firms Chart-Track and Arcadia Research claimed that the N-Gage had sold only 5,000 decks in the United States in that time, and 800 decks in the UK. Critics suggested Nokia was counting the number of decks shipped to retailers, not the number actually purchased by consumers. Nokia later admitted this was the truth.

As of September 2005, Nokia had more than 50 games available for the system. As of August 2007, it was estimated that Nokia had shipped more than two million N-Gage game decks.

Fully inspired by Wikipedia at http://en.wikipedia.org/wiki/N-Gage. Last accessed on 15 December 2009

To invest in the sector, high financial capacity is required. Growth of this sector is conditioned by tight technical constraints concerning latency, speed and handset capacity in terms of storage, computation and display.

3.2 The traditional distribution retail value chain

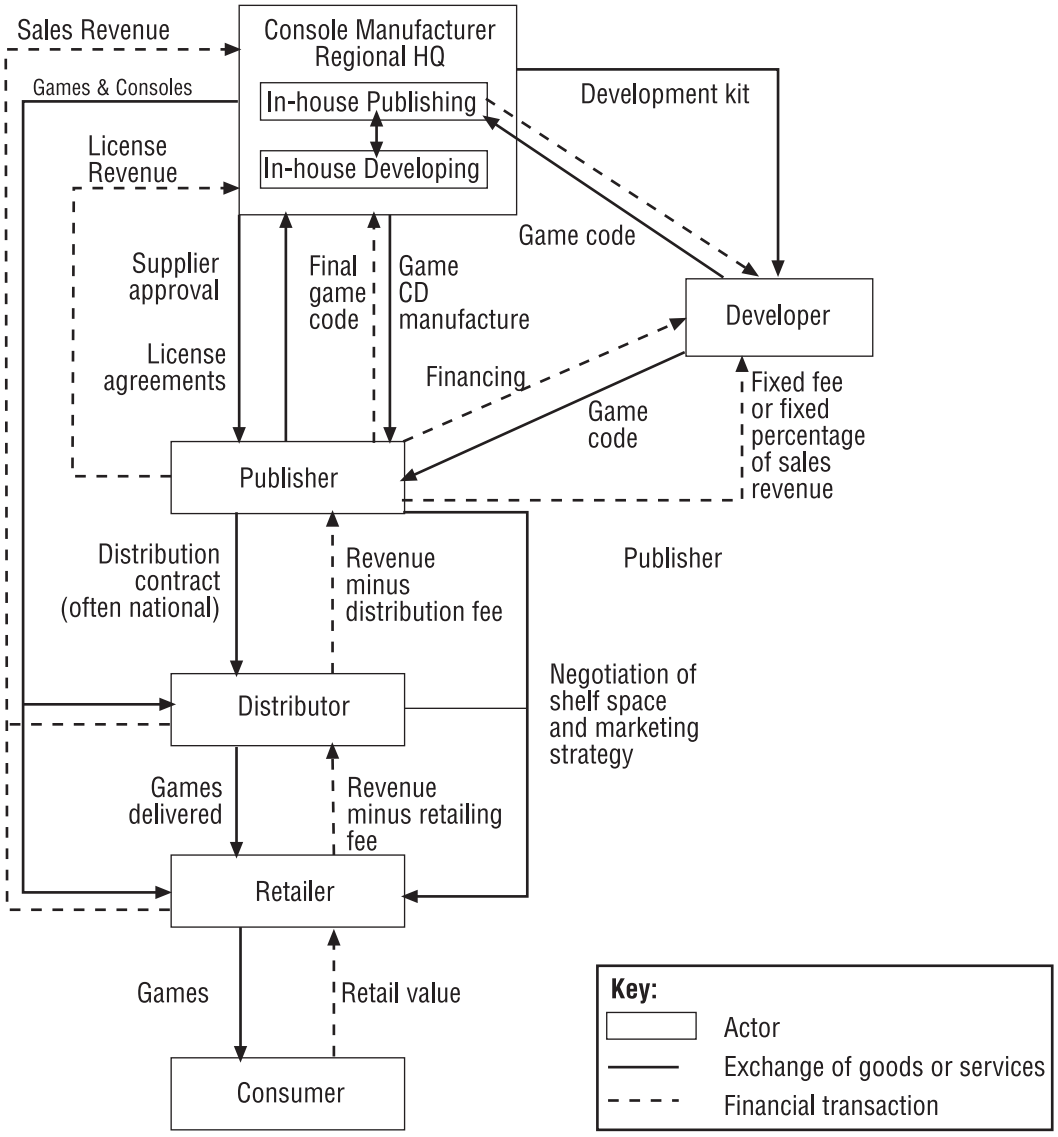
Figure 5 shows a simplified and traditional view of the value chain for video games. It looks like a classical and linear retail distribution value chain. The product, from its creation to its consumption goes through a series of necessary intermediaries to allow for its commercialisation, each of the intermediaries exercising its specific role and aiming to optimise its profit and position. This presentation excludes the hardware production part, reserved domain of the console manufacturers (see Chapter 2), as to concentrate on the software part, being the purpose of this report.

Obviously, different actors with different objectives and competences are occupying the various positions in the value chain. Their mutual relations create the value chain dynamics, and shed light on the potential transformations that this value chain might incur in the case of disruptive trends. Behind the existence of such value chain, it is quite obvious that each party takes a share of the total revenue, and that this share is the object of many negotiations. However, the distribution of revenues between the stakeholders is difficult

Figure 5: Video games traditional value chain[68]

68 Source: This scheme has been presented in Behrmann M., Software games – Technological and market potential. Presentation at the International Expert workshop of 16 October 2009. Sevilla, Spain. It is also used by other sources, among which Norwegian Ministry of Culture and Church affairs, 2008. Video games. Report 14 (2007-2008) to the Storting (Norwegian parliament), and PWC. Mateos-Garcia et al (2008) add a transversal additional supply layer for intermediary inputs.

Figure 6: Supply chain (Phillips et al., 2009)



Source: Phillips R. et al. (2009).

to apprehend. According to Wi, J.H (2009), in the case of an off-line game where the retail price is US$58, the retailer will keep US$18, the wholesaler US$10, and production cost will require another US$10, which leaves a profit of US$20 for the developer.[69]

Adapting from Mateos-Graci and al. (2008), we can describe the above value chain as follows:

- **Content creation or development** - the artistic and technical activities (i.e. engine) that result in the production of video games.
- **Content publication** - the aggregation, presentation, pricing and marketing of video games.
- **Content distribution** - the content transportation, logistics, intermediation and stock management activities to which a video game is subject until it reaches its point of sale.

69 At 8. For example, the cost structure a book is split as follows: author (11%), publisher (14%), printer (16%), distributor (wholesale part, 11%: logistics, + "diffuseur" – e.g. sale force- : 7%), retailer (36%), VAT (5.5%). Genvo S. and Solinski B. (2010) are offering the following break-up of a 55 euros retail price: game designer: 14%, editor 29%, console manufacturer 22%, retail outlet 35%.

- **Content retail** - the retail pricing, presentation and transaction management activities to which a video game is subject until it is sold to a customer.

At all the stages of this value chain, one needs to add the existence of intermediate inputs supply, which are not depicted in the above scheme. This includes the design, development, production and supply of all the intermediate inputs necessary for the undertaking of the aforementioned activities (e.g. software, hardware and specialised services and network access which enable content creation, publication, distribution and retail). In the case of video games and for the purpose of our report, middleware is an important intermediary input.

This stylised model of the value chain makes it possible to understand the basic division of labour inside the sector. It should be noted, however, that there is no fixed correspondence between the steps in the value chain and the actors involved. For example, vertical integration might lead to the incorporation of different activities by a single actor. This can be exemplified by a publisher carrying out both development and distribution activities.

A more complex view of this value chain is offered by Phillips R. et al. (2009).[70] This mapping further qualifies the nature of the relationships between the different players. This diagram also shows the link between integrated (in-house publishing and development) firms and other players.

70 Phillips R. and al. (2009), *In search of excellence: a comparative business model assessment of value-creation capabilities in the computer games industry*, Northwest Regional Development Agency. UK.

3.3 The main actors of the value chain

3.3.1 Games developers

A **video games developer** is a company that invents and develops video games, and in particular develops the necessary software to run the video game. A video game developer may specialize in a specific video game console, or may develop for a variety of platforms including the PC or the mobile platforms.[71] It can also specialise in certain types of games[72] (see Section 2.3).

The production of video games, as it is with most information, digital and creative content goods (prototypes), is characterised by high fixed costs and low marginal costs. The initial financial investment to create the first "copy" – the developer's main mission - is extremely high. Once this exists, the additional copies can be (re)produced as at almost zero cost. This need for an early investment affects the power relation in the value chain, and usually leads to the emergence of the publishers as pre-financing, and therefore dominant, actors to the detriment of the developers.

Developers are usually studios, with multidisciplinary teams. Such companies are small and numerous. In Europe, a large population of these highly creative small development studios is found mainly in the UK, France, Germany, the Nordic countries and to a lesser extent in Spain. Taking into account the specific relation of developers to publishers (see below), and the existence of independent[73] developer companies, some developers publish their own games and

71 In this case, the availability of platform-independent middleware is a key factor in reducing development costs and allowing multi-platform development. Please refer to Chapter 5 for details on layers of software and middleware in particular.

72 Please refer to Section 2.3 for different classifications of video games.

73 Independent companies aim to maintain and grow their business without having to develop games on demand from publishers.

Table 4: Top 50 games developers 2008

1. Nintendo	18. Epic Games	35. Tose
2. Infinity Ward	19. Hudson Soft	36. Codemasters
3. Blizzard Entertainment	20. Neversoft Entertainment	37. Maxis
4. EA Canada	21. EA Redwood Shores	38. Pawapuro Production
5. Valve	22. Crytek	39. EA UK Studio
6. Konami Japan Studio	23. Nintendo EAD Tokyo	40. Firaxis
7. Insomniac Games	24. EA Los Angeles	41. Amaze Entertainment
8. Capcom Osaka	25. Realtime Worlds	42. Massive Entertainment
9. EA Tiburon	26. Bethesda Softworks	43. Retro Studios
10. Bioware Edmonton	27. Naughty Dog	44. Sega of Japan
11. Bungie	28. SCE Studios Santa Monica	45. Sports Interactive
12. Ubisoft Montreal	29. EA Black Box	46. Tecmo
13. 2K Boston / 2K Australia	30. Turn 10 Studios	47. Sumo Digital
14. Harmonix	31. Traveller's Tales	48. Crystal Dynamics
15. Bandai Namco Games	32. Relic Entertainment	49. Obsidian Entertainment
16. Square Enix	33. Beenox	50. Big Huge Games
17. Game Freak	34. Level 5	

Source: GameDeveloperResearch, 2008.[75]

therefore can be regarded as publishers and developers. This is, for example, the case for the majority of the Norwegian developers.[74]

Being small and often young, such companies are confronted by a variety of additional managerial issues, typical of SMEs. These put a lot of pressure on the managers' business skills and consist of: unbalanced budgets and deal-flow, dependence on major customers, absence of real marketing, uncontrolled growth needs, recruitment issues, project size escalating, supplier management (need for outsourcing or syndication), etc.

A 2008 professional survey (see Table 4) indicates that companies established in European Countries are rather well represented among the top developer companies worldwide.

This is again true when looking at the 2009 ranking in the "Develop 100" list,[76] which introduces the top 100 developer studios. In this top ranking (by sales), there are 27 European companies (including 1 Norwegian company) while the USA lead with 32 companies, and Japan and Canada follow with 26 and 11 developer companies respectively.

These rankings, in particular at national level, show high volatility, reflecting the ups-and downs of a young and cyclical industry. Still, in these two rankings, based on different years and criteria, some companies appear clearly as the current champions: Blizzard Entertainment (USA), Nintendo (JP), EA Canada (Canada), Capcom (Japan) or Infinity ward (USA).

Within Europe, the UK is the absolute leader with 23 out of the 27 European top ranking companies,[77] for example: Rockstar North (3rd),

74 See in: Norwegian Ministry of Culture and Church Affairs, 2008. Video games. Report 14 (2007-2008) to the Storting (Norwegian parliament.).

75 See at http://www.gamedevresearch.com/top-50-developers-2008.htm

76 See Annex 3 for an updated list ranking the top 100 developers – Develop 100 List (source: www.develop100.com, May 5th, 2010).

77 This might also be due to a UK-oriented bias of the surveying method. Still, it does reflect at least partly a reality.

Traveller's Tale (12th), Kojima Productions (17th), Media Molecule (18th), Lionhead (22nd), Jagex (29th), Criterion (37th), and Sports Interactive (38th). Crytek (Germany)[78] and Ubisoft (France) are the highest ranking non-UK European developer companies at 22nd and 39th. In 2008, companies like Rockstar North, based in Scotland, had 185 staff and a turnover of around £12.5 million. Travellers' Tale had 198 staff and a turn over of £11.5 million. [78]

In France in January 2007, it is estimated that there were some 114 studios employing all together fewer than 2,500 staff. The large majority of these studios had fewer than 15 staff members. Their small size, under-capitalisation and the production cycle itself seem to have contributed to a high company replacement rate in this sector.[79]

Box 8: Microsoft games studios in the UK

Lionhead
In 1997 Peter Molyneux founded Lionhead with Mark Webley, Steve Jackson, who had co founded Games Workshop, and Tim Rance one of the Cities most highly-regarded systems analysts. In late March 2001, Lionhead's first game 'Black & White' was released to widespread critical acclaim, attracting some of the highest review scores ever achieved by a software programme. Worldwide sales currently top the two million mark. Autumn 2004 saw the release of Lionhead's second game 'Fable' for Xbox. Sales now top the 2 million mark and it was Xbox's fastest selling game when released.

Lionhead Studios represents a unique new model, which allows games to be developed in a creative, family style environment, whilst having a higher output of releases than the average development house. The massive success of Black & White and Fable proves that this is the best development model for original, innovative, but commercially successful games. Lionhead Studios was acquired by Microsoft on 6 April 2006. Peter Molyneux is one of the few true visionaries in our industry. Lionhead is a shining example of the innovative and creative talent in Europe that has delivered some of the most influential and unique games experiences in the gaming market.

Rare
Rare, Ltd. is a multi award winning British video game development company acquired in 2002 by Microsoft. It was founded in 1982 by brothers Tim and Chris Stamper and has created a large number of successful and critically acclaimed games. Rare has been the mastermind behind some of the most popular video games in history, including such global multimillion sellers as "GoldenEye 007," "Perfect Dark," "Banjo-Kazooie" and "Viva Pinata."

Since becoming part of Microsoft Games Studios, Rare has gone from strength to strength with 2007 seeing Rare's debut on two new platforms: Diddy Kong Racing DS appeared on the dual screen handheld (to be followed in 2008 by Viva Piñata: Pocket Paradise), while Jetpac Refuelled emerged as a downloadable Xbox Live Arcade release (paving the way for remastered versions of classics Banjo-Kazooie, Banjo-Tooie and Perfect Dark in the years to follow).

On the Xbox 360, late 2008 saw the launch of sequel Viva Piñata: Trouble in Paradise, with Banjo's long-awaited return in Banjo-Kazooie: Nuts & Bolts, as teased at MGS' X06 event in Barcelona, hot on its heels.

Source: Microsoft

78 Crytek is still present in the top 100 developer list in 2010, but at rank 61, while Ubisoft holds the same rank, 39.

79 Interview of an author of *"L'innovation et la R&D dans l'industrie française du jeu video"*, 2007. IDATE.

The "Nordic" games industry employs 3,700 people working for some 260 registered companies. However, it is expected that employee numbers will reach 7,000 by 2015, and 20,000 by 2020. In Norway, the total sales of games developers are estimated at around €15 million (2006) in a market almost totally dominated by one company, Funcom, located in Oslo with 173 employees. Other companies, all smaller than 10 employees, are for example: Capricornus (around €800,000 sales in 2006), or Minimedia (€120,000 sales in 2006).[80] Sweden appears to have the most mature video games developer industry among the Nordic countries, with some 30 developers employing around 600 people with a total turnover of some €75 million. Most companies are gathered in Stockholm and Malmo. An important player in the Swedish landscape was DICE. Created in 1998, it was taken over by Electronic Arts, a major American publisher in November 2004.[81]

Box 9: FUNCOM = MMO Experience

17 years, listed on OSE, with offices in seven countries

MMO pioneer –All technology proprietary

1996: Started development of the worlds first 3D SciFi MMO: Anarchy Online

1998: Casual online portal with 500.000 players

1999: Started Online Mobile Games company

2001: Launched Anarchy Online, first with digital distribution

2004: First company to implement dynamic in-game advertising, touch ads etc.

2004: First western MMO company with F2P

2004: First gaming company day/date digital

2006: First western MMO with digital items

2008: Launched Age of Conan –Real time combat

2010: Many MMO games in development; kids to mature people

Anarchy Online –World's first sci-fi MMO: 9 years since launch, millions of players, a profitable game

Source: Funcom

80 Adapted from: Norwegian Ministry of Culture and Church affairs, 2008. Video games. Report 14 (2007-2008) to the Storting (Norwegian parliament).

81 Adapted from: Norwegian Ministry of Culture and Church Affairs, 2008. Video games. Report 14 (2007-2008) to the Storting (the Norwegian Parliament).

Box 10: Eurocom: a European video games developer (49th in Develop 100 Ranking, 2009)

Founded in October 1988 by current owners Mat Sneap, Tim Rogers, Neil Baldwin, Ian Sneap and Hugh Binns, Eurocom's first game Magician, was published in 1990 for the 8-bit NES console. Eurocom has steadily expanded its development to cover all the major consoles and handhelds, and has developed over 70 titles in that time. In 2008, Eurocom had a development team of 270 people based in its Derby (UK) studio, working on multiple projects across Sony, Microsoft and Nintendo platforms, and PC.

Previous Eurocom developments have included many of the biggest selling titles in the industry including games based on James Bond, Harry Potter, Ice Age, Buffy the Vampire Slayer, Batman, Crash Bandicoot, Spyro, and Tarzan. Eurocom also created wholly original games, such as the acclaimed Sphinx and Cursed Mummy for THQ. One of their recent developments is Beijing 2008, developed wholly in-house for Playstation 3, Xbox 360 and PC, and published by SEGA.

Source: adapted from Wikipedia

3.3.2 Publishers

A **video games publisher** is a company that publishes video games that it either develops internally or has ordered from a video games developer. The publisher is responsible for licensing the rights and the concept on which the game is grounded, for handling the marketing and often even the distribution.

While the gatekeeper role is played by several hardware platform owners,[82] publishers rarely specialise in only one platform. They opt for platform diversification, but this strategy has its own limits as often titles released for one platform are not compatible with another. Table 5 shows an example of this situation by presenting how Atari's revenues are broken down by platform.

Regarding the industry structure of the video games publishers, Table 6 lists the top 20 video game publishers, ranked in 2009 according to their revenues.[83]

This list demonstrates quite clearly that US and Japanese companies hold the lead in the publishing stage of the video games value chain. Among the world top 20 video games publishers, there are only two European firms: Ubisoft and Atari, both headquartered in France. It is a rather

Table 5: Atari revenue breakdown by platform, fiscal year 2009/10, Q1

Xbox 360	37%
PS 3	24,6%
Wii	19,9%
NDS	7%
PC	8,1%
PS 2	3,1%
PSP	0,2%
Others	0,1%

Source: ATARI Corporate site, corporate press release, 24 July 2009.

82 As explained in Section 2.3.

83 See Game Developer, October 2009. At: http://www.gamasutra.com/php-bin/news_index.php?story=25506. The ranking, following the Wikipedia note, is established on the basis of overall score in six factors: annual turnover, number of releases, average review score, quality of producers, reliability of milestone payments and the quality of staff pay and perks. Note that this is not a ranking by revenue.

Table 6: Top games publishers 2008 and 2009

Name of Publisher	Country	2008 Position	2009 Position
Nintendo	JP	1	1
Electronic Arts	US	2	2
Activision Blizzard	US	3	3
Ubisoft	FR	4	4
Take-Two Interactive	US	6	5
Sony Computer Entertainment	JP	5	6
Bethesda Softworks	US	(new entry)	7
THQ	US	8	8
Square Enix	JP	10	9
Microsoft	US	9	10
Konami	JP	11	11
Sega	JP	7	12
Capcom	JP	14	13
MTV Games	US		14
Namco Bandai	JP	13	15
Warner Bros. Interactive	US	(new entry)	16
Disney Interactive	US	16	17
Atari	FR	(new entry)	18
Atlus	JP	(new entry)	19
LucasArts	US	17	20

Source: Adapted from Wikipedia and http://www.gdmag.com/homepage.htm

clear indication that Europe needs to grasp emerging opportunities to better position itself and its industry if it wants to reap the benefits of the video games business.[84]

84 Europe hosts another major video games editor that does not appear directly in the above ranking as it combined with Square Enix, eighth in the ranking, only recently. Headquartered in London, UK, EIDOS has a valuable portfolio of intellectual property including: Tomb Raider™, Hitman™, Deus Ex™, Championship Manager™ and Just Cause™. Eidos is a wholly-owned subsidiary of Square Enix Holdings Co. Since November 2009, Square Enix Ltd. and Eidos Interactive Ltd. combined business in the UK and operate under the name of Square Enix Ltd. which is part of the Square Enix Europe business unit. Square Enix Europe is the unified business unit representing the sales and marketing offices, together with a global network of leading development studios. With its headquarters in Wimbledon, London, Square Enix Europe develops, publishes and distributes entertainment content under the brands of Square Enix, Eidos, and Taito. Square Enix Europe also manages several leading development studios including Crystal Dynamics, IO Interactive, Beautiful Game Studios, Square Enix London Studios and Eidos Montréal. Video games represent the major part of Square Enix revenues with estimated 250 Million Euros revenues for the current fiscal year.

Box 11: The view from Microsoft

New business models
On top of the traditional fully-packaged games XBOX players can purchase from retailers, there is the Xbox LIVE business model which is based on subscriptions plus transactions.

Revenues are derived from the annual subscription that members pay plus the transactions they make to obtain premium content.

The service consists of online gaming, music and social applications (e.g. Facebook and Twitter). Consumers pay an annual charge (£40.00 or equivalent) for the top tier of membership and also pay for additional games and content via a marketplace system.

There are 23 million members of LIVE globally, and Xbox LIVE continues to redefine and lead social games and entertainment. Xbox LIVE enjoyed its biggest week ever at Christmas time, with a new member joining every second. Xbox LIVE saw record peaks of more than 2.2 million people using the service at the same time. The addition of new social features like Facebook, Twitter, Last.fm and 1080p instant on movies has been a huge success with nearly 10 million members utilising entertainment content on Xbox LIVE.

An important statistic is the rise of revenue associated with advertising in or with games. This part of the market is expected to grow by 15.9% over the next three years to ;750 million.

The future of gaming
The industry increasingly looks to technology and interaction with consumers (e.g. Kinect for Xbox 360, originally known by the code name Project "Natal": game player movement recognition camera resulting in controller free gaming (that Microsoft will launch in fall 2010) to drive its onward growth.

Microsoft has the rare opportunity to combine its history of building world-class software and platforms with its passion for entertainment to create new, epic experiences across all of the screens in people's lives. These **experiences** are designed to be **personal** (uniquely about you), **contextual** (uniquely about the world around you), and **social** (uniquely about your relationships).

The strategy is twofold: to create their own world-class entertainment experiences, connecting smart devices (Phone, TV, Console, PC) to smart services in the cloud and to build a platform that allows 3rd parties to create epic entertainment experiences as well. Over the last six months several key product milestones were achieved with new levels of integration across the board from Windows Phone 7 to Zune to Xbox Live and Kinect.

Natural user interfaces will also revolutionize gaming and entertainment in the home. Natural means creating technology that works exactly how we expect it to work and the research to make this possible has been 20 years in the making; with world-class engineers, psychologists, ethnographers, physicists, chemists, vision specialists, and designers applying rigorous science to computer vision, machine learning, user interfaces and language processing. These inventors are creating technologies that have a 1-10-year horizon or more. But now, we have digital ink, speech, touch, and air gesture, we have the convergence of years of research, and the work on products like Windows 7, Surface and Zune HD, all of which explore new ways to use touch capabilities. We are at **an exciting inflection point in technology** where we are able to create an experience that is simpler, more intuitive, more natural. Kinect will remove the last barrier to gaming and entertainment, the controller, freeing consumers to have the experience they want with technology that's natural for them. It became then less intimidating for people allowing getting more people gaming. A new set of people, new customers (i.e. girls) will be added while some other will benefit from a broader scope, making the market grow. Consequently, the market changes and will be more mainstream, it will not remain the "unacceptable face of the entertainment".

Source: Microsoft (Emphasis is ours)

In order to better understand the structure and operations of firms involved in video games publishing, the box below describes in greater detail the top four video games publishing companies together with Atari, for years the French icon of the games industry which was sold to Japanese Namco Bandai in 2009.

Box 12: Top four video games publishing companies, and Atari

Nintendo
Nintendo Co Ltd. is a multinational corporation located in Kyoto, Japan. Today Nintendo is a video game company, which over the years has become one of the most influential in the industry and Japan's third most valuable listed company, with a market value of over US$85 billion. In addition, Nintendo is the fifth largest software company in the world.

Unlike most of video games publishers, Nintendo develops and produces its own game consoles. As of 2 October, 2008, Nintendo has sold over 470 million hardware units and 2.7 billion software units.
Source: www.wikipedia.org

Electronic Arts
Electronic Arts, Inc. is an international developer, marketer, publisher and distributor of video games. Founded in 1982, the company was a pioneer of the early home computer games industry and was notable for promoting the designers and programmers responsible for its games. Originally, EA was a home computing game publisher. In the late 1980s, the company began developing games in-house and supported consoles by the early 1990s. EA later grew via acquisition of several successful developers. By the early 2000s, EA had become one of the world's largest third-party publishers. In May 2008, the company reported net annual revenue of US$4.02 billion in fiscal year 2008. Currently, EA's most successful products are sports games published under its EA Sports label, games based on popular movie licenses such as Harry Potter and games from long-running franchises like Need for Speed, Medal of Honor, The Sims, Battlefield and the later games in the Burnout and Command & Conquer series. They are also the distributors of the Rock Band series. EA reported a US$1.08 billion loss for the financial year ending March 2009. Revenue for the same period was up to US$4.2 billion, a 15 percent rise from the previous year's US$3.6 billion.
Source: www.wikipedia.org

Activision Blizzard
Activision Blizzard is the American holding company for Activision and Blizzard Entertainment, majority owned by French conglomerate Vivendi SA. The company is the result of a merger between Activision and Vivendi Games. It is believed that Activision Blizzard is the only publisher that has "leading market positions across all categories" of the video game industry.
Source: www.wikipedia.org

Ubisoft
With Ubisoft Entertainment, Europe keeps a leading publishing company among the world's top. Ubisoft is a French computer and video game publisher and developer with headquarters in Montreuil-sous-Bois, France. The company has facilities in over 20 countries, with studios in Toronto, Montreal and Quebec City (Canada); Bucharest (Romania), Barcelona (Spain); Shanghai, Chengdu (China); Singapore; Cary, North Carolina (USA); Düsseldorf (Germany); Sofia (Bulgaria); Casablanca (Morocco); Sydney (Australia); Milan (Italy); Pune (India) and São Paul (Brazil); amongst other locations. For 2009, Ubisoft claims sales revenue around ;1 billion, with around 4 500 staff.

Ubisoft's revenue for 2002-2003 was ;453 million; for fiscal year 2003-2004, this grew to ;508 million. As of 2005, Ubisoft employed more than 3,500 people, of which over 1,700 working in production. The company's largest development studio is Ubisoft Montreal, which in 2004 employed approximately 1,600 people Yves Guillemot, a founding brother, was the chairman and CEO. As for 2008-2009, Ubisoft's revenue was ;1,058 million, reaching the ;1 billion milestone for the first time in its history.

Atari
Atari used to be the second European Video games Publisher in this top 20. The Atari group, mainly comprised of the Atari brand, Atari catalogue of IPs, Cryptic Studios Inc., Eden Games and a later created London studio, is a global creator, producer and publisher of interactive entertainment software for all market segments and all interactive game platforms including consoles from Microsoft, Nintendo and Sony, advanced smart phones, Personal Computers, web and online. Atari also distributes video games notably in North America.

Previously owned by Atari Interactive, a wholly owned subsidiary of the French publisher Atari SA. Its subsidiaries, including some 15 developer studios distributed around the world, included Cryptic Studios, Atari London Studio, Eden Games, Atari Interactive, Inc. and Atari, Inc., headquartered in New York City. The group Infogrames Entertainment S.A., a global producer, publisher and distributor of software games for all the interactive platforms, was then holding the Atari brand. Infogrames announced in February 2009 the signature of a definitive agreement between Atari Europe S.A.S and the Japanese Namco Bandai Games Europe S.A.S. establishing a strategic partnership. Infogrames had started selling stakes to Namco Bandai in late 2008, in March 2009 Namco already held a 34% stake, and some months later the Japanese group finalised the acquisition and Atari Europe became officially Namco Bandai.

3.2.3 Distributors

Video games **distributors** usually market the games, handle the packaging and transport, organise the infrastructure for distribution, and sometimes even provide user support. Together with the retailers, they cover the logistics of the chain. Though they are not the publishers themselves, they are usually specialised distributers for video games (and often other digital products). In particular, as large publishers are primarily interested in promoting their own games, independent game companies find small specialised distributors for their titles. There are also large international collaboration agreements such as those for Sony and Nintendo, in which the games and hardware are handled respectively by Nordisk Film (DK) and Bergsala (SW) in Scandinavian countries. Retailers are usually electronic chains, multimedia shops and specialist shops but nowadays video games can be easily found in ordinary distribution stores such as FNAC, Wal-Mart, the Metro group or even Carrefour.

One of the characteristics of the video games industry is that its products, as are many cultural goods nowadays, are digital, and therefore potentially transmissible and reproducible on many platforms. While digitalisation raises issues of copyright and is constrained by the speed of standardisation processes, this characteristic opens up the possibility of multiplying distribution channels towards a multiplicity of platforms and formats. Sony, Nintendo and Microsoft, as they are the dominant hardware owners, can impose their proprietary standards on developers and publishers. Similarly, developers need the publishers to access any of these dominant platforms. With further digitalisation and standardisation, the balance of power between these actors could be affected. A growing number of new actors is therefore foreseen, which will position themselves in the video games value chain as video games go progressively online and mobile. It is also possible that in some cases, this evolution towards new platforms and formats will suppress some of the intermediaries.

Changes are already visible. For example, big retailers, such as Wallmart or FNAC, are increasingly playing the role of distributors and contacting video game publishers directly. On the other hand, the increased importance of online distributors like Amazon in many cases reduces the role of "traditional" retailers.

Box 13 describes two video games distribution retailers.

Box 13: An American and a European video games and entertainment software retailer

GameStop Corporation: an American video game and entertainment software retailer.
The company, whose headquarters are in Grapevine, Texas (a suburb of Dallas), United States, operates 6,200 retail stores throughout the United States, Canada, Australia, Ireland, Denmark, Finland, France, Germany, Italy, New Zealand, Norway, Spain, Austria, Puerto Rico, Switzerland, Portugal, Sweden and in the United Kingdom. GameStop will open around 400 new stores for the 2009 business year.

The company operates retail stores under the name GameStop, EB Games, Micromania and MovieStop. In addition, the company runs two e-commerce websites, GameStop.com and EBgames.com, and also Game Informer magazine, GameStop's proprietary video and computer game publication. In addition to video and computer games, GameStop sells magazines, strategy guides, and other related merchandise. A major source of the company's profit is also buying used games from its customers and selling them back at a profit. Approximately 48% of GameStop's revenue is from its used products sales (based on the quarter that ended Nov. 1 2008).

Source: www.wikipedia.org

GAME: a European video games retailer
GAME is currently based in Basingstoke (UK) and manages over 1000 stores across Europe. Established in 1992 as the "Rhino Group", GAME acquired Virgin Games stores in 1993, Centromail in Spain and Scoregames in France in 2001, Gamestation in UK in 2007 and JRC stores in Czech Republic in 2008. It presents itself as the leading video games retailer in Europe. It has been selling PC and video games in the UK for over 20 years and claims to be established in some of the world's largest video games markets, with a market lead position on UK and Ireland (Estimated Market Size (EMS): US$ 6 billion, Spain (EMS: US$ 2.1 billion, Scandinavia (US$1.2 billion), France (4th retailer; US$ 4.2 billion), Australia (4th retailer; US$ 1.4 billion) while expanding into developing markets like the Czech Republic.

Source: http://www.gamegroup.plc.uk/gmg_plc/about/markets/

3.4 The (changing) rules of the game

Publishers are often presented as the central economic actors in the video games value chain, ruling the overall organisation of the market. The strong position of the publishers is due to their specific intermediary role in the value chain: they have the scale and skills to generate the relevant deal-flow, manage large budgets, develop global branding, and organise marketing and property rights. As we have seen above, they often integrate several positions in the value chain vertically, growing their own developer departments, absorbing developer companies or acting as distributors and retailers. Hence, the basic rules driving the business models of the video games industry are built on a few observable facts:

- the high initial fixed costs for developing video games make the publishers the financial operators of the industry,
- the features of the video games market, a digitalised and cultural market,[85] encourage the publisher segment to move into an oligopolistic[86] structure. Vertical and horizontal concentration happens as publishers own dominant hardware platforms, absorb and grow successful developer teams as part of a risk-reducing strategy. At the same time, they aim to extend their distribution channels with cross-platform standards for production, transmission and reproduction, within a profit-maximising mass market strategy.

85 In particular, the video game market, like other cultural markets, is characterised by uncertain demand; short periods of profitability, infinite variety of supply and vertical differentiation of markets. For more, see for example, Caves, R. 2002. Creative industries: contracts between art and commerce. Cambridge, Mass.: Harvard University Press.

86 Or better said "oligopsonic" - a situation where there is only a few demand actors (rather than supply actors, as in oligopolistic situations).

With developers, publishers share the goal of extracting as much value out of the value chain as possible, while minimising the risk for their own organisations. In particular, publishers often finance the work of developers by pre-paying royalties, but therefore also exert a direct influence on the nature of the production itself. The uncertainty and brevity of profitable demand drives the whole supply side towards rather mainstream choices or sophisticated portfolio strategies. Basically, the publisher's position is one of taking the financial risks.

This is not perceived by the developers who usually see publishers as conflicting with artistic or innovative initiatives, as for publishers "innovation" is often seen as synonym of over-budgeting and missed milestones. Developers also believe that "few independent developers are considered more than work-for-hire. (…) Developer's share of the value chain is likely to decrease over time".[87] This may also signal a move toward a more mature market.

This industry has shown other signs of "maturity". For instance, through one of its trade associations, ISFE, it became an innovator in the area of self regulation which led to the creation and adoption of the PEGI Game Rating System throughout the Community and beyond. In addition, it also adopted the more recent and international PEGI Online Safety Code which applies to online gamers (see Box 14).[88]

Box 14: The PEGI age ratings

PEGI Mission statement
The Pan-European Game Information (PEGI) system aims to provide European consumers with information on game content from an independent source to allow them to make informed decisions on buying video games.

The strength of PEGI originates in its unique ability to build upon a variety of input from governments, consumers, academia and industry throughout Europe.

The PEGI system and how it functions
PEGI is a system of voluntary self-regulation promoting the safe use of video games. It is the first ever pan-European age rating scheme. It has been operating in Europe since April 2003 and provides the public (particularly parents) with an indication of the lower age for which the content of a game product is suitable. The system's efficiency is based on its ability to provide the consumer, at the time of purchase, with appropriate information and advice to consumers regarding the nature of the content and age suitability according to criteria developed and assessed by experts.

The PEGI system applies to all game software, whatever the format or platform involved, sold or distributed in the European Economic Area by any company subscribing to the standards. The European Union institutions, together with the vast majority of governments in the EU and the EEA, fully support the project.

Source: ISFE, PEGI Annual Report 2009.

87 Quote of R.Muzyka, CEO, BioWare Corporation, cited from the Developer Business Summit of San Jose, California, USA, 2004. Published in the proceedings by International Game Developers Association (IGDA).

88 Both the PEGI and PEGI Online System were endorsed by former Information Society Commissioner, Viviane Reding and were mentioned with approval in the Commission's April 2008 Communication on Video games. The development of the PEGI Online System is an initiative which was jointly funded by the DG INFSO and ISFE members.

Box 15: Video games publishing: A risky business

- The Christmas selling season accounts for about half of the industry's yearly sales of video and computer games, leading to a concentrated glut of high-quality competition every year in every game category, all in the fourth quarter of the year.
- Product slippage is very common due to the uncertain schedules of software development. (…) These problems are compounded if the game is supposed to ship for the Christmas selling season, but actually slips into the subsequent year.
- There is a consensus in the industry that it has increasingly become more "hit driven" over the past decade. Consumers buy the game that's best-marketed and of the highest quality, therefore buying fewer other games in that genre. This has led to much larger game development budgets, as every game publisher tries to ensure that its game is #1 in its category. It may offer a common feature among the so called cultural industries.
- Games are becoming more expensive to produce. The "next generation" of consoles, particularly the Playstation 3 and Xbox 360, have more advanced graphic ability than previous consoles, but taking advantage of that ability requires a larger and competent team size than games on earlier, simpler consoles (…). On this generation of consoles, games commonly require budgets of US$15 million to US$20 million. Activision's Spider-Man 3, for example, cost US$35 million to develop, not counting the cost of marketing and sales. Every game financed is, then, a large gamble, and pressure to succeed is high.
- When publishing for game consoles, game publishers take on the burden of a great deal of inventory risk. All significant console manufacturers since Nintendo with its NES (1985) have monopolized the manufacture of every game made for their console, and have required all publishers to pay a royalty for every game so manufactured. This royalty must be paid at the time of manufacturing, as opposed to royalty payments in almost all other industries, where royalties are paid upon actual sales of the product—and, importantly, are payable for games that did not sell to a consumer. So, if a game publisher orders one million copies of its game, but half of them do not sell, the publisher has already paid the full console manufacturer royalty on one million copies of the game, and has to absorb that cost.

Source: www.wikipedia.org

Box 15 describes in detail the most important factors that determine the business of video games publishing.

One of the ways to solve the often tense relations between publishers and developers is for the publishers to have their own in-house developing teams, and/or to absorb external third-party developers by mergers and acquisitions. This has added to the youth of the industry and the difficult economic conditions of survival for all actors has made the industry and its value chain a rapidly evolving landscape of appearing and disappearing companies.

For all these reasons, it appears evident that one of the disruptive trends in the video games business is the emergence of new actors from different businesses, or the bypassing of existing actors currently in dominant positions. Both phenomena are made possible by digitisation of the distribution: the emergence of new distribution channels comes with new distribution actors (e.g. the mobile operators), and the search by developers for alternative distribution models (e.g. online distribution).

To summarise, the distribution channels of video games are strongly controlled by a small number of (mainly non-European) companies, who often combine the function of games platform owners and of large scale publishers. These actors are at risk of being challenged by other actors of the value chain who estimate not getting their fair part of the business revenues. Opportunities for this kind of transformation are at hand today, affecting directly the value chains, and consequently, the logic of the business models.

As already observed by Mateus-Garcia and al. (2008), growth in mobile gaming and online distribution are two such opportunities, and Europe could take advantage of the opportunities offered by the emergence of online video-games[89] and of mobile gaming. These two cases, together with their impact on the video games value chain, are presented in Table 7.

Box 16: Piracy at bay

For most players, one of the main threats to existing market structure appears to be piracy. This industry is suffering serious economic damage from widespread illicit file-sharing on peer-to-peer ('P2P') networks. In addition, the threat is increasingly coming via other channels, such as "one-click" hosting sites or 'cyber-lockers'. More and more frequently, new video game software is distributed for illegal download on the Internet within minutes of its official release and, occasionally, even prior to release.

As releases of video game titles have relatively short commercial shelf lives, game piracy can have a particularly destructive effect on the sales performance of many games. Casual infringements, where otherwise law-abiding people download pirate versions of games, are now exacting a far greater toll on the industry than in the past. Taking into account its technical expertise, the industry is building on its software strength to provide technological and interactive solutions to piracy rather than engaging in litigation. This is illustrated by the Korean case where software privacy was one of the main drivers of the switch from off line to online gaming.

The industry has recognized that it is not possible to eradicate piracy but awareness/ communication/ education may help. Therefore, the industry is relying on its capacity to invest in the development and introduction of disruptive technologies. Online and mobile games are not only bringing new business models but adding "new piracy-proof opportunities". Eventually, the digital content will only be available online through downloading.

Table 7: Video games: Key innovative technologies and their impacts

Content distribution	Impacts
Online distribution of video games	Open up new channels for entrance in the market. In the case of video game consoles, these platforms are dominated by hardware providers. Important growth expected.
Mobile gaming	New channel for distribution of easier to develop video games with alternative value chains dominated by mobile carriers, ISPs and other content aggregators. Growth limited by market fragmentation in mobile Operating Systems. Important growth expected.

Source: Mateus-Garcia, Geuna and Steinmueller (2008), p.55.

89 For definitions of online and mobile games, please refer to Part II of this report. Online video-games are played online and they may or may not require the installation of software on the client device (PC or console or handheld device). Mobile video-games are, generally speaking, played on mobile telephone devices.

In conclusion, with emerging opportunities, new companies might become essential intermediaries in the video games value chain, such as online portals (Google, Yahoo, pogo.com), internet service providers, social networks (Facebook,MySpace) or even telecom operators (i.e. Orange, Telefonica, Vodafone) or handsets equipment manufacturers companies (e.g. Nokia). We will see in the following chapters if this is really the case and what it might mean for the European software video games industry.

4. The Video Games Market

In something less than 40 years, software games developed from scratch into an industry producing billions of profits and today, its revenues and investments give the video games industry a relevant position among other mainstream media industries (Deuze et al., 2007).

To assess the economic importance of the video games market, the following section presents the most recent data on the size of video games sales worldwide and in the most important regions. In addition, data on the most important types of video games product segments, as defined in the previous section, together with an assessment of the value of hardware and software is presented.

4.1 The global video games market

The size of the global video games market

Figure 7 shows estimates of the total size of the global video games market up until 2013. In the period 2004 to 2013, the global video games market is expected to grow from less than 30 billion to over US$ 70 billion.

Other sources report similar values of the size of the video games market. For the US market alone, the combined computer games and video games sales in 2007 accounted for US$9.5 billion, an increase of 28% against 2006 (ESA, 2008). Similarly, the OECD (2004) estimated that the global video games market in 2003 was over US$ 21 billion, compared with US$ 32 billion for the recorded music industry. It also mentioned that US games revenue in 2001 had already surpassed that of film box office tickets. According to IDATE (2008), the size of the global market for video games in 2009 was estimated at €46 billion. Developed regions such as Europe, the US and Japan are the main markets for video games. It is estimated that in 2009 these regions accounted for over one half, or €26 billion, of the video games market.

Figure 7: Global video games market, million US$, PWC 2009

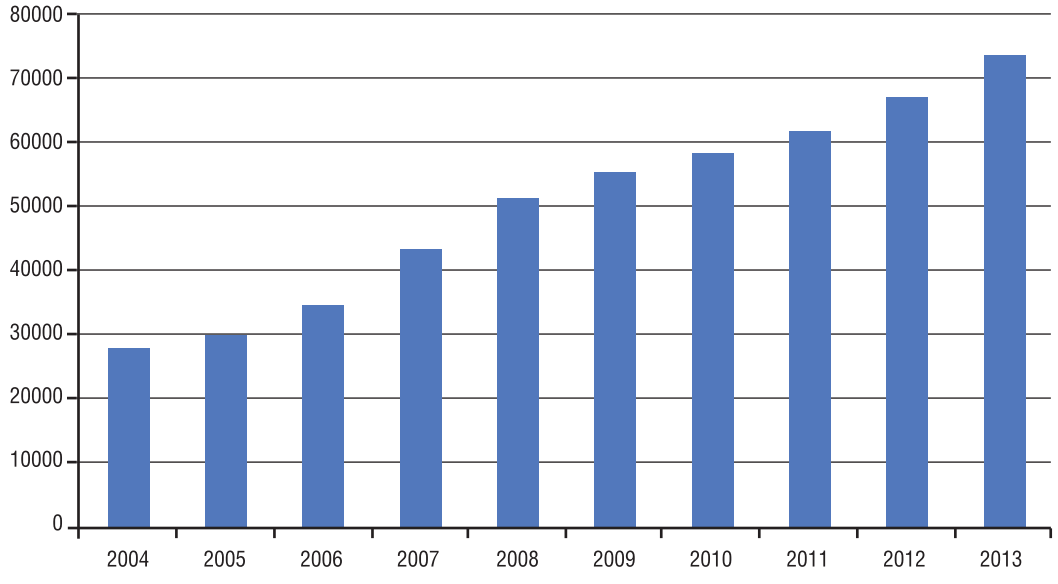
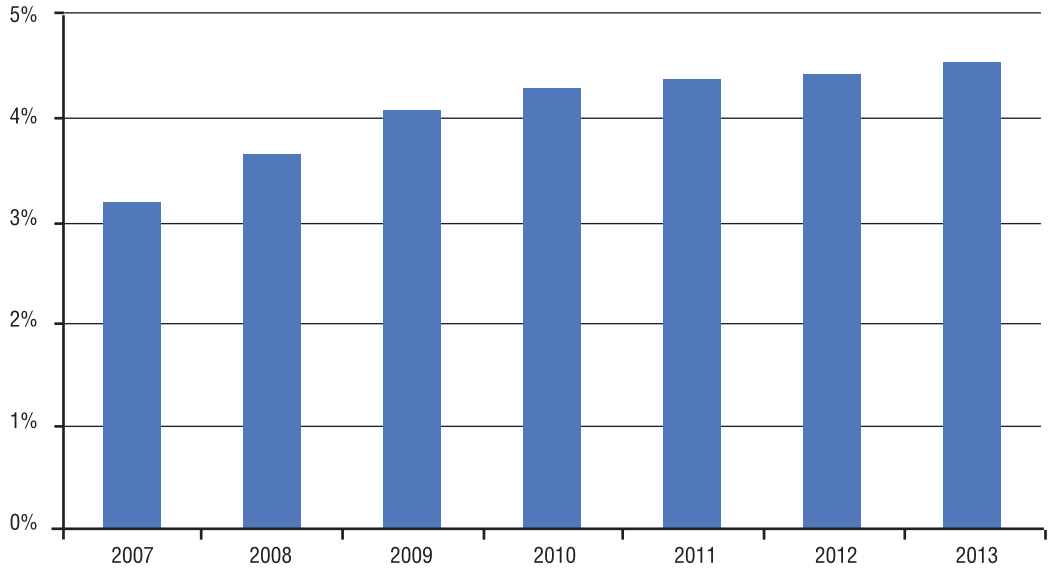


Table 8: Global video games and global media and entertainment market, 2007-2013, million US$, PWC 2009

	2007	2008	2009	2010	2011	2012	2013
Total Video Games	43,460	51,390	55,089	58,383	61,604	67,026	73,513
Total Media & Entertainment*	1,373,941	1,408,950	1,354,068	1,359,495	1,411,788	1,506,409	1,613,173

** Media & Entertainment includes: internet access fees, internet advertising, TV fees, TV advertising, Recorded music, Filmed entertainment, Video games, Consumer magazine publishing, Newspaper publishing, Radio, Book publishing, Business-to-business publishing.*

Figure 8: Share of the video games market in the global media and entertainment market, in %, 2007-2013, PWC 2009



The relative importance of the video games market

Table 4 presents the value of the video games market against the background of the entire media and entertainment market.[90] According to these figures, in 2007, the global value of video games sold worldwide was US$ 43.5 billion. The growth dynamics forecasted for the video games sector are exceptional, when compared with the entire market for media and entertainment products and services. The former is expected to grow by almost 70% to over US$ 70 billion by 2013, whereas the latter is expected to grow by only 17%.

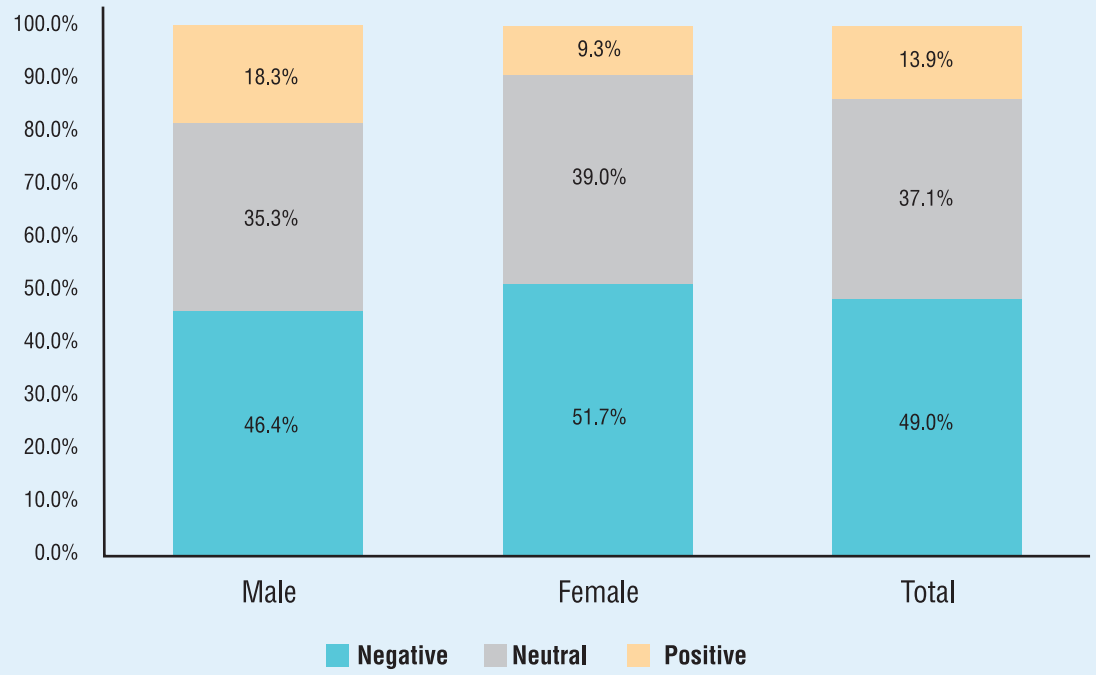
Table 8 reports the relative importance of the video games market as a share of the global media and entertainment market. In 2009, the video games market accounted for around 3% of the media and entertainment market. In comparison, the recorded music and filmed entertainment represented 2% and 6% of the global media and entertainment market respectively.

According to these estimates, in addition to the overall rapid growth of the video games sector, its overall importance is expected to increase. For example, within the next four years, the share of the video games market in the total media and entertainment market will increase by 0.5% or, in real numbers, by nearly US$ 20 billion.

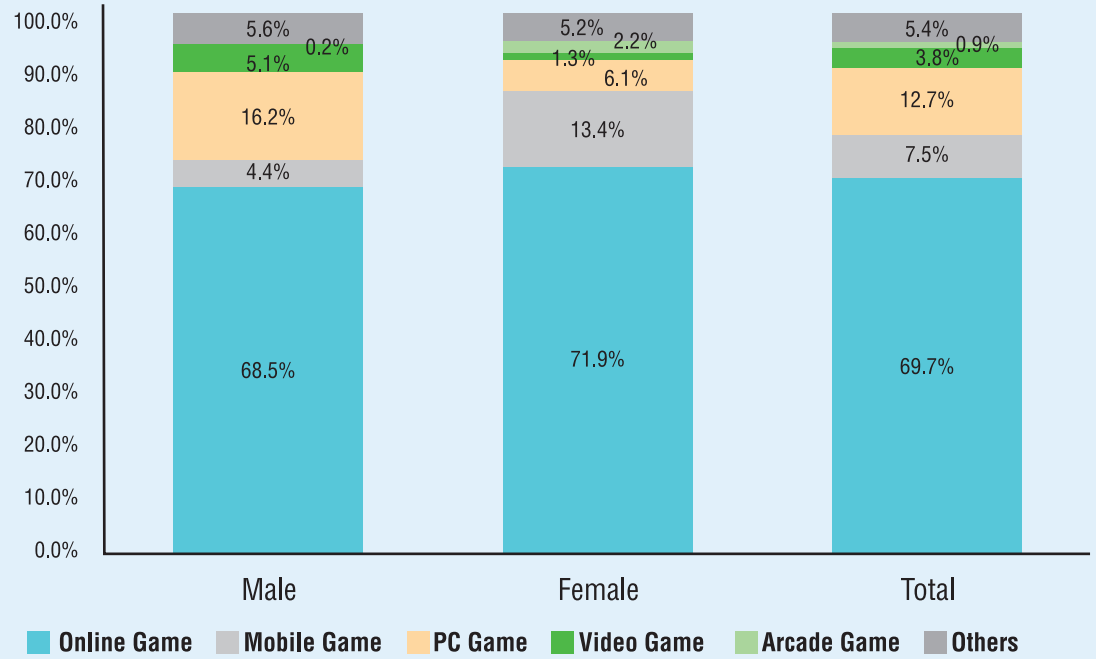
90 Media & Entertainment includes: internet access fees, internet advertising, TV fees, TV advertising, recorded music, filmed entertainment, video games, consumer magazine publishing, newspaper publishing, radio, book publishing, and business-to-business publishing.

Box 17: Glimpses of demand: the South Korean experience - a summary of some surveys.

User Perceptions of Games



Frequently-used Game Platforms

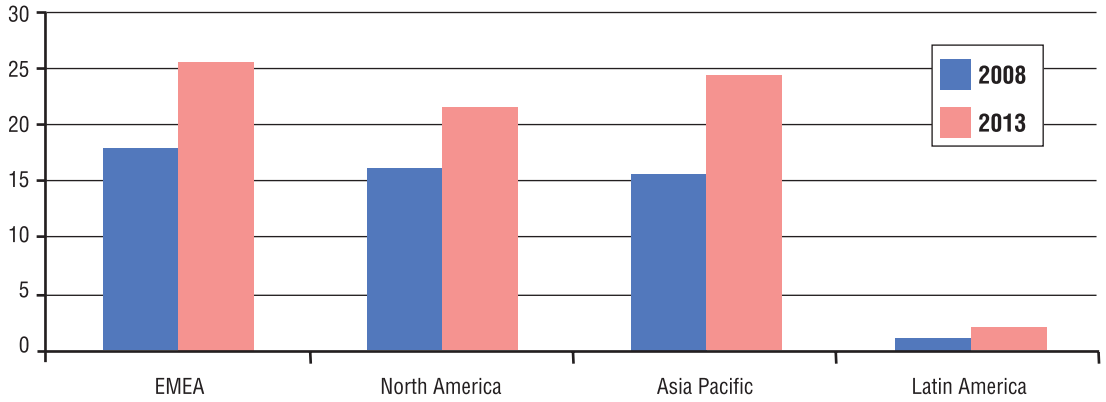


Source: Professor Hangjung Zo; KAIST, South Korea. Presentation at the IPTS validation workshop, Brussels, 10 June 2010.

Regional markets for video games

Figure 9 reports the size of the video games market for the four major world regions: Europe-Middle East-Africa (EMEA), North America, Asia and Pacific and Latin America. According to these figures, the EMEA area already represents the biggest market for video games. Projections foresee that EMEA will maintain its primacy, while the Asian – Pacific region is expected to challenge

Figure 9: Video games market size, by geographical area (billion US$), PWC 2009



and overtake North America as the second largest region in 2010. This trend seems to be confirmed by annual data for Australia, where the video games market increased in 2008 by almost 48% in terms of value and by 43% in terms of sold units.[91]

Regarding the EMEA region, there are five countries in which the size of the national market for video games exceeds the 1 billion dollar mark. These countries are: France, Germany, Italy, Spain and the UK and, among these five, the UK and France hold the lead. In 2009, video games worth a total of US$ 5.1 billion and US$ 4 billion were sold in the UK and France respectively. With US$ 2.9 billion, Germany is the third biggest video games market. In the same year, video games worth a total of US$1.8 billion and US$1.4 billion were sold in Spain and Italy respectively. Thus, altogether, these five countries accounted for US$15.2 billion, which is equivalent to nearly 30% of the global video games market.

4.2 Market size by platform

This section takes a closer look at the composition of video games sales by the platform for which the video games are designed. It uses the framework defined in the previous section to analyse the size of PC, console and handheld and online and wireless games markets.[92] Before going into the specificities of each product segment, a general overview is given below.

Figure 10 presents the size of the video games market for each platform. According to these data, games sold for consoles and handheld devices have the highest share in the total sales of video games. In 2009, the value of console and handheld video games rose above the 30 billion US dollar mark, and represents nearly 60% of the entire market for video games. The next largest product segments are online and wireless video games. Each of these segments accounted for nearly US$10 billion in 2009.

Regarding the future development of the video games market, Figure 10 reveals that it is expected that the video games market will continue to grow. However, there are some differences in the dynamics of individual segments. In particular, whereas the online and wireless product segments will grow and, as a result increase their overall importance, the sales

91 See NPD press release at http://www.npd.com/press/releases/press_090401.html (last accessed 14 September, 2009).

92 The present section refers to wireless games rather than mobile for conformity to the data source. For a definition of online games, please refer to Part II; it seems useful to anticipate that online games are played online by means of different platforms. Though the PC platform used to be the most common means to play online games, now all the main consoles allow for online gaming.

Figure 10: Video games market by platform, million US$, at 2008 prices, PWC 2009

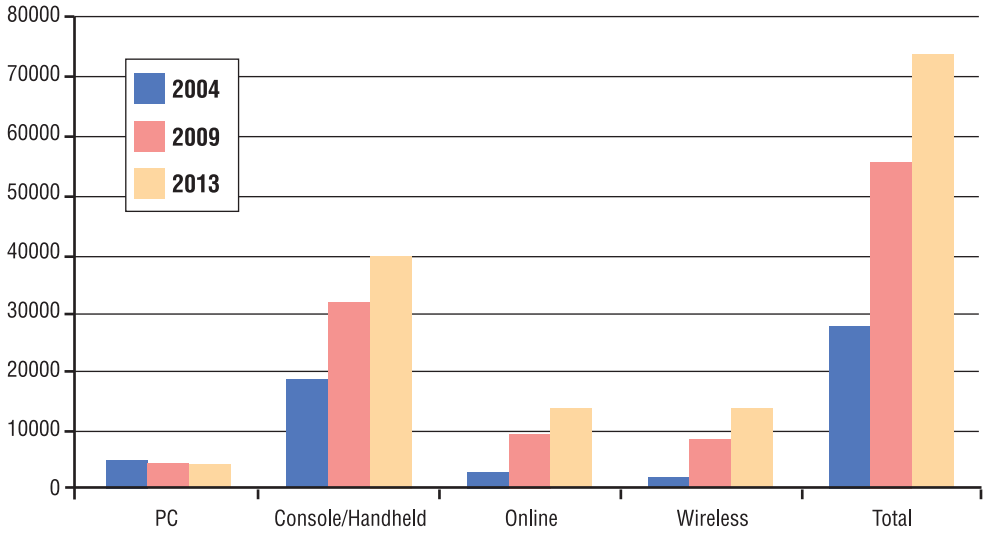
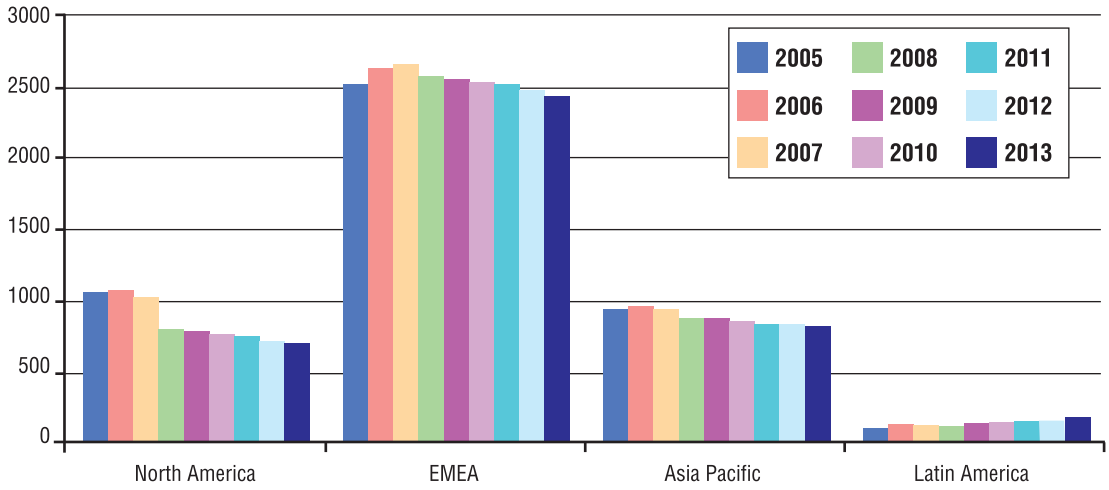


Figure 11: PC video game market by region - 2005-2013 (million US $, average 2008 exhange rate) PWC 2009



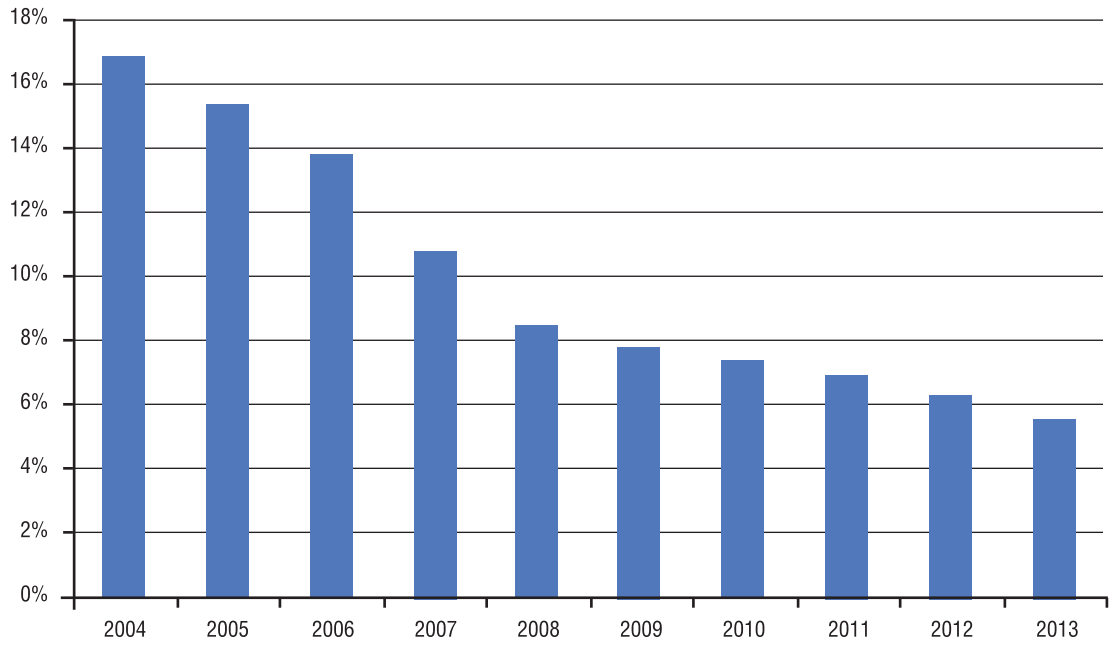
value of PC-based video games will decline and, by 2013, it is expected that it will have dropped to around US$4 billion, or 6% of the overall video games market value.

4.2.1 PC video games

The market share of PC-based games was still recorded as steadily growing up to 2000 (Williams, 2002). Then it started a slow but continuous decline, falling annually at a rate of 1.2%, from US$ 4.3 billion in 2009 to US$ 4.1 billion in 2013 (see Figure 11). Nevertheless, it must be mentioned that, in order to access some specific but highly-diffused genres of games, such as MMOGs, a PC is still required, and this will contribute to stabilising the market.

Figure 11 indicates how relevant PC-based gaming is in the EMEA area in comparison with the other areas of analysis. In 2008, the PC games market accounted for US$ 2,559 million in the

Figure 12: PC video games share in the total video games market, advertising included, 2005 - forecast 2013, in%, PWC 2009



EMEA area against US$ 789 million in North America. Thus, when taking into account the European and Mediterranean area, the decline of the PC video games market is not yet as marked as it is in North America. In other regions, the decline is also less pronounced and the value of the Asia-Pacific market, estimated in 2009 at US$ 860 million, was higher than that of North America.

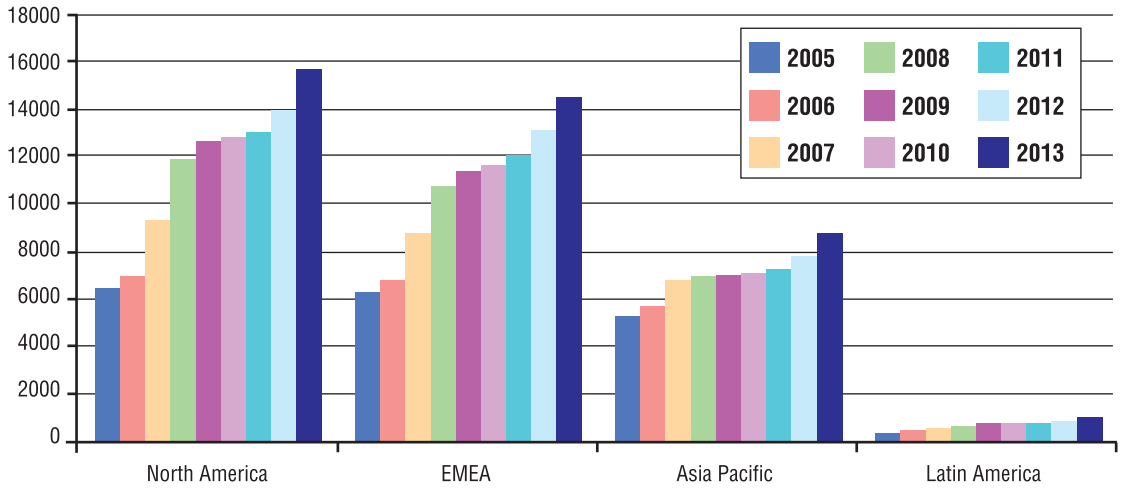
Figure 12 reports the share of PC-based video games in the estimated global video games market over the period 2004 to 2013. As mentioned above, the overall importance of this product segment has been decreasing and this trend is likely to continue. For example, whereas in 2004, PC video games accounted for 17% of the whole global video games market, in 2009 this share was only 8% and in the coming years it is expected to drop further.

4.2.2 Console and handheld video games

Figure 13 presents detailed data on the value of console and handheld video games in four world regions. According to these estimates, North America is the biggest market for this type of video game. For example, in 2008 the value of console and handheld video games sold in North America accounted for US$ 11,881 million. The EMEA region is the second and the Asia-Pacific region the third largest market for console and handheld video games. In 2008, sales reached US$ 10,748 million in the former and US$ 7,020 million in the latter. With US$748 million, the Latin America region represents only a small share of the global market for console and handheld video games.

In all regions, the size of the console and handheld video games market is expected to grow. For example, by 2013 the value of console and handheld video games sold in the North America and EMEA regions is expected to reach US$ 15,535 million and US$ 14,497 million respectively.

Figure 13: Console and handheld games market by region - 2005-2013, PWC 2009



Box 18: Glimpses of demand: Generation M2, Media in the lives of US 8-18 year olds - a summary of some surveys.

	1999	2009
Total amount of media exposure (hours per day)	7.29	10.45 (+29%)
Amount of time spent on each medium		
TV / Content	3.47	4.29
Music / Audio	1.48	1.29
Video games	**0.26**	**1.13**
Print	0.43	0.38
Movies	0.18	0.25

Proportion or recreational computing: social networking 24%, games 19%, video sites 16%, instant messaging 13%, other websites 12%, graphics/photos 6%, e-mail 6%, other 5%.

	Girls	Boys
Use by platform, Gender (minutes)		
Cell Phone	16	17
Handheld player	18	24
Console	14	56

Source: Generation M2, Media in the lives of US 8 to 18 year olds: Presentation for the IIC UK Chapter by Victoria J.Rideout, Ulla G.Foehr, Donald F. Roberts (our emphasis). Out of a sample of 2002 respondents, October 2008-May 2009. A Kaiser Family Foundation Study. Presentation available at http://www.iicom.org/chapters/uk.php

Figure 14: Console and handheld video games share in the total video games market, advertising included, 2005 - forecast 2013, in%, PWC 2009

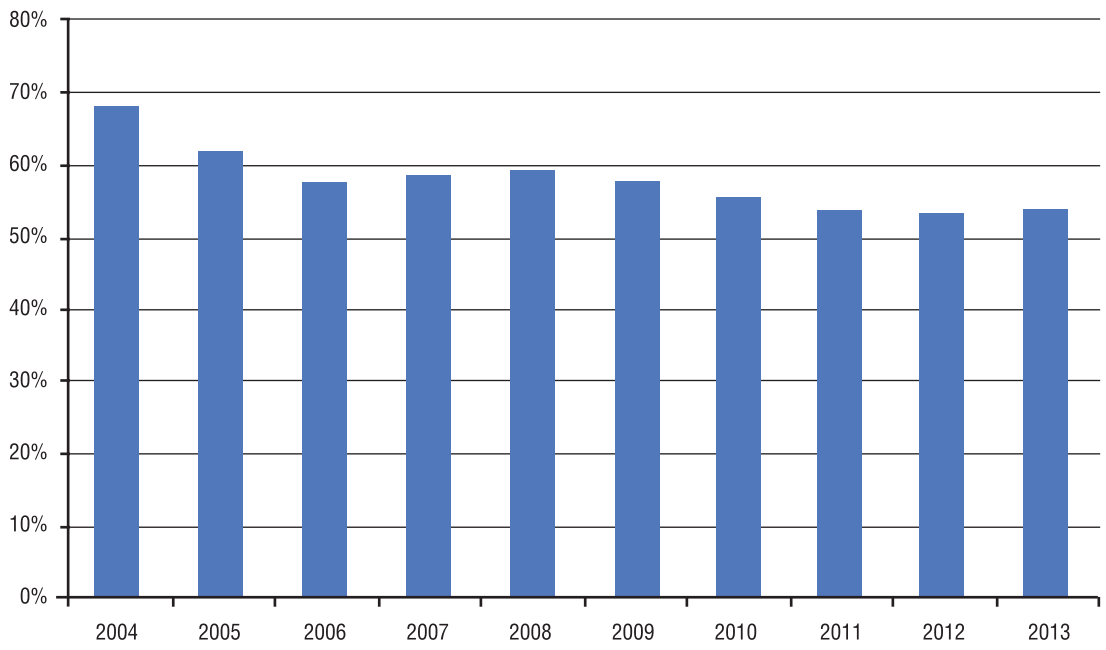


Figure 14 reports the share of sales of console and handheld video games in the estimated global video games market over the period 2004 to 2013. As expected, the share of this product segment is relatively high. For example, in 2004 console and handheld video games accounted for nearly 70% of the whole global video games market. However, over the last few years, this share has continued to decline and, in 2009, the sales of console and handheld video games accounted for less than 60% of the entire video games market. This trend is expected to continue and, in 2013, the value of sales of console and handheld video games will represent around 55% of the whole global video games market.

4.2.3 Online and wireless video games

Figure 15 gives detailed data on the value of online and wireless video games in four world regions.[93] In 2009, the total value of online and wireless video games sold in the EMEA region was US$ 5,069 million and for the North America region only US$ 3,003 million. With sales of US$ 9,081 million, the Asia-Pacific region is the biggest market of online and wireless video games. The sales of this type of game in the EMEA area have been always higher than in North America, while the Asia Pacific region has always been far ahead. As for other product segments, in comparison to the remaining regions, Latin America represents only a small share of the global market.

According to the data presented in Figure 15, the sales of online and wireless video games have been increasing rapidly over the last few years and are likely to grow further in the foreseeable future. For example, in the EMEA region, a double digit annual growth rate is still foreseen until 2013. However, the pace of growth is likely to decrease. Whereas in 2008 the EMEA market for online and wireless video games grew in comparison to 2007 by nearly 30%, this growth rate is expected to drop to around 10% annually from 2010 on and continue to stay at this level until 2013. Similar trends are expected in other regions. For example, in North America growth was 18% in

93 As indicated in the previous section of this report, wireless and online video games do not share the same technological characteristics and are not part of the same product segment. However, for illustrative purposes, they are considered here together.

Figure 15: Online and wireless video games market by region - 2005-2013, PWC 2009 (millions US $)

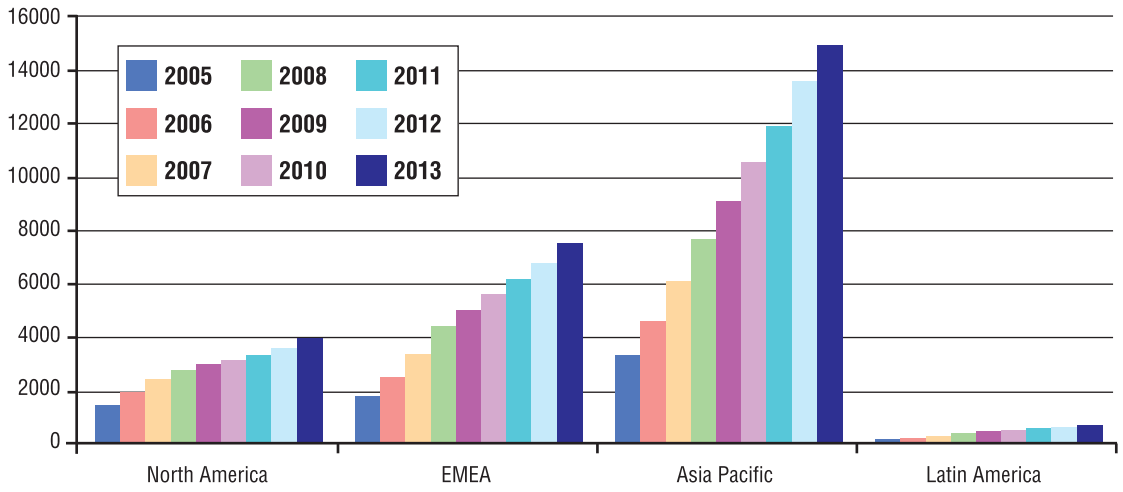
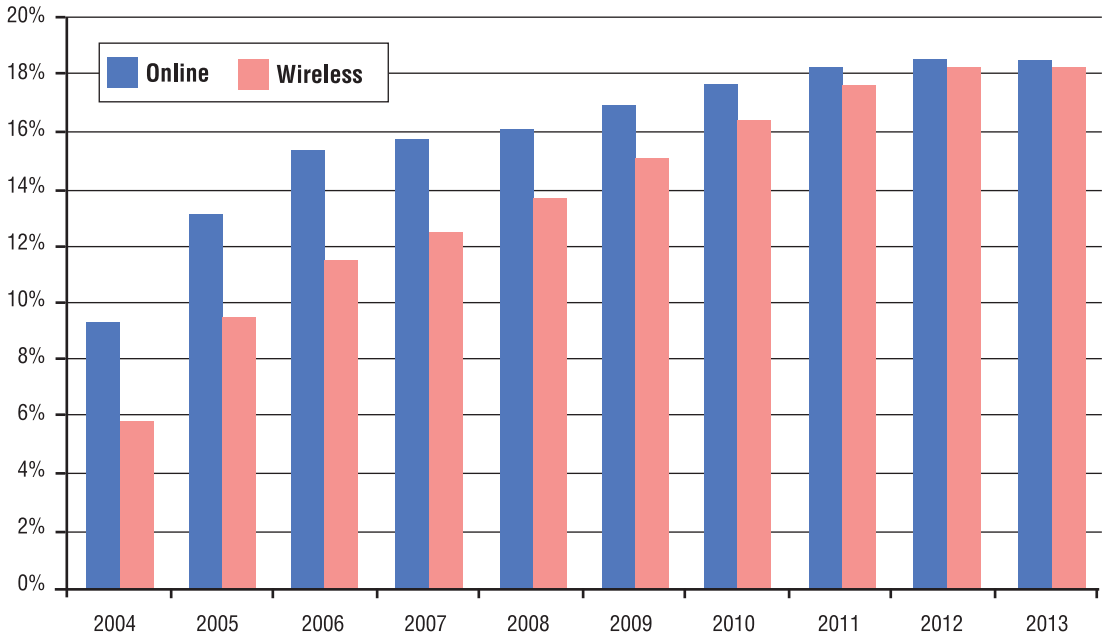


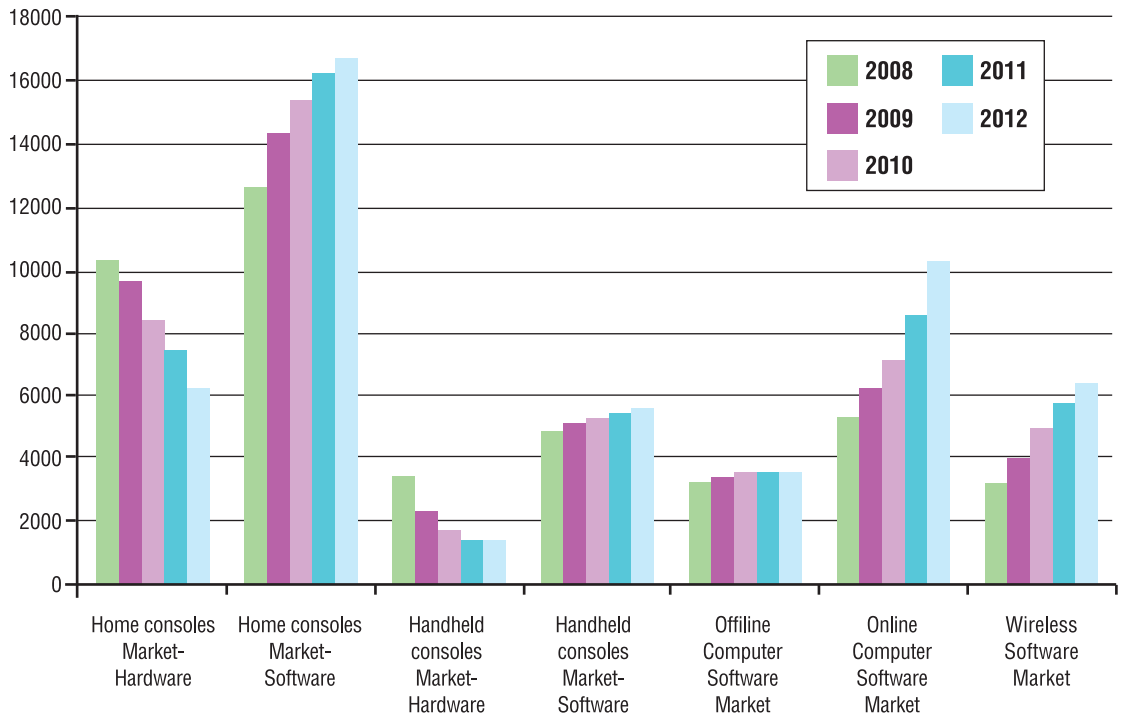
Figure 16: Online games and video games shares in the total video games market, advertising included, 2005 - forecast 2013, in%, PWC 2009



2008, after having been 25% in 2007 and 35% in 2006. Forecasts expect a drop to a single digit increase starting from 2009, partly due to the fact that maturity in the broadband market will slow broadband household growth, and that, at the same time, the current generation of consoles will also mature. It is expected that an annual growth rate of 6% from US$ 2.8 billion in 2008 to over US$ 3.9 billion in 2013 in North America will only be sustained by new subscription services that will enter the market and by new companies developing digitally-distributed solutions.

Figure 15 shows that, since 2004, the online and wireless market has grown with remarkable rapidity, driven by the increase in the number of broadband subscribers, the innovation in available games, and the transition to handheld devices and the newest generation consoles: e.g. Nintendo DS Wifi Connection was launched in

Figure 17: Value of hardware and software in video games, by segment, 2008 – 2012, in million euro, IDATE 2008



November 2005, and both Microsoft and Sony launched their online services for gaming consoles between late 2003 and early 2004.[94] This shows that the dynamics of this market are driven by technological novelties and new applications.

Figure 16 shows the sales share of online and wireless video games in the estimated global video games market for the period 2004 to 2013. Both market segments are expected to cover about 13% of the total end-user games market in 2008. By 2013, it is estimated that the shares of both product segments will reach around 18% of the online and wireless video games in the total video games market.

4.3 The value of hardware and software in video games

Figure 17 reports the value of software and hardware for consoles and handheld video games and the value of software for the remaining product segments, i.e. PC and wireless. The reason that the value breakdown by hardware and software is provided for consoles and handheld platforms is that these are dedicated platforms, whereas PCs or mobile phones, on which other types of video games are played, are general purpose devices.

According to the data presented in Figure 17, the value of home consoles was around €10,258 million, whereas the value of software dedicated to this platform exceeded €12,559 million. It is estimated that this gap will increase even further and, by 2012 the value of console hardware will drop to around €6,291 million, whereas the value of software is expected to increase to over €16,587 million. Similar relations can be observed for handheld devices. There, the value of hardware in 2008 was €1,550 million and of

94 It must be taken into account that figures on online games only refer to subscription fees, while retail purchases of games are accounted for in the relevant categories: PC, console or handheld.

the related software €5,668 million. Regarding the remaining product segments, the value of wireless software was considerably higher than the value of offline PC video games software. Moreover, the value of wireless software is likely to grow, whereas the value of PC-specific offline video games software is likely to stagnate.

4.4 Conclusion

As presented in this chapter, in 2009 the global video games market was estimated at US$55 billion and is expected to grow to over US$ 70 billion by 2013. These growth dynamics are exceptional for the media and entertainment market. In the forecasted period, the market for video games is expected to grow four times faster than the rest of the media and entertainment market. The data presented here seem to confirm the increasing size of the video games market and these high expectations for its future thus reinforce the perspective of an increasingly important role for this industry in the coming years.

Regarding the developments of particular product segments, online and wireless video games are expected to increase their importance in the video games market. Increased consumer awareness, growing internet broadband penetration in households and increased content development for online-specific games sustained by new technology exploitation are expected to be among the elements that will allow the revenue from the online and wireless gaming market to continue to grow. Hence, this product segment will be the second largest after the console and handheld video games one, and far ahead of the PC video games one.

Concerning the value breakdown of hardware and software in video games, it is observed that video games software already has a considerably higher value share in some product groups. The market segments driving the growth of software for video games market will be those related to online PC and wireless software. In contrast, market segments related to hardware in both console and handheld sub-segments are expected to shrink consistently. However, the software segments that pertain to both types of hardware will maintain a positive trend.

In conclusion, these introductory figures on the size of the video games market indicate that the relevance of the video games market and of its software segments is of outstanding interest, and it is expected that this will increase in the coming years. This interest is likely to be strengthened by a key aspect of this industry: i.e. its capability to succeed through investments in the development and introduction of disruptive technologies. Later on, other industries could benefit, through technology transfer, from the research and development carried out for video games-related products. However, though more and more studies are trying to calculate the dimensions of the game industry, the lack of official data clearly constitutes a constraint to the appraisal of its potentials and to the understanding of its dynamics.

Technical Report Series

5. Software Layers

5.1 Software layers in video games

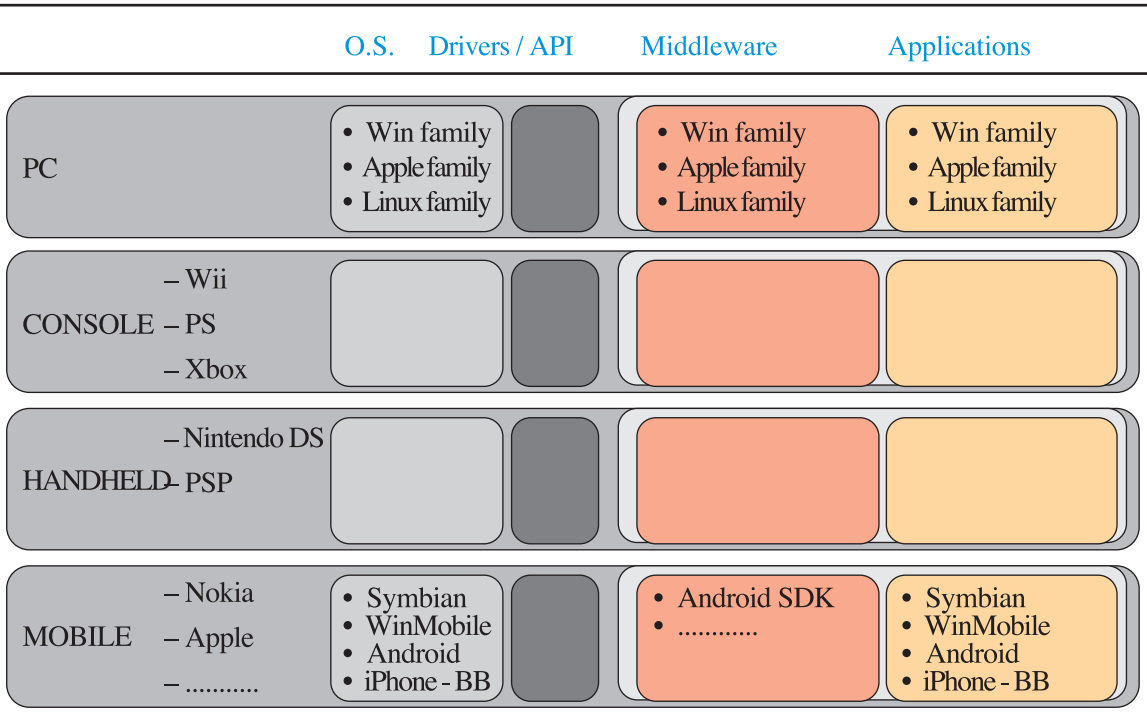
In most modern consumer electronics devices, end-user applications are not directly responsible for interaction with hardware. Software application layers play the role of intermediary between the high-level applications (those the user interacts with) and the hardware itself.

Figure 18 provides a simplified representation of the different layers of software that could be integrated in a current generation video game, together with some illustrative examples.

In line with the video games classification by platform we saw in Chapter 2, the figure is organised in four main blocks, each corresponding to one of the four platforms. For each of them, the platform name and of some of the most common hardware devices are indicated. Then, for each platform, four layers of software modules are represented as successive building blocks. The first layer is the Operating System (OS). Then, a second layer collects device drivers and Application Programming Interfaces (APIs) which are tightly connected to the operating system. A third layer refers to Software Development Kits (SDKs) called "engines", and more generally, to the software intermediary applications commonly named Middleware. Finally, the end-user applications are included in the fourth layer.

The left-hand side layer, the Operating System, is the closest to the hardware. Then, moving to the right of the figure, the layers have progressively higher levels of abstraction from the hardware. The last two layers are connected because, from the user point of view, the middleware does not come as a separate module, but is instead integrated as a building block of the end-user application.

Figure 18: A scheme for software layers in video games



Most of these layers act within a "software stack". Google describes its Android OS for smartphones as not only an operating system, but also a "software stack" for mobile devices that includes an operating system, middleware and key applications. The Android Software Development Kit provides the tools and APIs necessary to begin developing applications that run on Android-powered devices.[95] This expression "software stack" provides a simple but clear image of the way several layers of software are piled one on top of another to allow whatever application to run on a platform.

The approach takes into account the interaction of different layers of software which are integrated to build a specific application and to allow it to run, exploiting the functionalities of the hardware device. It is, of course, still valid in cases where the software application is a game, developed to be played by means of one of the video game platforms classified earlier in this report.

In the following sections, we propose a brief description of how each of the above mentioned layers is composed, what kind of modules are to be found in it, and a short explanation about the reasons behind its existence as a separate layer. Additional information is provided about the major software applications and their producers, taking into account each of the video game platforms.

5.2 Operating system and device drivers

In this section, the operating system layer and the device drivers layer are addressed together, because in the main video game products available, these layers are integrated. Treating them separately would not provide any further insights. These two "low-level" layers (i.e. the layers closest to the hardware device), are both closely dependent on the specific hardware they are designed for. Device drivers in particular cannot be considered independently from the specific device they aim to manage. A brief description of the characteristics of each of the two layers is provided in the next two sub-sections.

5.2.1 Operating system and device driver layers: an introduction

The first layer of software is the operating system. An operating system (OS) is a low-level software application which is responsible for interaction with the hardware, the management and coordination of activities, and the sharing of the resources, playing the role of an interface between the hardware side and the user side. The latter can be the user him/herself or a higher-level application (a programme the user interacts with). The operating system hosts the other software applications which "run" on the machine (this being a PC, a console, a mobile phone or any other modern consumer electronics device). It makes a set of services available and handles operations needed to interact with hardware devices, by making use of device drivers (detailed later). The services provided by the operating system are accessed by higher-level applications by means of Application Programming Interfaces (APIs) and specific calls to such services (system calls). Applications can invoke such interfaces to request the operating system for services or data.

The presence of an OS and of APIs obviates the need for applications to deal with hardware management and detailed low-level operations, also making the development of applications themselves lighter and faster. The level of complexity of an OS is variable and dependent on the type of hardware; in general, older electronics used to have embedded operating systems rather than software ones; nowadays, handheld devices could have more layers of services integrated in the operating system than standard PCs.

95 Refer to the Google Projects from the Android web page, accessible online at: http://code.google.com/intl/de-DE/android/ (last accessed: 12 December, 2009).

A device driver ideally connects the OS to a hardware peripheral and acts as an interface by converting general input/output instructions sent by the OS into messages that the hardware peripheral device is able to manage. Many device drivers are already built into the OS. Drivers are hardware dependent and, generally, operating-system specific.[96]

The reason for drivers, which play the role of interface and translator between hardware, OS and other software applications, is that they allow programmers to develop higher-level application code independently of specific hardware devices. Drivers (and OS) save developers from having to know in advance the hardware characteristics and languages of the peripherals. They free applications from the burden of dealing with lower level operations, because they translate generic high-level commands into suitable instructions by drivers and OS services.

In the conceptual representation proposed in Figure 5.1, OS, drivers and APIs are proposed as the modules on the left side of the figure. Specific drivers are usually produced by the hardware manufacturers and distributed together with the hardware peripherals. Nowadays, a wide range of generic drivers is deployed together with OSs. An example of modularity in OSs and drivers is the Linux OS, which allows programmers to either build device drivers as parts of the kernel of the OS itself or to separate them in loadable modules.

In the cases of both PC-based and mobile games (for example, to be played on Nokia Smartphones, iPhone, etc.), platform providers are likely to be different from OS software providers. In the case of handheld and console-based games (for example: Playstation, Wii, Xbox, and PlayStation Portable, Nintendo DS, etc.), the operating system is normally a dedicated one, and is provided by the hardware manufacturer.

5.2.2 PC platform OSs

The PC environment has evolved quite fast over the last two decades, and operating systems have been among the main actors in a war to consolidate standards and market positions. Since the early ´90s, the absolute leader of the PC operating systems market is obviously Microsoft, by means of the different releases of the Microsoft Windows operating system. Apple Inc. has developed the Mac OS X, a dedicated operating system for Apple-based personal computers, but it occupies a very small share of the market.

In this almost monopolistic context, Linux has presented itself as an alternative to the proprietary systems since the late 80s, by means of several variations of the UNIX operating system, largely distributed under open source-based licences. When focusing on PC-based video game platforms, the UNIX operating system cannot be considered as a relevant competitor. Nevertheless, it must be mentioned that UNIX-based operating systems are being exploited by console platforms.[97]

5.2.3 Console and handheld platform OSs

As mentioned previously, the video game consoles market is highly concentrated and only has three actors: Nintendo with the Wii console, Microsoft with the XBox console, and Sony with the Playstation console.

All of these consoles have proprietary dedicated operating systems.

The same logic applies to the market for handheld gaming devices, both in terms of oligopolistic situation and in terms of operating system choice. As we have seen earlier, the

96 Also, currently, many OSs have virtual device drivers to allow for more flexible management of hardware peripherals.

97 The Operating System on which the Playstation 3 console operates is a UNIX based one.

players are in this case only two: Sony with the PlayStation Portable (PSP) handheld, and Nintendo with the DS device. Operating systems are dedicated.

5.2.4 Mobile platform OSs

With regard to mobile platforms, the handset software application environment for mobile content allows gaming programmes to run on the device´s processor.[98]

Currently, the key players in the mobile gaming value chain are a number of dominant *platform software environments*, among them those proposed by Nokia (Symbian), Microsoft and Palm (Windows Mobile), Google (Android), Apple (OS X) and Blackberry (RIM).[99]

The improvement and diffusion at progressively lower prices of smart phones has meant that the range of possible choices has grown impressively over the last few years.

Symbian, supported by Nokia, has a good community of developers and is claimed to be the world's most popular smartphone operating system nowadays, thanks also to the fact that it is installed on Nokia´s multimedia devices. Portability on Mac hardware and usability are elements of strength. Symbian is expected[100] to remain the top seller for the next few years.

Microsoft has been producing its Windows Mobile for years, developed on the basis of Windows CE initially to be exploited on Pocket PCs. The OS does not have much of the PC version: it runs on the hardware of a number of manufacturers and it has a business-oriented style and specificities.

Palm introduced its PDAs in 1996, and is now relying on the Windows Mobile OS for its hardware while allegedly developing a Linux-based version.

Android by Google is an open source mobile operating system which manages phones constantly connected to the internet. The Android project was initiated by the Android Inc. Company, which was then purchased in 2005 by Google. Afterwards, on 5 November 2007 a consortium was founded of 47 firms (led by Google) involved in hardware and software development in telecom services, and committed to supporting diffusion and enhancement of open standards for mobile devices.[101] On the same day, this business alliance, named Open Handset Alliance (OHA), presented Android. It is based on the Linux operating system and released under an open source licence.[102] It allows interaction with the device by means of Java libraries, and therefore through Java language code. It was first used on HTC phones and is expected to be used on a number of devices as a free and powerful open source OS. This last characteristic has attracted the attention of application developers, whose creativity would no longer be constrained but freed from proprietary ties and able to produce innovative applications. It is noticeable that HTC also developed and

98 Modern smartphones are based on a processor not very different, in terms of functionalities and role, from those of the PCs we are more used to.

99 These are sometimes grouped under the label of "software/platform providers and aggregators", together with Java and Brew which actually are more generally "aggregators" providing an interface between applications and device processors). See in particular: iSuppli, 2009.

100 Ref. for example to InStat, accessible online at: http://email.in-stat.com/cgi-bin4/DM/y/hBU6m0RpugG0K560DHgg0Ec (last accessed: 12 December, 2009).

101 Among the founding members, the OHA lists firms such as Intel Corporation, Nvidia Corporation, Qualcomm, Texas Instruments in the group of semiconductor companies, HTC, LG and Motorola among the handset manufacturers, about 7 mobile operators, and software companies such as eBay, LivingImage, NMS Communications, Nuance Communications. ARM Holdings Plc, Asustek Computer Inc., Garmin Ltd, Sony Ericsson, Toshiba Corp, the Vodafone Group Plc. joined the alliance, among others, on December 2008.

102 Since October 2008, all the source code is available under the Apache Licence.

Table 9: Operating systems for smartphones

Company Name	Company Country, year of foundation	Smartphone Operating System	Market Share as OS Vendor, Q3 2009
Research in Motion (RIM)	Waterloo, Ontario, Canada (1984)	BlackBerry	20.6%
Apple	Cupertino, California, US – (1976)	iPhone	17.8%
Microsoft	Redmond, Washington, US (1975)	Windows Mobile	8.8%
Palm	Sunnyvale, California, US (1992)	Palm	NA
Nokia	Tampere, Finland (1865-1871)	Symbian	46.2%
Google	Menlo Park, California, US (1998)	Android	3.5%

Source: IPTS elaboration on companies' public information, and Canalys estimates on OS market shares.

deployed the SENSE interface for the Android system, which contributed to the success of its Android-based devices.

iPhones run a smaller version of Mac's OS X operating system, giving these phones supremacy in terms of usability and appeal, and also for browsing. Moreover, this OS allows iPhones to run third party applications, and thus exploit a very active and experienced developer community. However, these phones are critically lacking in basic phone functionalities and business applications facilities.

Research in Motion (RIM) produces Blackberry, which evolved to smartphone OS from a previous edition for pagers. It is another example of the most common approach in which hardware and software are solidly connected and integrated, as both smartphone and OS were produced, one for the other, by RIM. Moreover, it was initially aimed at business customers to whom it offered integrated solutions, ease of use, and a clear user interface. Consequently, it over took Microsoft Windows Mobile on the market. Recently, the RIM OS has also been gaining market share in the non-enterprise segment. It must be underlined that it is a proprietary OS which is completely closed and only available on BlackBerry phones.

On 6 October 2009, Verizon announced their decision to adopt Android, while Microsoft announced that Windows Mobile 6.5 was ready. On the same day, Palm launched the opening of its operating system to developers' programmes. Finally, forecasts[103] expect that the market for smart phone operating systems in 2014 will be shared among three big players: Symbian (26%), Android (17.9%), and Apple OSX (17.4%), with a shift in market share from Symbian to Android (while iPhone should be able to keep its share).[104] There is some indication that he "open source OS" will build momentum" at last, with the consolidation of Android expected to take place in 2010.

Obviously, this is a very dynamic, still immature market. Fierce competition in the mobile universe is moving, according to the opinion of market analysts,[105] from OSs to the level

103 Ref. to InStat Information Alert, Vol. 251, 2 November 2009, accessible online at: http://www.instat.com/abstract.asp?id=66&SKU=IN0904440WH (last accessed: 12 December 2009).

104 Gartner also foresees that, in 2012, Android will run 14% of mobile phone operating systems, against the 2% it runs today, occupying second place in world rankings behind Symbian (reducing to 39% from the current almost 50%) and ahead of iPhone, Windows Mobile and BlackBerry systems. Ref. to the article "Android to grab No. 2 spot by 2012, says Gartner" of 6 October, 2009, in ComputerWorld, reporting Gartner data, accessible online at: http://www.computerworld.com/s/article/9139026/Android_to_grab_No._2_spot_by_2012_says_Gartner (last accessed on 12 December 2009). On 6 October, 2009, Verizon announced the decision to adopt Android, while Microsoft announced that Windows Mobile 6.5 was ready, and finally Palm announced the opening to developers programmes. In the words of Allen Nogee, principal analyst at InStat, 6 October 2009 will be recorded as a day in history in the world of smartphones (ref. the note accessible online at: http://email.in-stat.com/cgi-bin4/DM/y/hBUjK0NbShJ0K560ErrN0Eb).

105 It is maybe relevant to mention that InStat estimates for 2014 a smartphone market of 412 million units, from the 161 million units expected to be shipped in 2009.

of functionalities and interfaces. Nevertheless, newer OSs are competing with Symbian, among them Android.

Table 9 lists the main producers of operating systems for smartphones, the countries in which they have their headquarters, the year they were founded and the operating system they distribute. Nokia is the only European producer of a mobile operating system.

5.3 The middleware

5.3.1 The reasons behind middleware

Between the OS and device driver layer and the end-user application, an intermediary layer can be identified, though it is usually hidden from the applications' end users. This layer mainly refers to applications like *engines*, which are meant to be used (called) by higher level applications and are designed to provide them with specific functionality. They usually come in the form of Software Development Kits, which are sets of development tools, including libraries and applications which allow software developers to develop applications faster and in a portable way. The purpose of Software Development Kits and engines in general can be very diverse, and with regard to video games there are several types of engines which will be briefly described in Section 5.3.2.

The presence of an additional layer, besides that of drivers, is needed for two reasons. Firstly, it ensures the reduction in application development costs by allowing reuse of components on one side, and secondly it improves efficiency and effectiveness in the applications' development process, thus making it possible to develop cross-platform applications.

The typical duration of the whole development cycle of applications in general, and games in particular, is usually longer than the application's life. The reduction of developing and testing time is a requirement of highest importance.

The possibility for an application to run under different environments, or on different platforms in the case of video games, is generally referred to as *portability*. Though portability issues are second order considerations, they are nevertheless important as regards development costs, in that portability allows an application to be sold for different platforms. One of the most important characteristics of most software modules belonging to the middleware layer is that they allow portability, at least to a certain extent, achieving some level of *platform abstraction* which translates into *platform independency*.

In the games software segment, the portability factor is challenged by the coexistence of different platforms, each of them characterised by the integration of various hardware and software components. The portability issue arises because of the existence of different operating systems, as we have seen in the cases of PC-based platforms and mobile platforms.

The case of mobile platforms is self-explanatory: various factors affect portability, among them internalisation, carrier requirements, device specific bugs, differences in screen size and resolution and processor power, and possibly the presence of proprietary APIs (Wee, 2007). Thus, portability must respond to strong requirements, and must be efficiently designed to avoid any negative impact on production costs and development time. Such considerations pushed mobile game developers to achieve, as far as possible, game code device independency in order to support effective portability strategies. The development of an abstraction layer was therefore an obvious step, in order to provide interfaces for all the most important issues, from input and output to memory and peripherals management.

Scalability and flexibility in the development process are also aspects connected to production

costs and to the opportunity of an interaction among different layers of software. The development of a single application, integrating all of the mentioned layers or, at least, all of them except the operating system, would lead to much higher development costs and would reduce to zero the possibility of reusing part of the codes (at reasonable cost) for different applications or for subsequent versions of the same one. In the first video games, from the arcade period to the Atari 2600 at least, the situation was pretty much that of programmes written typically as singular entities, which needed to be specifically designed from scratch to optimise the use of the scarce graphic and computational resources. Memory constraints constituted a further strong limitation to the possibility of splitting some functionalities from the core of applications in general and of a game in particular. Still in the ´80s most games were hardcoded and contained only a very limited number of reusable routines.

Scalability is closely connected to the chance of enjoying economies of scale, as it allows new versions of a game to be created once a core game play is fully designed and developed. The development of further versions costs less, requires less effort and shorter production time, getting to exploit the same benefits that makes portability an important issue in software development in general, and particularly important in the video game segment.

Maintainability must also be listed among the factors behind the shift to the creation of more software layers between the low level operating system and the upper level application. When the process of maintenance and testing of an application takes place, the presence of different modules makes it simpler to distribute a new feature or to fix a bug on different versions of the application itself. According to the literature (Beizer, 1996; Bessen, 2002), there is substantial evidence that the main share of software costs is incurred in the stages of testing, debugging and maintenance.

Last but not least, it is possible to conclude, then, that video games are built upon a (software) *game engine*, which represents the core technology. The core game engine allows the higher level application (the part of the game containing the content) to more easily interact with the lower layers, drivers and operating system, and, as a consequence, with the hardware. The game engine is meant to be in charge of heavy and repeatedly accessed routines, e.g. it deals with graphics rendering[106] and with the "intelligence" of the game. The engine is in charge of detecting the interaction of entities in the game, the reactions to each action, and so on. Moreover, the middleware provides the developers with an effective development environment.

Therefore, it is not come surprising, but it is relevant, that most successful engines have been leased to multiple game producers. Once a core game engine has been developed and used to power a successful game, it is likely that other developers take advantage of the consolidated effectiveness of the tool to power their games too. The core engines can actually be used as a base for different games, as it is devoted to managing the basic core functionalities. Different games with completely different plots and content can be powered by the same core game engine which takes charge of rendering functions, motion control, contact detection, and so on. Improved sales quickly pushed the development of third party core game engines which were used by the games particularly appreciated by consumers.

Another reason behind the production and distribution of SDKs can be found in the desire to support specific sets of technologies, e.g. AJAX in the mobile platform (Ballon, 2009). Last but not least, the availability of SDKs and effective engines means that more developers can afford to develop applications for specific platforms

106 The rendering of graphics basically refers to how the graphic is presented on the screen (Walfisz et al., 2006).

Box 19: Criterion Games Box

Criterion Games Box was founded in 1993 in Guilford (Surrey, UK). It is the producer of the very successful Renderware middleware, together with a number of famous games. Specialised in 3D graphic rendering technologies, its middleware takes care of physics, artificial intelligence, rendering, audio components. Originally set up as a spin off of Canon, it was bought by Electronic Arts in 2004. In 2007, after cutting back on personnel and closing a lab in Derby, it employed, in combination with Electronic Arts, around 500 people at its base in Guildford.

(adapted from Wikipedia and web information)

or hardware devices. Hence, providing access to SDKs (and to resources in the lower layer) could be a good strategy to push the creation of third party application suppliers and bigger development communities around platforms. In the end, this access could affect the success of the hardware device itself.

5.3.2 Purposes of middleware in video games

The first separated middleware modules appeared between the late '80s and the early '90s to handle the graphics in video games. These modules represented the first generation of third party *graphics engines* or *renderers*, as until their appearance video games were built mostly as single hard-coded applications. In the mid '90s, the increasing complexity of applications pushed further the development of what were starting to be called *game engines*. These were meant to improve the development of *first person shooter* games just converted into their 3D versions. Core parts of successful games such as Doom and Quake were licensed to other companies, which were building different games taking advantage of already available and effective routines managing graphics, characters, collision detection, or other core aspects. At the end of '90s, the most successful games were those designed to take into account the interaction of different layers, and which separated the engine from the game content. In 2004, Electronic Arts bought Criterion Games, founded in 1993, which produced the famous and successful Renderware game engine. Renderware was in fact a family of middleware technologies, which grouped together management of graphics, artificial intelligence, audio and physics[107] components of games. It was integrated as a core engine in titles as famous as Gran Theft Auto. Therefore, this came as a shock for the industry, regardless of the fact that both Electronic Arts and Criterion Games declared they would continue to distribute the engine libraries. Producers perceived the risk involved in being dependent on a third party producer for a core engine as being too high.

This provoked what is generally referred to as the shift to a second generation of third party middleware modules, to the middleware 2.0 era.[108] From 2004 on, middleware started diffusing again and available libraries increased in number and functionalities, the big change being that they were no longer proposing a complete solution. Instead, modules produced by third parties evolved into small flexible and lightweight components, in charge of the management of more specific functionalities.

The technology and the business models have changed, and few companies nowadays claim to offer a complete solution to developers' needs. Instead, like small mammals running

107 Physics middleware: physics engines take care of the simulation of physics models, thus providing the game with the management of effects such as mass, velocity, wind resistance, etc.

108 For a more detailed historical overview of the transition to Middleware 2.0, refer to the article on Develop, available online at: http://www.develop-online.net/features/13/Rise-of-Middleware-20 (last accessed: 12 December 2009).

through the bones of their giant ancestors, available technology has become flexible and light. The development of game functionalities is, in the framework of the Middleware 2.0 era, based on a core game engine, highly modulised by means of the integration of a wide range of tools in charge of the management of all the other main functions, from graphics to storage, extraction and display of game data.

Game engines are usually designed with a component-based architecture, which allows the substitution of specific sub-systems for other specific middleware reusable modules. They can even be conceived as a series of middleware components which are loosely connected and can be combined with other third party products in order to build a customised game engine. The modules composing a game engine are devoted to specific core functionalities which must be combined and integrated in order to allow the functioning of the game itself.[109]

Game engines, besides offering hardware abstraction to allow the software code to be independent from the hardware device or platform, provide abstraction from common game-related tasks, which are usually highly complex. Among the functionalities which are expected to be managed by game engine modules, those dealing with graphics need to be independent from graphic processor units, and include *rendering engines* for *2D* and *3D graphics engines*. Physics engines or collision detection / collision response are also very common. Physics engines take care of the simulation of physics models, thus providing the game with the management of effects such as mass, velocity, wind resistance, etc.. Collision detection and response to a predicted collision also have to be managed throughout the game (for certain genres, obviously). Basically, physics engines provide the game with a simulation of physical behaviour in the real world, including that of objects and bodies, explosions, liquids, soft and hard materials, etc. The speed of the simulation in these cases is usually important, even if it comes at the expense of the accuracy of the simulation, as both are limited by computational resources availability.

Game engines specifically devoted to providing functionalities to *first-person shooter* games (FPSs) were among the first to be developed, to improve visual quality with better graphics on a human scale.[110] After fast evolution in which they progressively managed to deal with textures, shading, lighting and so on, first-person shooter engines recently achieved photorealism.

Another category of engines with highly specific characteristics manages Massive Multiplayers Online Games (MMOGs), where the interaction of a very high number of characters strongly increases the complexity.

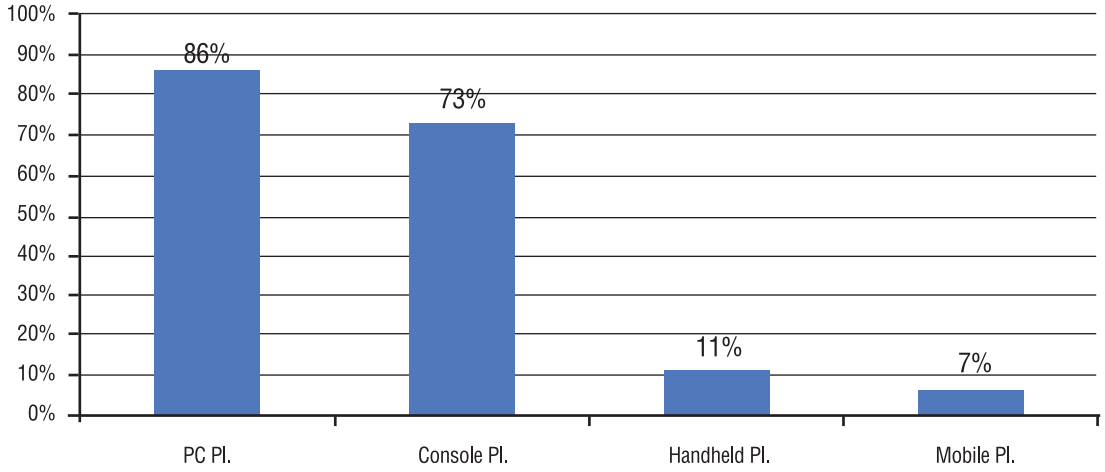
5.3.3 Middleware and platforms

These middleware components offer the developer the most important feature allowing hardware abstraction: by referring to the intermediary layer of modulised middleware, interoperability and portability among platforms (at least among some of them, or among different hardware devices in the same platform) are guaranteed. This provides the final users with a wider selection of games for their favourite hardware, but gives the studios an incomparable advantage in terms of cost reduction and opportunity to enter different markets. In this perspective, the evolution of third party middleware can be taken into account when changes in the boundaries of platforms are analysed (Ballon 2009).

109 It may be surprising, but games are nowadays among the most evolved and resource-demanding types of software applications.

110 Other genres of games deal rather with realism on a large scale: e.g. flight simulators, and real time strategy games (RTSs).

Figure 19: Platform coverage of middleware software models



Source: IPTS elaboration on information provided by GameMiddleWare.org (accessible online at: http://www.gamemiddleware.org/ (last accessed: 17 December 2009).

It must be underlined that the third party middleware producer environment is still changing fast. Successful companies, usually founded by a few brilliant young developers, which licence the core middleware portion of their software, are often bought by big studios or platform producers. Then they are either integrated into the buyer's company structure to work in-house (as a first-party development entity) or kept as satellites dedicated to second party development. In general, survival as third-party independent development companies is directly connected to the success of the games their modules are built in.

In terms of the business model behind game engines distribution, it is worth mentioning that game engines are distributed under different types of licences. Basically engines divide into: i) free open source engines, generally distributed under a licence of the GPL (General Public Licence[111]) type together with the source code (along with the open source approach), ii) freeware engines, distributed freely but without the source code, and iii) commercial engines, which are proprietary engines distributed under the payment of a royalties or similar commercial contracts.

It is quite difficult to maintain an updated list of all the available middleware products for video games, due to the variety of tools and the rapidity with which new versions are released and need change, quickly making very well known tools obsolete.[112]

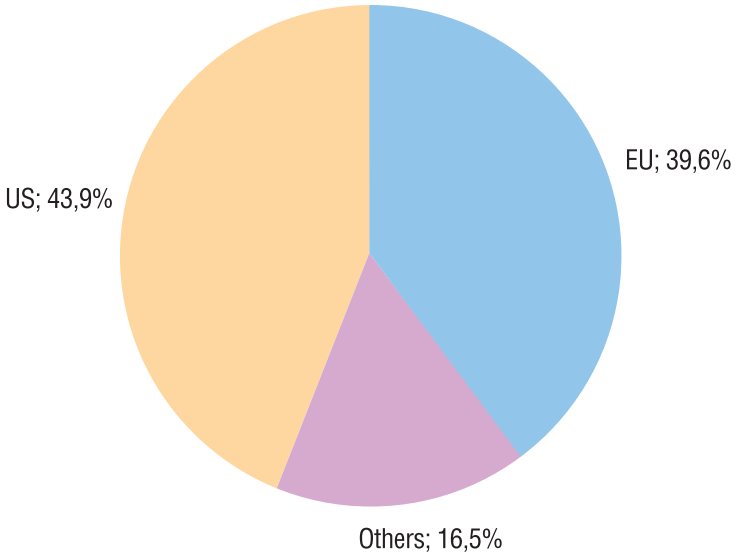
Moreover, although it is not useful to address the different platforms separately, as one of the most relevant characteristic of the middleware software layer is that it can be used across platforms, it could be useful to grasp the coverage of middleware solutions among platforms. Figure 19 shows the percentage of coverage by each platform for 212 middleware applications listed by GameMiddleWare.Org.

Of the 212 game middleware modules taken into account, 182 are portable on PC, and 154 on Xbox, Wii and PS consoles. The level of coverage is much lower for mobile applications (only

111 Please refer to the GNU organisation for detailed explanation about GPL licences: www.gnu.org/licenses/gpl.html (last accessed: 12 December 2009).

112 Among the attempts to maintain updated lists of game middleware, refer for example to the organization GameMiddleware.Org, available online at: http://www.gamemiddleware.org/middleware (last accessed: 12 December 2009). Wikipedia also proposes a quite complete list of game engines, available online at: http://en.wikipedia.org/wiki/List_of_game_engines (last accessed: 12 December 2009).

Figure 20: Geographical distribution of middleware producers



Source: IPTS elaboration on information provided by GameMiddleWare.org (accessible online at: http://www.gamemiddleware.org/ (last accessed: 17 December 2009).

Table 10: Most common commercial core game engines

Company Name	Product Name	Country, year of foundation
Crytek GmbH	CryENGINE	Germany, 1999
Digital Extremes	Evolution Engine	US, 1993
Emergent Game Technologies	Gamebryo	US, 2002
Epic Games	Unreal Engine	US, 1991
Garage Games	Torque	US, 2000
Id Software	idTech	US, 1991
Terminal Reality	Infernal Engine	US, 1994
Trinigy	Vision	Germany
Unity Technologies	Unity	US
Valve Corporation	Source Engine	US, 1996
Vicious Cycle Software	Vicious Engine	US, 2000

Source: Elaboration on the list provided by DeLoura, 2009, available online at: http://www.gamasutra.com/blogs/MarkDeLoura/20090302/581/The_Engine_Survey_General_results.php (last accessed: 12 December 2009).

14 modules work in the mobile environment, based on iPhone, Symbian, Palm, Brew), and for handheld consoles (24 modules serve for PSP and Nintendo DS handhelds). Figures confirm a major portability across PC and console platforms.

Though the landscape of third party development companies changes fast, a brief mention of the nationalities of the companies producing the selected 212 middleware modules seems worthwhile. Figure 20 shows the distribution of companies among European Union countries, other countries and the United States.

Most middleware modules are produced in the United States, which provides 93 of the 212 analysed items, 43.9% of the total. The figure shows that 39.6% of modules are produced by companies based in one of the European

Union countries. Of these 84 products, 22 were developed by companies in the UK, 19 by companies in France, 12 in Germany, 5 in the Netherlands, 4 in Ireland and 4 in Sweden.

35 items, or 16.5% of the total, come from other countries. 14 of these have been developed by firms in Canada.

The diffusion of middleware among studios is shown by a recent survey (DeLoura, 2009a and 2009b) of the top 11 middleware commercial products, most of which are in the core game engine segment, see Table 10.

The survey revealed that more than 80% of the respondents were aware of 5 of the most common products listed (namely, Unreal, cryEngine, Torque, Gamebryo, Source). 60% of the respondents declared they had used Unreal.

Two German companies, Crytek and Trinigy appear behind the most popular core game engines.

5.4 The game as end-user application layer

Software applications are the highest level modules, at the rightmost end in Figure 18. Users exploit these applications in the PC environment when, for example they edit documents, produce spreadsheets, or keep accounts. With regard to the video games environment, the applications are actually the programmes run to play games. As already mentioned, the end-user video game application in most cases contains, as building blocks, necessary modules of the middleware layer: the upper level layer, "the game", puts together the software for the game and the game engine. This is, in the behind-the-scene creation of content, the task taken up by the studios or the developers teams. We have presented these at length in Chapter 3.

5.5 Conclusions

The definition of platforms used initially (Chapter 2) for the video games classification - "systems made up of several physical and / or software modules, linked by interfaces" (Gawer & Cusumano, 2004) - reminds us that hardware and software components in video games are both fundamental elements[113] that have to work in an integrated manner.

The software components are at the core of this *integration*. They are responsible for whatever kind of action results from the game itself (the "plot"), and also for the management of all types of interaction between the user and the hardware (input and output). In other words, inputs from the user and outputs addressed to the user have to be managed by software, at the same time as the game plot unfolds.

Along with this definition of a platform comes the concept of *modularisation* of complex systems. It follows that software is conceptually separated into modules, each taking care of specific interactions. The evolution of software development has pushed progressively towards more advanced fragmentation of software modules, which finds an obvious justification in the case of video games.

Video games function through the integration of different modules, some of which are basically stable while others can vary (Baldwin & Woodard, 2008), and be substituted by different modules depending on the applications or functionalities required. Module updating also happens over time, following the technological evolution of the platform itself. Some authors actually define platforms according to how far they can integrate reusable components or shared functionalities, generating economies of scale (Bresnahan,

113 It seems not necessary here to refer separately to firmware, which indicates small basic low level applications which are generally embedded in chips and assembled on hardware modules in most of electronic devices.

1999). Reusability of components and economies of scale are therefore among the main reasons behind the existence of different software modules. Modularity brings economies of scope in production and the resulting upgradability in turn accelerates the time-to-market (M.Bourreau, P.Dogan, M.Manant, 2007).

We have seen that it is relevant to identify different software layers as modules interacting in a video game (and, more generally, in a consumer electronics device application). This framework allows us to analyse the software dimension of video games, identifying the core layer - the engines - as the most powerful products and the main actors on the scene.

We have seen that the industrial actors of the video game industry are working out their positions around such issues as:

- the status and market shares of mature OSs in the console / handheld and PC oligopolistic markets.
- the competition among emerging OSs for mobile platforms.
- the central role of middleware – games engines – in a new era of modularised engines.
- and last but not least, higher level application developments that belong to the studios and developer teams already presented in Chapter 3.

In all of the above software layers – with the exception of hardware consoles and handheld platforms where Europe has no presence, Europe has an enviable range of actors, and opportunities to improve its positions. This goes for Nokia and its mobile gaming challenge, the important population of middleware producers and its network of creative developer studios.

Mobile gaming and online gaming (MMOGs) are emerging trends that are affecting the status quo. Their emergence will probably affect current and future dynamics in the video games software industry, and they will be the key to future competitiveness in this industry.

Part II. Online and Mobile: The Coming of a New Era

6. The Online Games Ecosystem

6.1 Introduction

The distribution of electronic entertainment products is challenging, among others, the movie and music industries. It has already been foreseen that this shift towards "digital entertainment" (In-Stat, 2010b) will cause a "digital entertainment revolution" which will progressively push electronic diffusion of all entertainment content, which compete with other types of content, including user-generated.

Among video games segments, online games benefit most from the increase in electronic diffusion of content, as this guarantees, on the one hand, growth in the number of users and demand, and on the other hand, allows games to be improved by adding new functionalities, and opening new sub-segments as it becomes possible for millions of players to interact simultaneously.

The availability of broadband access is enabling the diffusion of simple and little articulated online games, which require less dedication and commitment from the user. Such games offer nevertheless comparable satisfaction in terms of fun and relaxation, and basically no barriers to beginners in terms of knowledge or skills. This opens the door to occasional (thus, "casual games") gaming to a completely new slice of the potential market. Online gaming now addresses a new and much wider range of ages, and the target market is growing exponentially, sustained even further by the parallel non-stop growth of social networks communities. At the same time, the possibility to play, and even to design simple games to be played on social networks[114] is encouraging the diffusion of online gaming and supporting in turn the interaction of users in the content creation process.

Video games, which allow non-linear interaction with the user (unlike music and movies where the interaction is linear), are getting the most out of the possibility of being played online, by exploiting the promises offered by massive multi-player interaction, creation of persistent virtual worlds and characters, multiple entry points and continuously updated plots enriched by the contribution of user-determined content.

In order to describe the online games subsector and to indicate possible policy issues, we first define online games (Section 1.2) and then put them into a historical perspective.

Section 1.3 describes the industrial ecosystem, the characteristics of the production process and the value chain in the online video games industry.

The main techno-economic models for the production and distribution of online games (Section 1.4) and an overview of market data (Section 1.5) are provided to show - to the extent to which available data make it possible – the business activity and current dynamics of the industry.

The main business models adopted by successful companies are also presented, together with the main changes affecting the organisation

114 See for example the article "How to write a FaceBook application in 10 minutes", published on 18 June 2007 at: http://gathadams.com/2007/06/18/how-to-write-a-facebook-application-in-10-minutes/ (last accessed: 20 May, 2010).

of production, the peculiarity of the online gaming activity, and the changes occurred in the distribution and deployment of these games in comparison with the offline ones.

Finally, in Section 1.6, several successful European companies are described in order to support the analysis of the main strengths and weaknesses of European firms and to, finally, draw a picture of the main challenges to which European companies will be exposed in the future.

6.2 Definition and categories of online games

The simplest definition of an online game points out, almost tautologically, that it must be a game played over "some form of computer network"[115] or, as could obviously be expected nowadays, over that most diffused and accessed of computer networks - the internet.

In its work on online games, the OECD Working Party on the Information Economy (OECD, 2005) also draws a line between the online and the offline video games industries. The OECD definition also takes the hardware platform[116] into account: while it identifies different trends for offline games depending on their platform,[117] it forecasts strong growth for online games irrespective of hardware platform. This makes it possible to consider the online segment without differentiating it by hardware platform, but simply by referring to the fact that the game is played over the Internet. Most of the literature agrees (Steiner, 2009) on this approach and considers online games irrespectively of the underlying platform, so long as it permits "at least some sort of network connection".

The aspect of interactivity is horizontal to all video games, as they all share the characteristic of being "an interactive kind of mediated entertainment" (Jansz and Martens, 2005), and without the user's interaction the game simply cannot proceed. However, the meaning attributed to interactivity is evolving, and with regard to (online most of all) video games it refers to the capability of the gamer to influence what happens in the game by means of actions performed via an interface (Grodal, 2003; Vorderer, 2000). This interactivity is pushed to the maximum in online gaming, where the gamer interacts not only with the game itself, but also, in many cases at the same time, with other gamers by means of the moves in the played game. Through this kind of interaction, the game enters the sphere of interpersonal communication. This "social context of game" is very important as a trigger to push gamers to play online multi-players games. This has pulled the demand for this kind of online games, leading to the definition of two bigger categories in games which are played over a network: games that the user plays alone over a network, and games which allow the user, by means of the underlying network, to interact and play with other players.

Indeed, using this approach, online video games can be divided into two main sub-categories, with often very different characteristics in terms of game structure, user interaction, and most of all underlying business model. One or more specific markets correspond to each of the subcategories.

This basic distinction drawn is the one between *single user games* and *multiplayer*

115 See Wikipedia (available at: http://en.wikipedia.org/wiki/Online_game; last checked on 12 March, 2010). Generally, this definition tends to exclude mobile games, if only for mostly historical reasons. Mobile games are addressed in the next chapter of this report.

116 In the cited work (2005), the OECD groups platforms in three big categories: PC, console, and wireless, and adopts a perspective similar to that of some major consultancy and market data firms. The difference between this approach and the one adopted in the present work has no relevant consequences. In the present work, a slightly more detailed classification of platforms has been adopted for the sake of clarity and because it allows us to address specifically the oligopolistic situation in the hardware production of handheld gaming equipment.

117 While the off-line PC video games segment is considered already mature, moderate growth is expected in the off-line console segment. Strong growth is expected to continue in the off-line wireless segment (OECD, 2005).

games. The former are generally available as "*browser games*", which are played by means of a web browser and typically do not require additional software, specific to the game, to be installed.[118] Multiplayer games, however, are instead usually (still) played in the form of "*client-based games*", where the activity required of the client machine is still relevant, its performance and elaborating power still matter and possibly some kind of software programme or engine has to be installed on it. It is rather common to find nowadays these labels in the catalogues of successful game producers, and they represent the evolution of the previous categorisation, now rather obsolete.

Indeed, at a much earlier stage in the diffusion of online games, Junbaek et al. (2004, among others[119]) attempted to classify video games according to the characteristics of the interaction between the client machine (generally speaking, at that time, a personal computer) and the remote server. A rather old but accepted classification identified three types of games suitable to be played online. These were classified according to the structure of the system required by the games themselves in three groups: a distributed client model, a centralized server model, and a client/server model. The *distributed client model was* originally adopted by very successful pioneer online games, such as Doom.[120] In this model, the client PC ran the game's engine, and a server was necessary to provide the connections and environment to peer players' local machines. By leaving most of the operational effort on the client's layer, this model was especially appreciated in the past when the workload on the server's side used to represent a bottleneck (as did availability of a connection). Most of the process in this case is operated at the client layer. *The centralized server model*, on the opposite, delegated the engine management to the server, leaving on the client's side only the input and output operations, whose results were transmitted to the server, which was in charge of all the operational effort. Work overload on the server' side used to be a common problem in the past years. The *client/server model* was attempting to strike a balance between the client and server activities.

The evolution in software architecture and most of all in computing power, storage capacity and network speed is making the above-mentioned approach rather obsolete. Moreover, it is considered useful to explain the reasons behind the availability of online games which, in order to function, require the gamer either to download parts of the programmes or to buy a packaged software application. Even if non browser-based online video games still are bound to belong, to some extent, to one of the three above mentioned categories, due to the different number of operations delegated by the software engine to the client machine or to the server, any specification is nowadays generally skipped, and the wider and less differentiated label of "client-based games" is commonly adopted in the cases in which one or more layers of the game software need to be installed on the client machine.

6.2.1 Browser games

To play browser-based games (BBGs), users only require access to the Internet and a web browser. This clearly represents a possible first big advantage for users, who can access browser-based games from almost anywhere. By skipping the need to install software applications on the specific PCs where the games are to be played, browser-based games free the users from being dependent on their own computers, and allow them to play in a variety of different occasions, situations and places (last but not least, they can play their favourite online games during pauses

118 In some cases, slightly different specifications of the definition are proposed, when for example games with multiplayer capability are named "Internet games" to distinguish from the simple single-user "online games", as done by Internet.com in its webopedia definition (available online at: http://www.webopedia.com/TERM/I/Internet_game.html; last checked on 12 March 2010).

119 See for example Sweeney T. (1999).

120 See: http://doom.wikia.com/wiki/Entryway

at their workplace). Moreover, this provides an answer to a security issue that is still perceived as important, at least in Europe (in Asia it seems much less relevant): people are still reluctant to download material from the internet.

Moreover, this "freedom" for the users is also extended to legal aspects (such as license and copyright terms) and to maintenance: all aspects that relate to updates -new improvements, patches, bug eliminations, extensions- are all addressed directly on the server which provides the game.

The development of browser-based games has been made possible by the continuous availability of more and more advanced plug-in tools which endowed browsers with much greater functionality than they originally had. In many cases, pieces of software actually have to be installed on the client PC, but these are usually general purpose plug-in tools.

Some games make use of server-side scripting, sending requests to the server. The game is actually played on the server computer to which users connect through the browser, and this allows for more complex interaction among users. Server-side scripting relies on languages such as PHP, ASP, Perl, Python, and Java. Other games employ Java Scripts, or Shockware, Flash Player, Silverlight plug-ins or other common client-side components.

Bearing the above distinction in mind, it is worth repeating that, even though in principle browser-based games are rather simpler than client-based online games, the evolution in available software engines is supporting a progressive increase in the power of browser-supported applications, and multiplayer interactions are already possible. Nowadays multiplayer browser-based games are available, allowing for all the types of multiplayer game flow: not only turn-based games which give turns to each user to execute his tasks, but also real-time games which give real amounts of time to users to act.[121]

Therefore, a move towards a convergence of the two categories of single and multiplayer online games into the browser-based typology is conceivable, once browser-based games prove they can deal with complex interactivity. Eventually, continuous improvements in browsers and add-on software on the one hand and in the speed and performance of networks on the other could lead the browser-based games to reach the same quality and complexity as client-based ones in a relatively short time, finally making the latter obsolete.

6.2.2 Client-based games

Unlike browser-based games, client-based games need an application to be installed on the gamer's personal computer in order to function. This software can usually be downloaded from the game's (distribution) website. In this, these games are similar to traditional video games, which required clients to buy software, for example, in a store. Once this software is installed and run on the client PC, it is possible to start playing. The presence of the software usually allows better graphics and some more advanced features of the game, while on the other hand browser-based games are often rather simple in graphics and limited in complexity of the content.

At the moment, client-based games still exploit the local machine's resources better, in terms of graphics, rendering capacity, and computing power, and thus giving room to games of all possible genres to be performed.

121 On the other hand, even in former literature (Griffith et al., 2003) the adopted convention was to name single player-oriented games, which offered the possibility to look for human opponents online, as 'Stand Alone (online) games'. With this kind of games, the online experience is limited by the simplicity of the plot and by the lack of a "clear game narrative", which reduces the extent to which social immersion is possible in such games. Grouping behaviour is unlikely to take place, and there is no immersion in a virtual world, even though communication among players is possible.

The most relevant distinction, already presented, is the one between single player games and multiplayer ones.

Single player games share similar usability and plot characteristics and used to be called *stand alone* games: the level of social immersion in these games is reduced by the fact that the plots are simple and they lack "clear game narrative".

Multiplayer games, on the other hand, are of different sorts but all of them allow a group of users to play together. As these games can provide some of the most successful experiences, brought about by the improvement and diffusion of online interaction, it seems useful to describe them in more details.

Multiplayer games are played simultaneously by many players. They are designed to allow single users to play against one another, or against all the others. Groups of users can team up, and share common objectives. Teams can play against independent users or other teams, or against the game itself.

Multiplayer games of different genres are available, ranging from first person shooter games (FPSs) to Real Time Strategy games to role-playing.

Some literature (Griffith et al., 2003) claimed that multi-player video games can be distinguished by the complexity of the game narrative, as well as by the numbers of players who can compete simultaneously, to take into account the historical category of *Local and Wide Network* (LAWN) games).[122]

The availability of progressively faster and more efficient broadband and computing resources connection has made it possible to pass from the interaction of a small number of players to the massive interaction of a huge number of users. Massively Multiplayer Online Games (MMOGs) are the most successful representatives of this evolution. MMOGs are also the most sophisticated video games allowing numerous independent players, who may or may not agree to forming coalitions. The interaction between the players adds a level of complexity. The plot cannot be strictly defined, as it continuously develops according to the decisions, actions and interactions performed by each of the users. Consequently, these games are in most cases based on evolving worlds, and have very detailed narratives which develop unpredictably.

The size of the groups playing a single MMOG depends on the specificity of the game. Some may have several hundred thousand to one million individual users connected at the same time, others are played by smaller groups. Either way, the numbers of players are equally large.

Technically, MMOGs are generally based upon a client-server architecture, as the persistent worlds must be always online and thus have to be run continuously on a server which allows users' clients to connect and play, by means of the client's software locally installed.

Different sub-classes of MMOGs have been identified, according to their genre. For example, Online Role-Playing Games (MMORPGs) have different role-playing dynamics from Online Real-Time Strategy Games (MMORTSs), or Online First Person Shooter Games (MMOFPSs). Additionally, there are MMO management games, sports games, rhythm or music games, and social games, where the specific scope is represented by socialisation. These games overlap, to some extent, with online communities, as they end up building virtual worlds.

One of the fundamental characteristics of MMOGs in general is the persistence of the "world" they create, whose existence is not linked to the single player. The character improvement on

122 These games had their golden age some years ago when the 'LAN parties' became very popular, gathering very high numbers of players. See Box 21 on the historical overview of online games.

which most of games are focused takes place in these worlds, which are often three dimensional. In the case of MMORPGs, the player is asked to choose a fictional character, in a fantasy world, and to play his role, taking decisions and performing his actions. These games frequently require some form of cooperation or interaction among players, and they end up creating a whole virtual economy of supplementary tools which players can purchase, often by means of virtual money. This virtual economy is, of course, also ongoing within the game's ongoing world which is usually hosted by the game's publisher. When a single player disconnects, the world continues to exist and also to evolve as a result of other players' actions and interactions. As character development and social interaction are generally essential to these games, most of them provide users with tools to allow and facilitate communication among players, and may also provide the possibility to build teams and coalitions.

6.2.3 Games in social networks

Finally, the increasing importance of *social networking games* is worth mentioning. The diffusion and importance of these games are growing in parallel to that of online social networks (like, among others, Facebook, MySpace, Bebo).

Social networking games can be categorised as equivalents (according to the degree of user involvement these games offer, and their complexity and persistence) to both browser-based games and MMOGs. However, in both cases, this new category of games is played over a social network, and usually provides the users with a real time experience.

The fact of being played over a social network provides the game, either simple and "casual" in its narrative or persistent and complex, with a *viral distribution,*[123] as pointed out by McClure (2008).[124] These games are basically casual games when the level of required user engagement is considered. They share with casual games the easy-to-learn dynamics, the simple retention attributes, and, consequently, the same broad audience.

More complex social networking games lie in the overlapping areas among gaming, persistent and immersive virtual worlds, and social networking itself, and among social networks activities gaming is becoming a more and more common one.

As a consequence, it is difficult to allocate social networking games to one of the two bigger categories briefly described in this section. Technically, they belong to the browser-games category, as they are based, in most cases, on simple interaction through the web browser and do not require the installation of heavy software engines. On the other hand, the persistence of the virtual world on which most of them are based forces us to reconnect them to MMOGs. In fact, social interaction and communication among players are obviously key aspects: the social interaction is relevant not only in the network, but also in the virtual worlds.

Social networking games, especially those which are easy and short to play as casual games and persistent (and therefore able to grow user loyalty or… addiction), are expected to represent a growing and rich market, in both user numbers and profiles. The target users span an incredibly wide range of ages, from young teenagers (the segment usually targeted in the past by video

123 This expression, rather common today, refers to the capacity of self-replication of information (for example, in this case about new games) in an online social network environment, where the sharing of information and profile-related settings among friends by simply accepting someone's "friendship" allows for diffusion of news, information, games at a previously unforeseeable pace.

124 McClure focused on the simple share of social networking games.

games) to much older people. The latter have possibly less time to spend on video gaming per day than teenagers, but more economic resources and differentiated interests. The incredible, and even, to certain extent, unexpected success of titles like FarmVille on FaceBook has already pushed many analysts to state that the event marking the contemporary revolution in the video game history is the integration of video games into social networking (Liew et al., 2008): in other words, the switch to a Game 2.0 era. The reasons for this success can be found in the viral marketing typical of social networks where people accept invitations sent by friends, and the capacity of social networking games to address new categories of users of all ages, and to exploit the short amount of time that is available to these groups of users. For example, FarmVille[125] gathers more than 65 million users, of which about 1.2 million may be playing on the same day.

Besides this very famous example, many others come from the European industry (for example, to mention only one from the Development Leader Board in the www.appdata.com ranking,[126] i.e. the German-based wooga – a world of gaming, which declared more than 9 million monthly active users in 2010 with social network-based games like Bubble island, Brain Buddies, Monster World).

Box 20: Zynga and FarmVille

FarmVille, available only on FaceBook, has 30 millions farms, against the 2 million real farms present in the US, and to play is free. FarmVille earns its company Zynga an estimated US$ 200 million per year, It keeps a team of 15 developers working to release new virtual items, such us tractors (800 thousand sold every day) twice a week.

Zynga (www.zynga.com), founded by Mark Pincus in January 2007, is a social game start up which, in spite of its relatively late appearance, holds some of the most successful titles in social network games, such as the already cited FarmVille, Mafia Wars, Café World, and Treasure Isle. On November 2009, Zynga declared it had reached 100 million unique users every month, and now claims to have more than 235 million monthly active users across all games. The company also announced that more than one million users per month purchase virtual goods in Zynga games, and that direct user purchases accounted for around 90% of the company's revenues. The mission of the company is to connect people through games, and it has said it is committed to "transforming the world through virtual social goods". It is active in raising funds for non-profit social activities by means of the connected foundation Zynga.org, started in 2009, which has already gathered more than US$ 3 million.

Another category of games which is expected to experience huge growth and to condition the evolution of the gaming landscape is, again, one that makes use of the possibility offered by social networks for users to create content and share it, exploiting the same viral approach already mentioned. The resulting User-Generated Games (UGG) in social networks are already popular with increasingly large numbers of users, who involve themselves in the creation of small games and other forms of entertainment within the context of existing online environments.

The exploitation of users' imagination and creativity is opening up brand new perspectives. This is contributing to the development of new content and thus supporting the extension of games life times. On the other hand, user contributions in content extension or creation are likely be of varying quality and also raise relevant questions regarding the ownership of intellectual rights and exploitation priorities, the answers

125 As reported by Gerd Leonhard of Media Futurist in the first quarter of 2010.

126 See http://www.appdata.com/leaderboard/developers (last accessed: 28 July 2010).

Box 21: A brief historical overview of online gaming

Internet is not the only or even the first computer network to be exploited to allow remote access to video game software or to offer, to a different extent, some interaction among players. Nevertheless, its diffusion and its power, together with the progressively wider availability of specific support tools and standards,[127] enabled unprecedented diffusion of this type of video games.

Actually, the idea of online gaming had started by exploring and exploiting the opportunities offered by other available LAN[128] protocols.

In the early 90s, along with the progressive diffusion of relatively cheap technology and software to connect PCs in small networks in order to share resources and applications, LAN or "netplay" versions of successful games were first released, mainly to satisfy the strong demand for interactive game playing with other users. These versions of successful games allowed a number of simultaneous players, once they were all connected to the same LAN network. At first, the number of interacting players was limited to four, but this then progressively increased with improvements to network technology and available computing power.

Soon, gamers started to organise themselves to have better chances of playing together, by agreeing to meet in places where a LAN was available or, alternatively, by building temporary networks to connect their PCs in order to spend a day playing simultaneously. This gave birth to the phenomenon of "LAN parties", which achieved notable diffusion between the late '90s and the first years of 2000. As technological constraints were overcome, huge concentrations of people started to meet in the same place and share a local network. This allowed the first experiences of what, a decade later, would become massive multiplayer gaming. The literature has investigated peoples' motivations for engaging in this type of collective gaming experience (Jansz and Martens, 2005), and surveys indicate that the competition aspect comes only third, while the main motivations are apparently the social contact and the chance to know more about the game played. The social context of gaming, therefore, had a pivotal role in increasing the potential demand for multiplayer games. The switch to the TCP/IP protocol and to Internet led to the exponential increase in the number of players, reaching and exceeding 10 million users in many cases, and to the growing demand for a cross-platform approach. Pushed by increasingly multipurpose and better performing consoles, and by improved Internet vocation of PCs, game servers started offering services for multiple consoles and allowing PC and console users to share the same server.

Therefore, going back to the issue of classification of online games, it is clear that online games are defined by the technology behind them or, more specifically, by the fact that the network is the enabling factor, allowing the user to interact with the game and also, in most cases, with other players, rather than by the specific platform or genre to which they belong.

to which are not straightforward. However, any form of interaction among users in a multiplayer video game environment brings a certain level of user-generated content to be distributed, due to the persistence of the virtual worlds and the unpredictability of the results in terms of actions and plot development that users' decisions imply.

127 Reference is made here, for example, to the Java architecture which allows applications to run under Java Virtual Machines independently from the underlying platform, or to the Flash technology which allows for easier and more effective delivery of multimedia content (audio and video integration and streaming, graphics manipulation), animation and interactivity over web pages.

128 A Local Area Networks (LAN) is a network which connects computers physically present in a limited area, like an office or a relatively close group of buildings. In the past decades, LAN had a huge diffusion, as they provided better performances than their wider-scale counterparts, the Wide-area Networks (WAN). The first universally diffused standard was the Novell Netware one, which was then overtaken by the progressively more powerful Windows-based one. Though Ethernet-based technology is still in use (also with fiber PON/GPON networks), nowadays the use of LANs is made possible in most cases by wifi technology.

In fact, the online segment alone of the video game industry has a number of business models, monetisation techniques, and variations in the value chain structure which are directly influenced by aspects such as the number of players, the presence of persistent virtual worlds, the type of user engagement and viral distribution mechanisms.

Therefore, an effort to address the online games segment must take into consideration all of the above mentioned characteristics. The following sections will try to identify both the similarities and the differences in the ecosystems of the two broader aggregations, which are:

- simple browser-based (mostly stand alone) online games, and
- complex persistent multiplayer (mostly MMOGs) online games.

These broader aggregations of typologies of online games, even if less accurate, find their legitimacy in the market, where they are normally used to refer to one or to the other of the two big worlds of online games, by addressing the categories at their extremes but without neglecting the opportunities which the market can exploit and which come from the specific sub-categories in each of the two worlds.

6.3 Some data and prospects on online gaming market

It is not easy to quantify economic activity in the software market, where production is not accurately represented in official statistics. Measuring and monitoring the evolution of the online games segment is even less straightforward, due to the characteristics of the product itself and to the consequent lack of basic indicators suitable to frame in a single picture the complexity of the different sub-categories and articulated typologies which online gaming implies. Nevertheless, techniques are developing to track online gaming activities, mainly to support business decisions, and the resulting figures could contribute to building a quantitative view of the segment. Usage statistics and download numbers are often the only available ways to integrate data in order to monitor the dimension of the online and mobile markets. This is especially true where free applications are concerned as the easier accountancy of subscribers and paying customers is not possible. Finally, the issue of measurement of activity in the online games segment, and in the whole video game industry, is indeed a meaningful one. In any case, a lot of companies in the growing online field may not be accurately accounted for, thereby making it difficult to get a precise view of the size of this growing segment.

However, some 'side' figures can help us to try framing the online gaming current dimensions and to give an idea of the potential development it could still have.

In addition to PCs, nowadays easy to think of as connected to the Internet and allowing for online gaming, consoles and handheld game devices are rapidly improving their connectivity capabilities. This contributes to accelerating the shift towards playing online. With improvements in the hardware of game devices, video game software products, usually delivered as packaged goods, started to add more and more online features, providing the users with some additional content or features. By accessing online resources,

Box 22: Data

It must be noted, than while more and more studies are trying to catch the dimensions of the video game industry, the lack of official data clearly constitutes a constraint to the appraisal of its potential and to the understanding of the dynamics of this sector. It is, for instance, highly problematic to break down the revenues along the value chain nonetheless it would be highly meaningful to compare the revenues, the shares and the growth perspective of each of the segments.

the users could get an improved experience. Therefore, access to downloadable extensions adding playing time, content or other features to the original packaged version of the game could be accessed by connecting to OEMs' online networks. Such emerging networks for digital download and access to online functionality relied for their progressive increase in extension and supply on the availability of reasonably cheap and efficient access to broadband Internet access. In the most recent years, besides the improved capability of playing games directly online, broadband access is allowing consoles and handheld game devices to provide the users with an extended range of media content, which may support a rather rapid convergence of various multimedia contents into games' equipment.

Taking into account the game console hardware penetration, and with regard to the US only, in-Stat (In-Stat, 2010b) estimates for video consoles used as in-home entertainment hubs show a penetration of almost 24 million online-enabled gaming devices in 2008, and forecasts more than 73 million households in the U.S. with an online-enabled gaming devices in 2013. The expected growth is still quite impressive, even taking into account that not all of online –enabled devices will be actually used for connecting to broadband Internet to play online games or to access online content.

Nevertheless, the number of worldwide registered active users of console and handheld devices connected to the three main dedicated networks (PSN, Xbox Live and Wii Wi-Fi) has been estimated to have reached 40 millions already in the first quarter of 2009 (iSuppli, 2009).

The availability of the network infrastructure needed to support the online gaming activity can be described in terms of broadband access. In June 2009, residential broadband access through DSL, cable and fibre was considered to reach about 23 out of 100 inhabitants on average in the OECD countries.[129] The coverage is also still bound to improve. Estimates (iSuppli, 2009) claim the actual residential broadband penetration to exceed 54% in North America and Japan, and 15% in China, and the number of worldwide broadband subscribers is expected to grow from 468 millions in 2009 to 734 millions in 2013. The EU number of fixed broadband lines per 100 inhabitants, including both households' and enterprises' (fixed broadband penetration rate) rose from 6.1% in 2004 to 22.9% on 1 January 2008, ranging from a 37.3% in Denmark to the 10.9% in Slovakia. As broadband access can be achieved by exploiting different technologies, either wireline or wireless - xDSL is the mostly deployed access technology in Europe - it is not surprising that EU coverage in terms of share of the total population reached 93% as an average in 2008 from 89% in 2005 (IDATE 2009 data reported by European Commission, 2009a).

Again in the OECD data,[130] households with access to a computer at home (including PC, portable, handheld devices) in the 27 European Member States were in 2008, in average percentage on all households, almost 68% (with top performers like Iceland at 92, the Netherlands at 88, Sweden at 87, Denmark at 86 and Germany at 82), while they were around 62 in the U.S., 86 in Japan, and 81 in Korea.

Once set the framework in terms of access to suitable network connections and hardware, and taking into account the general picture provided in chapter 4 of Part I of the present report regarding the dimension of the market of video games in general and of online and wireless games, it is immediately evident that tracking in a consistent

129 With peak of 38% of broadband subscribers in the Netherlands, about 33 in Korea, 27 in the US. OECD data, OECD Broadband statistics, 2009 (available online at: oecd.org/sti/ict/broadband, last checked on 12 March 2010).

130 Please refer to OECD Key ICT indicators, available online at: http://www.oecd.org/document/23/0,3343,en_2649_34449_33987543_1_1_1_1,00.html (last checked on 12 March 2010; figures last updated 22 July 2009).

Table 11: Traffic rank of online game web sites: top 10

Rank	Online game web site name	Alexa Traffic Rank
1	Play-Free-Online-Games.com	47,358
2	Apex Web Gaming	55,574
3	Multiplayer Online Games Directory	86,907
4	Omerta	107,869
5	Internet Gaming	69,00
6	Myth-Weavers	149,234
7	GamesByEmail.com	176,567
8	RolePlay onLine!	179,114
9	Top Mud Sites	217,784
10	Just Riddles and More	152,369

Source: Author's elaboration on data from Alexa.com, last accessed on 28 July 2010.

way the number of users of online games, the success of games, the number and provenience of producers is a rather challenging task. Even worse are the chances of reliable results when the attempt is paid to track free online games.

Nevertheless, by tracking the number of accesses to websites it is possible at least to have a proxi measure of the dimension of the phenomenon. Web information companies such as Alexa[131] propose traffic ranks of categories of web sites.

Out of a total number of web sites belonging to Alexa's category of games, 38,258 are classified as related to video games, and 1,538 to online games. Most of the web site appearing among the top listed are portals, categorised directories of online games, sites listing online and downloadable games. In the following table, the top 3 sites are actually categorised directories, as well as sites positioned from 5th position on. The 4th position lists a massive multiplayer text-based role playing game. The *Alexa Traffic Rank* proposed in the table is based on (averaged) combined measure of page views and reach (reach measures the number of users, by giving the percentage of all Internet users who visit a given site).

Other online resources provide figures about the number of monthly active users per categories of web sites. Appdata.com (www.appdata.com), for example, made figures available with regard to the users of applications inside a social network like Facebook. Though this is a rather specific measure, it is useful as it gives us an idea of the size of the phenomenon of online games based on social networks. AppData, as independent traffic tracking service, monitors traffic trends for more than 75,000 Facebook applications. A considerable number of online games are easily identified in the top 15 applications. The number of monthly active users for games such as Farmville (more than 75 million in May 2010) provides a justification for the interest in business related to micro-transactions, once the expected number of users and possible consumers reaches such high levels. Online games based on social networks, as already mentioned, are taking advantage of the viral market distribution allowed by the dynamics of the underlying social network.

The already mentioned European producer *Wooga world of gaming*, with its main applications on Facebook, also has solid numbers of active users.

131 Alexa measures the popularity of web sites and calculates its traffic ranking by combining the number of average daily visitors to each web site with page views based on the traffic data of the past 3 months. The figures are updated on a daily basis, and the site showing the highest combination of visitors and page views is ranked as number 1. Therefore, the ranking for reach measures the number of users in terms of the percentage of all the global Internet users measured by Alexa, averaged over a specified period (one week or three months). More at www.alexa.com

Table 12: Facebook applications leader board

Rank	Facebook Application	Monthly Active Users (MAU)
1.	FarmVille	75,469,379
2.	Birthday Cards	31,224,574
3.	Texas HoldEm Poker	28,331,791
4.	Treasure Isle	27,700,524
5.	Café World	25,169,117
6.	Mafia Wars	22,893,537
7.	Petville	19,271,985
8.	Happy Aquarium	17,437,797
9.	Pet Society	16,946,823
10.	Fishville	16,615,603
11.	Zoo World	15,235,176
12.	Hotel City	13,356,627
13.	Restaurant City	13,061,378
14.	MindJolt Games	12,959,308
15.	Social City	12,234,087

Table 13: Wooga world of gaming applications users

Rank	Wooga applications	MAU
1.	Bubble Island	4,884,571
2.	Brain Buddies	2,639,009
3.	Monster World	1,717,857

Source: Elaboration on data from www.appdata.com data (last checked on 29 July 2010).

6.4 The online games ecosystem

The following model for digital mass consumption (Feijóo et al., 2009; Fransman, 2007) proposes three main stages, the first of which includes the process of creation/ production/ publishing, the second considers the delivery / distribution / access and the third deals with the use /consumption / interaction. This model can be applied to the online gaming ecosystem as well.

The core technical component of online games is represented by a piece of software. The innovation which online games have brought about was based on the co-evolution of the software core component, the content and the distribution model (and channel). Innovation in content quality and typology and in deployment was made possible by a corresponding transformation of the core software part, which basically allowed both a product innovation and a process innovation to take place. Online games share, therefore, the difficulties in measurement, observation, and identification of suitable indicators which affect software in general.

The additional characteristics of online games complicate the picture even further. Online games share with the video game sector most of the peculiar characteristics of its production process, in particular the high ICT intensity and the highly technical nature of the creative activities leading to the production itself. It also shares its specific organization around hardware platforms. The co-existence of different platforms affects the whole first stage in the proposed model (Mateos-Garcia et al., 2008): i.e. the production, the distribution and the publishing. Each platform provides specific requirements in terms of industrial and technical infrastructures. Nevertheless, when

Table 14: Digital consumption model and online games categories

	Browser G. (BBGs)		Client-based G.		
Stages in digital consumption / types of games	Stand Alone	Multiplayer	Stand Alone	Stand Alone	Multiplayer (MMOGs)
Stage 3					
Consumption (Narration / Content)	Simple	Low complexity	Simple	High complexity AAA[133]	
Use: Virtual Worlds	Simple			Persistent	
Interaction & Communication	None	Simple	Simple	None	High & Complex
Stage 2					
Delivery	Online		Download & Online		
Distribution	Easy / browser based / social networks / viral		Relatively complex / Platform Portals / Retailers		
Access	Easy / gen. Free		Relatively easy / diff. Models / Retailers		
Stage 1					
(Creation) Development	Simple / Low Investment Required		Complex / High Investment		Very Complex / Huge Inv.
Production Proces & Techn.	Simple / Standard	Complex	Complex		Complex / Persistent team
Publishing, Marketing	Simple / Online Ad	Simple / Online Ad	Online & Offline Ad	Online & Offline Ad	

online games are considered, the consequent differences in the business models adopted tend to be smoothed by the predominant characteristics of the online access, fruition and interaction that come into play in the second stage.

Therefore, while keeping in mind that platform differences also affect the business of online games; an overview of the industrial ecosystems seems even more useful, considering the classification proposed in the previous section. The production, distribution and consumption stages are proposed for each of the main categories, i.e. browser-based and client-based online games.

Specific characteristics of games can bring about further differentiations, among which the most important is obviously the possibility of playing the games in a stand alone or in a multiplayer context.[132]

As previously mentioned, the picture tends to coagulate, to form two broad areas sharing similar patterns: more complex multiplayer games and simpler, less demanding ones.

Ecosystem of browser based games (BBGs)

The browser-based game (BBG) scenario proposes the simplest solution to playing online: accessible to everybody, in most cases for free, offering simple, cheap and easy "casual"[134] entertainment to the widest variety of users of basically all ages. The narration is not articulated, so the effort in terms of time investment per game required of the player is not high. Generally the virtual world proposed, if any, is simplified, as are

132 It is possibly worth recalling that the first distinction between browser-based games and client-based games can be linked to different underlying platforms: browser-based games can generally be played on any platform, but are most commonly accessed by PCs, handheld or mobile equipment, while client-based games require PCs or consoles.

133 The label AAA, or Triple A, is used to refer to the top class characteristics of the most complex games (not simply A category, but AAA).

134 In this case the interpretation for the world "casual" must be that of the video game jargon, as in most cases the casualty pertains to the type of engagement and effort that these games require to the user, and not to the lack of loyalty of users towards their favourite games. On the contrary, in many cases easy and simple browser based games, casual in their genre, have an enormous amount of very loyal users.

the graphics, so no last generation hardware is necessary. Users prefer to play stand alone games, possibly to fill in a short break rather than to invest a lot of their free time, and the level of inter-user communication and interaction is absent or very low. These games can also be played by multiple players, and what differentiates these games from the complex MMOGs is the simplicity, recognizable in easier graphics, easier plot, and easier interaction. The multiplayer situation, nevertheless, guarantees the participation of users in the content development, both by means of interaction and of new content development. This could be an important hidden strength of this kind of game from a market perspective, as it is connected with several new business models allowing micro-transactions involving virtual items and game improvements of a number of types.

When considering the second stage in the digital consumption model, these kinds of games are distributed by allowing access online. In most cases, the right to play the game is granted for free[135] and the distributor gets revenue through advertising, but also through subscriptions for a period of time or, a trend becoming more and more important, payment for the purchasing of digital goods or additional content.

The distribution, in many cases, takes advantage of the viral diffusion capacity typical of social networks: in such environments, users can invite friends to join their network and connections. By accepting, the newcomers share resources and get to know and to try their friends' favourite games. This allows for an incredibly fast spread of a new title without any big advertising efforts.

The development time for BBGs' projects is generally short, and the level of investment required by the production of a title is low. Publishing usually takes place on dedicated web sites acting as portals of online BBGs, where a huge number of games is offered and users know how to find their favourite types or to look for new experiences. The role of portals is in many cases very relevant, as they allow for new title visibility. Without them, it could be extremely difficult to compete successfully with the incredibly high number of available games. Actually, the low requirements in terms of initial investment, development resources and distribution efforts allow many companies, including small ones, to enter the business and develop new games. In spite of the free-to-play approach which is very common, this type of game has already demonstrated that it can guarantee important revenues and for this reason is a fairly contained risk. In fact, not only complex MMOGs but also many simple BBGs are forecasting impressive figures in terms of numbers of users, and approaches like that of micro-transactions are diffusing at a very high rate. Even if the per unit revenue from the sale of a virtual good is minimal, the availability of millions of users easily makes the market sufficiently profitable.

Ecosystem of MMOGs

MMOGs are the most typical example of client-based, multiplayer, highly complex video games where users are confronted with a persistent world, real-life style graphics and evolved development of characters. Among users, communication is intense and relies on many tools, the system resources exploited and required are huge, and the investment in terms of users' time is also considerable. The virtual world that users access is impressive.

The distribution is relatively complex, as big dedicated portals are in charge of delivering software and access to users depending on the platform adopted. Titles are differentiated by platforms, and not necessarily all famous games are available for all the main platforms. In particular, the policy followed by console owners has been rather differentiated up till now.

135 Please refer to an overview of the different business models exploited, proposed in the next section.

Efforts are currently being made to provide independent developers with alternatives to the limited distribution channels available at the moment, and platforms are offering specific technologies to reduce the obstacles to game distribution, for example by allowing video games to be embedded anywhere online.[136]

The development requires huge efforts and impressive teams, the most advanced techniques are applied to improve the rendering of real effects, integration of real landscapes, textures and advanced graphics. Physics and rendering engines are exploited together with other middleware tools to improve the results and the impression of reality.

Moreover, the management of such projects must take into account a number of problems which occur due to the persistence of the related virtual worlds: the results of user interaction in massive multiplayer environments is to very difficult to predict; sets of different levels of play have to be continuously developed. As a consequence, a team of developers must be kept active on the project after the product is officially released, unlike what happens in normal software development where probably only a bug fixing team is kept on to intervene in case of necessity. Moreover, the game never really "switches off" or goes offline: the management of devoted servers has to be taken into account, as the game plot keeps being developed by the interaction of developers and users, while server technologies become more and more important.

As one would expect, the cost of production of a title of this last type is many times bigger than that of a browser-based, stand-alone game. For example, Lightspeed Venture Partners estimated (Liew et al., 2008) a production cost of about US$ 30 million for a title such as Halo 3, one of the most famous and successful video game titles for Microsoft Xbox, with this version providing online multiplayer playing possibility.[137] The same source estimated that the cost of production of the Zynga browser-based online game, Texas Hold'em, was less than US$ 1 million. Of course, the disparity is based on the differences in the game graphics, plot, complexity and in all the previously mentioned aspects. Nevertheless, it is also worth pointing out that, if Halo 3 in 2008 was expected to reach 10 million players, the Zynga's title was scoring around 8 million. Even though the browser-based title was raising a small amount of money per user, the target pool was big enough to guarantee a pretty good success in terms of revenues.

Nowadays, this kind of comparison between the two extreme approaches to the online video game products is quite common, as analysts and market strategists develop scenarios for the fast evolving video games universe. The first type of game is basically the transposition to the online environment of what core games used to be on offline PCs or console platforms. Those expensive games, built upon large budgets and possibly running to many subsequent editions, were called AAA games. The convention was to rank games as AAA, A or B depending more on their marketing potential than on other aspects. AAA games were those expected to raise the biggest interest on the market, guaranteeing the best sale performance, because of the budget invested in their development also because of the promotion and advertisement support campaign. Nowadays, the online segment is proposing a number of AAA games, most of which are MMOGs with widest audience. In this industry, the availability of an important budget is not necessarily a guarantee for success, because the aspect of creative content is preponderant and this makes of each game product a prototype. It is worth mentioning, however, that many analysts foresee further growth in terms of market share and number of titles for the smaller, cheaper, simpler browser-based games.

136 See for example the experiment proposed by InstantAction, presented in April 2010.

137 By means of accessing the Microsoft Xbox Live Arcade online portal.

In particular, Lightspeed Venture Partners foresees that the evolution to a "Game 2.0" situation will be brought about by browser-based online games rather than by AAA online games. Social games will lead this process, due to the viral marketing capabilities of the social networks that they can exploit, providing them with the possibility of increasing the number of users exponentially overtime. An AAA title, on the other hand, collects a very high number of users in the first phase after its release, and this number then progressively decreases as the offline advertising effort is reduced.

6.5 The techno-economic models

The main elements of the 'new economy business model' (Lazonick, 2006 cited in Teipen, 2008), primarily identified in the US ICT industry, consist of rapid product development for new markets, vertical specialization of companies in the value chain, the financing of companies by venture capital institutions and a highly flexible labour market. A similar framework was encountered when, after 2000, the convergence of the video game market towards a limited number of increasingly powerful console or handheld hardware manufacturers triggered concentration at the different levels of the value chain.

A first phase in the pre-online video game evolution saw very fast improvement in video game quality (in terms of graphics, realism, soundtrack, complexity and so on), made possible by the parallel increase in the power of consoles and PCs. To exploit the ultimate technologies and processing capabilities, big development projects concentrated on AAA-type games, whose complexity required huge teams, highly skilled project organisation, long or very long development time (up to years), and generally enormous budgets. In most cases, publishers financed development. When they were not agents for pre-developed products, they acted basically as financing entities, making it possible for developer teams and independent studios to afford the production of new games. Project costs were partially or even totally covered by publishers, leaving little room for self-financed or independently produced products, for which publishers were called only for bridging between production and distribution and retail.

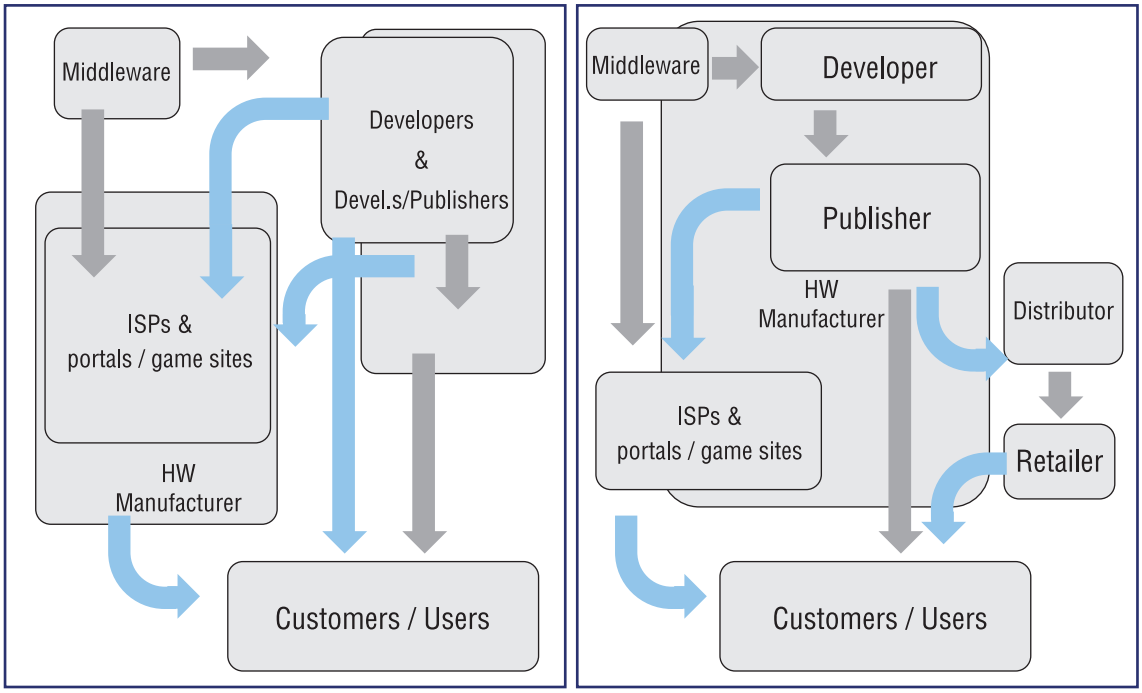
Changes in the value chain

The progressive but impressively fast switch to online gaming introduced new distribution methods and started to rearrange the relative roles and interaction dynamics among the actors at the different levels in the supply chain.

Clearly, logistics has lost relevance in the online games segment due to the fact that digital goods are reproduced and distributed over the network at low cost. Online digital distribution has affected the value chain structure, resulting in a convergence of the roles of the distributor and of the retailer under the range of activities of the publisher. A whole part of the core business involving publishers, distributors and retailers has basically disappeared as there is no longer any need to duplicate physical products because these can be distributed over the network. The publisher, in many cases, directly distributes games, without the need for a distributor to act as intermediary between the publisher and the retailer: i.e. "*disintermediation*" is taking place, cutting out the role of the distributor.[138] Publishers can also opt to distribute games through Internet Service Providers (ISPs). ISPs act as content aggregators and provide portals for game distribution which allow easier promotion and localisation of new games by users; at the same time they attract advertising which brings an added source to the mixed revenue models. The increasing importance of ISPs has triggered a process that is often labelled "*re-intermediation*": ISPs are taking on the role previously played by

138 Disintermediation is also taking place in the case of off-the-shelf games, where the increase in structure and negotiation power of big retail chains has allowed them to interact directly with publishers, leaving distributors with a marginal role.

Figure 21: Value chain in (re-) construction: comparison between value chain of browser-based online video games and of client-based online video games



Browser-Based Video Games **Client-Based Video Games**

Source: Author's own elaboration, inspired by data from the OECD Working Party on the Information Economy (OECD, 2005).

distributors. Possible legal limitations have to be taken into account, though, when considering this process.

These changes to the value chain of online video games, as compared with that of "traditional" video games, affect not only the interactions between the actors in the value creation process, but also the type and number of actors involved.

Different types of games are affected to different extents. The switch to online distribution has drastically cut the need for physical logistics. A whole part of the former business - manufacturing boxes, printing electronic support (disks, etc.), the organisation and the infrastructure of distribution, retail sales, inventory, and returns – has disappeared.

Though the characteristics of browser-based games have heavily reduced the need for distributors and retailers for logistic support, portals and dedicated sites with adequate visibility are required. In some cases, developers can afford to publish their browser-based games directly, shortcutting the next stages along the value chain.

This is not necessarily true for client-based online games, particularly the complex and expensive games, which in many cases still rely on the more traditional chain to reach consumers.

Figure 21 provides an overview of the changes to the value chain, for browser-based games (left panel) and client-based games (right panel). The arrows in the figure represent the flows along the value chain, and boxes represent the actors and steps. The dimension of boxes is different in order to provide a qualitative glimpse of the changes brought about by the switch to online to the video game value chain (bigger boxes show the increased importance of the actor along the value chain).

In the left panel, developers can take shortcuts to reach the users directly. However,

the role played by publishers and new actors like portals and ISPs could also grow as they will make the identification of new games easier and facilitate access to specific categories. In the case of console-based online games, hardware manufactures especially could still play an intermediation role, in the case of BBGs and CBGs. In the right panel, moreover, some room is still available for distributors and retailers, while it is more difficult for developers to reach users directly.

The business models

In the above framework, sources of revenues and business models are bound to change, and to keep evolving at the same pace as the underlying products, or services. Moreover, with regard to online games, the wealth of different types of games and the variety particular features to attract customers make the landscape of business models rather articulated. This is not restricted to the online games industry, which provides a playground where various new forces are confronting each other and co-evolving. Referring to the whole content industry, Leadbeater (2008) writes "*between the pure, open and voluntary models at the one end of the spectrum and the classic closed corporation at the other, an enormous middle ground is opening up, where new hybrids will appear, mixing open and closed, public and private, community and corporation, collaboration and commerce*."

The alternative business models which users face when entering the world of online games are actually rather different from those they were used to.

At least in the first phases of the online era, video games publishers tried to adopt the "old" video games industry business models. In the offline world, publishers used to hold the rights for the games, and licenses from software developers had allowed both publishers and console manufacturers to profit. The latter were even prepared to sell console hardware at loss per unit, while game titles were often pre-sold to publishers. A new title was generally expected to reach break-even point in the first few months after release, when some hundreds of thousands of copies had been sold.

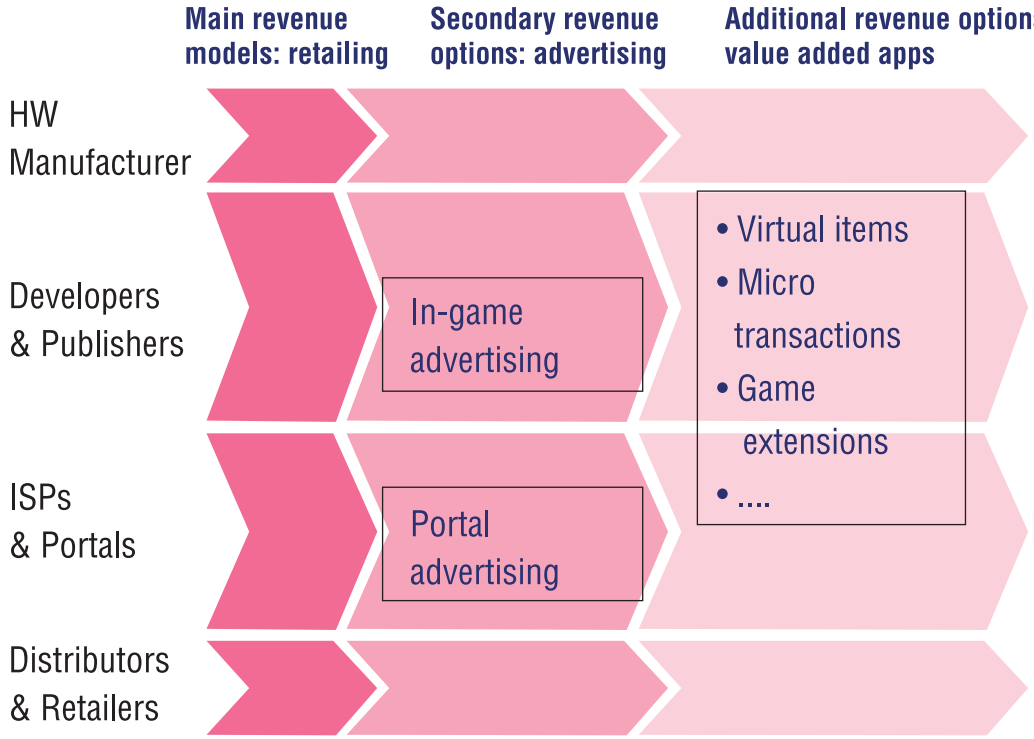
Currently, the emerging revenue stream from selling virtual goods online is attracting a lot of attention in the online video games industry.[139] The virtual items model allows gamers to buy individual digital components such as virtual currency, items, characters, and any in-game good which are not a full game in themselves. The purchase of virtual items is generally associated with games providing persistent worlds and character building capabilities, therefore MMOGs are the category where this monetarisation method can be better exploited. This model does not suit those MMOGs which still ask users to pay monthly fees, but rather those which allow free access, i.e. Lite MMOGs.

The flexibility of this model is bound to be exploited by creative producers and publishers. Basically, every item could be sold as a virtual item. This allows extending the exploitation of virtual items to a specific genre or category of games, but leaves room for creativity to find different interpretations and applications of increased and consolidated users' acceptance of this type of cost. For example, now not only is virtual money is sold, but also "powers" or characters' features, together with extensions to the gaming experience of various types: soundtracks, scenarios, and textures - anything that can be transformed into a virtual item.

As regards demand, consumers are attracted by the free-to-play (F2P) approach to the video game main product, because they see it as less of a financial risk. Users are more confident and more willing to pay small sums for digital items

139 For a description see Wi, J.H., Chapter 2, "Business models and corporate strategy".

Figure 22: Business models in (re-) construction



Source: Author's own elaboration.

offered to enhance their gaming experience, once they already know the game itself and enjoy playing it.

As regards supply, publishers are motivated to adopt the virtual items model by the huge difference in sales life span between virtual items and the games themselves. Virtual items have a much longer life in terms of sales, a major advantage for the seller. A single virtual item product could be sold online for years, while the "productive" life of a standard game is of some (or, more often, only a few) months.

Western games publishers have been migrating in these years towards micro-transactions, putting the sale of virtual items at the centre of their monetarisation models. European and North American users now feel at ease with buying digital content, as reported by DFC Intelligence (2010), and the *virtual item model* has been fully adopted, thanks also to the popularity and viral diffusion of social network games.[140]

Social network games like Farmville from Zynga, Free Realms from Sony Online Entertainment and Combat Arms from Nexon have been able to attract millions of users while monetizing through virtual goods. Free-to-play online games have also been successfully issued by European companies, such as Gameforge and its Metin2, the largest massively multiplayer online game in Europe.

DFC has forecast that the market in 2010 for Lite MMOGs will be around US$ 800 million in North America and Europe, and that it could reach US$ 3 billion by 2015.

140 See the presentation "Consumer Trends in Virtual Goods and Downloadable Gaming in North America and Europe", available online at: www.dfcint.com.

Asia has driven the rise in digital item markets, where the virtual item model has led to fast growth in the online games-related market.

When considering the effects of this evolution in the underlying business models on revenue distribution between the supply chain actors, two simultaneous processes have to be taken into account. On the one hand, there is the overall trend of transformation of digital products into services, which also involves online games, and on the other, there are the processes of disintermediation and re-intermediation, both of which affect the supply chain. A reduction in the importance of distributors and retailers has to be expected, while ISPs and portals are increasing their presence in the new evolving scenarios. The new challenges provide a good opportunity for publishers and developers to increase their revenue shares, which were, in the past, rather small especially for developers in Europe.

But these changes, represented by the vertical axes in Figure 22, have to be combined with what is expected to happen along the horizontal axes of the same figure. It is expected that an even bigger impact on revenue distribution will be brought about by the change in importance of revenue models. Retailing-based revenue models are shrinking as a result of the key role played by the free-to-play (F2P) model. This change supports a strong increase in the adoption of additional revenue options based on value-added applications. Virtual items and game extension sales are expected to account for the biggest revenue share in a market ruled by micro-transactions, though some room is left for advertising. Advertising is a source of revenues but its formats are changing to become more compatible with the new distribution approaches (in-game advertising, portal advertising, etc.).

6.6 Challenges and potential disruptions

The trend to convergence of all multimedia contents…..

The following sections of this chapter will show that online video games share the same destiny as many segments of the creative content industry, despite the distinctive features we have just described in previous sections. In fact, all multimedia content is undergoing a transformation from products into online services, and this evolution is affecting the organisation of production, the structure of revenues and the business models.

In the past few years, the distribution of online games has been progressively concentrated on internet portals serving the PC-based side (e.g., among many others, Valve's Steam Service or Manifesto Games), and on a few, very powerful, network platforms for console games, each controlled by the provider of the console hardware. In networks such as Xbox Live, Playstation Network and Wii Virtual Console, it is easy to recognise the gateway for online playing and games download of each of the three most successful console and handheld platform manufacturers.

Since then, independent applications stores have been growing rapidly,[141] providing online games access to PC users together with the possibility to download games, but also movies, music, additional contents. In the same way, console-oriented gateways are also increasing their importance and audience by differentiating the type of content and services that they allow users to access. Starting as gateways for

141 E.g. in 2009 two browser-based game companies (Bigpoint, Gameforge) from Germany were among the five fastest growing IT companies in the country. Source: http://www.deloitte.com/view/de_DE/de/branchen/article/5bcc6816ec574210VgnVCM100000ba42f00aRCRD.htm

accessing video games, and related contents and communities, they are increasingly offering different kinds of digital contents and resources.[142] This is pretty much in line with the process of digital convergence, already acknowledged in the literature (Screen Digest Ltd et al., 2006), which is based on digital distribution of different types of content and on the diffusion of interactive capabilities to the consumers. This phenomenon is not only affecting the video game industry, but also the movie, video and music industries, mobile communication and the whole publishing sector in general.

At the same time, game consoles have been equipped with optical disk players (DVD, Blu-ray), and multimedia facilities, and are thus converging towards home entertainment stations, where gateways play a key role as portals supplying every type of home entertainment and digital content. In this process, hardware providers hope to achieve the convergence of different home equipment into a single hardware platform by means of the evolution of gaming consoles. Gateways will be positioned as intermediaries between the providers of different kinds of contents and the users, adopting an integrated distribution system (building on already available and successful experiences like iTune).

…. the evolution of online games from product to service

Innovation in the software game industry in general (McKinsey 2008) is expected to bring growth in the future. The major trends emerging over the last few years are connected to the evolution of software applications from products to services. Parallel to the this process, online games are integrating more and more digital content, and video games in general[143] (with the exclusion of browser –based games making their competitive advantage out of their simplicity[144]) are making efforts to improve realism even further. Online games have a role in the digital content convergence process.

The diffusion of MMOGs together with the persistence of virtual gaming worlds give rise to the need for the development of new business models to match the increasingly massive and evolving demand. New sources of revenues have been identified and, at the same time, the persistence of virtual world and the need to adapt the online game's core to the decisions and behaviours of thousands, if not millions, of users has been pushing forward another process of evolution. Nowadays, online games are becoming more and more like services, provided by the publishers, rather than mere products, packaged and finished once deployment starts. Complex MMOGs, whose servers are always kept online,[145] need to be updated continuously by the publisher, and this trend is also beginning to apply progressively to simpler browser-based games.

…. and the evolution in consumer behaviour

Demand has been a driving force, pushing all multimedia content towards convergence. Consumer behaviour has also evolved over the past few years and has allowed the viral diffusion of online gaming to take place at an unexpected pace.

The increasingly active role of users has been sustained, on the other hand, by the interactive

142 The key dynamics of video games in general are described in a more general framework in Mateos-Garcia et al. (2008).

143 For a description of trends, refer to Kevin Carney (2008), among many others.

144 This might reflect another emerging trend in the economy: i.e. the "less-for-less" business models being tried out by multinationals like Nokia or Tata in India. The aim is to offer massive production of cheap basic-needs services to very large (poor) markets. The scale of the business makes its value.

145 The game is played by a big number of users, who access at different moments and contribute in different ways to the development of the game's plot. Therefore, the "world" represented in the game must be always available (online). As a consequence, a server (or a number of servers) must be always connected and devoted to providing users with the "virtual world" they need to play.

and social nature of the online gaming experience. It is argued that user engagement has been largely pushed by the social aspects of interaction in multiplayer games, where communities of users play a big role and communications among them are mandatory. This is seen as a first step for users towards interaction with the game itself, to the creation of content. Events in a game's virtual world are influenced instantaneously by each player's actions, and the game itself never stops, but is continuously changed by users' actions. Nevertheless, this trend could take time to establish itself and we should be cautious about predicting the different paths it could follow and also about its potential impact on industry.

The growth in social network online gaming is pushing this trend even further, and user-provided content is starting to be a reality. Virtual worlds as "Second Life" keep expanding as broadband penetration grows and critical mass is achieved. Innovative business models, combined with the availability of tools and digital market places where user-created content can be exchanged, are supporting further expansion.

The possibility for users to generate content has been rapidly adopted, among other alternative content models, as a new way to do business. And due to the increasing importance of virtual communities connected to online games, it has become necessary to take them into account by considering them as complementary to the interactive content creation process. In this framework, the distributor becomes more and more an aggregator of different types of content coming from different sources.

Box 23: Glimpses of demand: Norwegian kids, a media consumption example.

- *"Norwegian kids (2-17) spend 19 hours and 40 minutes on screen, per week,*
- *Games are a significant part: almost 8 hours per week/ average,*
- *96% of Norwegian kids have access to games machines, PC #1,*
- *When done with high school, have spent more time on screen than school,*
- *Media use increases significantly from 12 years onwards,*
- *Trend is moving (definitively) towards online, yet "our" kids have highest penetration of machines so they can freely "choose",*
- *Some online games reach over 100,000 players (out of population of 4.5 million),*
- *The trends are the same throughout Europe: our kids are spending ever more time on online games,*
- *...and so are the adults!"*

Source: Jørgen Tharaldsen, Funcom/ Norwegian Producers Association, presentation at the IPTS validation workshop, Brussels, 10 June 2010.

7. The Mobile Gaming Ecosystem

7.1 Introduction

Applications on the mobile platform[146] are an outstanding example of the convergence between electronic communications and media and entertainment industries (C. Feijóo, Maghiros, Abadie, & Gomez-Barroso, 2009). Convergence usually means huge expectations for new businesses arising from the opportunities of an unexplored domain, but also practical difficulties in transforming existing markets and understanding users' new preferences, particularly regarding online content (Screen Digest, CMS Hasche Sigle, Goldmedia, & Rightscom, 2006). This is exactly the case of mobile gaming. Due to the diffusion of mobile handsets, the mobile platform offers wider demographics than any other[147] and a virtually unlimited space for the development of old and new types of games. They are already a viable alternative to other gaming platforms; according to iSuppli, sales of games-capable handsets are expected to grow 11% during 2010, with forecasts of 1.27 billion gaming-enabled phones to be sold in 2010, compared to 38.9 million gaming handhelds, and 52.3 million consoles. In addition, mobile games can make intensive use of the competitive advantages of the mobile platform: ubiquity (any time, any place), the highest level of personalization (but keeping in close contact with the social network) and, looking into the future, context-awareness (location is the main example currently).

However, mobile gaming also faces a number of challenges, ranging from technology and economics to the institutional framework. From a historical perspective, initially there was a business culture clash between mobile operators and content / applications providers which has only recently been partially solved by the emergence of application stores.[148] Price, usability and processing power of mobile phones was next, again on the way to being solved with the forecast market success of smartphones.[149]

146 A mobile platform is defined as comprising at least a mobile device (a handset, for instance) and/or a mobile network. This definition allows us to include "side-loading", i.e., downloading a game to a PC from the Internet and then to the mobile device via a cable or a Bluetooth-type connection, and also the more straightforward procedure of going to an application store through a mobile device and network, installing the game on the device and starting to use it.

147 According to ITU (2009), mobile communications have been the most rapidly adopted technology platform in history. Today, it is the most popular and widespread personal technology on the planet: it had an estimated 4.6 billion subscriptions globally by the end of 2009, equivalent to 67% of world population. The Internet platform is used by 26% of world population. There are slightly more people with access to a PC at home (27%), while 71% of the population can access television (the only other comparable platform in terms of usage) at home (forecast to be overtaken by mobile in terms of penetration no later than 2010-2011).

148 An application store is a storefront accessible from a mobile handset that allows the users to browse and download the applications of their choice. Apple's App Store, the leading application store, has more than 140,000 applications available to users in early 2010 according to several industry sources (see for instance FierceMarkets).

149 There is no precise definition of a smartphone. It is usually considered to be a mobile phone offering advanced capabilities, PC-like. It includes typically a complete operating system and a platform for the development of applications. The regular phone market segment (as opposed to the smartphone segment) is usually named by the industry as the "feature phone" segment. Nokia calculates that 1.26 billion mobile phones were shipped worldwide in 2009 and that the handset industry will grow 10% in 2010. According to data from ABI Research, in 2009 14% of the mobile subscriber base owned a smartphone and a 22% compound annual growth rate in this market segment is expected until 2013. According to Marvell, a main manufacturer of chips for smartphones, prices in this segment could go down to less than €80 during 2010. The leap in usability of smartphones has been associated with the appearance of touch-screens as interfaces, the ability of mobile devices to deliver quality video and audio, and the inclusion of a number of sensors within the handset (accelerometers, location systems, short range wireless technologies, etc). According to data published by VGTelecoms (2010), smartphone subscribers (47%) are three times more likely than feature phone subscribers (16%) to play games on their device at least once a month. They are more than five times as likely to play games almost every day.

Lack of mobile broadband, which impedes online and social gaming, has been almost resolved at least in most parts of the developed world, and particularly in Europe.[150] Nevertheless, echoes of these difficulties surface in the complexities of the mobile ecosystem, in the fight for control among the emerging platforms in the ecosystem, and in the different perceptions of the mobile game realm evolution. For many game developers, mobile is still just another distribution channel; and for mobile industries, games are just another type of content / application. But beyond mere techno-economics lie a number of more fundamental challenges. Attracting, rewarding and sustaining innovation in the mobile game field so it becomes a "serious" industry is arguably the biggest of them. Encouraging the right conditions for such innovations is a very relevant matter for Europe, which counts on a powerful mobile industry (device suppliers, network suppliers and mobile operators) and, logically, considers the cultural aspect of games as a differentiating asset.

The following section provides a case study of the mobile gaming ecosystem, analysing its current status and future prospects in Europe as regards competitiveness and how this can be improved. Following a brief history of mobile gaming, the mobile games ecosystem will be introduced in some detail, including the main actors and activities and their links with the mobile and software game industries, along with the main techno-economic models, the players' strategies, the user perspective and some market data and forecasts. In the next section, the success factors and limitations –challenges ahead- for its evolution into a potentially dominant game platform and the possible disruptions along this road are discussed, giving particular relevance to ubiquitous mobile broadband, smartphone trends, the deep personal / social relationship with the mobile device and the future role of context. Finally, the case study offers some conclusions on how this domain may evolve and some hints on how to design European policies to help develop this industry.

Some definitions will be useful before we start. In this case study, mobile gaming refers to the production, distribution and consumption/use of games by means of a mobile network and/or a mobile handset. Mobile gaming is usually seen as part of the mobile content market segments, but with the increasing availability of broadband mobile connections, it could be become more properly part of the mobile applications market segments,[151] especially in those cases where the software runs partly on a mobile device and partly on the network –in the cloud. Lastly, mobile gaming belongs to the broader category of mobile entertainment that usually includes, apart from games, the use of mobiles for leisure activities such as listening to music (or using music as ringtones), personalizing the mobile handset (using wallpapers, for example), or even accessing video (streaming or downloading). Due to the similarities in the value structure of this other mobile market segment (economies of scope effect), a number of relevant companies in

150 Mobile broadband started with the third generation (3G) of mobile communications (the UMTS family of standards in Europe). Currently, we have 3.5G (HDPA standard in Europe) and in the future we will have 4G (LTE and WiMax technologies are the main contenders), see Ramos et al (2009) for further details. The penetration of mobile broadband among users was 13% on average in the EU (EC, 2009) with 77% coverage of the population on average across the EU-27, plus Norway and Iceland (IDATE, 2008). According to the latest Mediascope Europe report (EIAA, 2010), 71 million Europeans browse the mobile internet in a typical week and, with almost an hour a day actively spent going online via their mobiles (6.4 hours per week), 'internet-on-the-move' is proving a more frequent activity than reading newspapers (4.8 hours) or magazines (4.1 hours).

151 The difference between –mobile- content and applications is rooted in a conventional way of thinking. Content appeared first in the mobile realm as a result of the direct translation of content industries' activities into this domain, i.e., television/video, music, books, games, etc. It is frequently associated with a leisure perspective. The applications are inherited from an Internet perspective, see for instance the classification used at MMA (2008), and are often useful in some way to the consumer: communications, multimedia, word processing, spreadsheets calculations, productivity, navigation, travel, etc. It is obvious that the differences between the two are increasingly blurred and losing their relevance, hence the use of "mobile content and applications" throughout the text, see also Feijóo, Maghiros, Abadie et al (2009) for further details.

the production and distribution of mobile games are also typically involved in this other categories of entertainment.[152]

7.2 A brief history of mobile gaming in Europe and North America

Before 2002, users could only play very simple games like Tetris that were embedded into mobile handsets. The beginning of a true mobile gaming market can be set after 2002[153] when mobile operators started commercialising phones able to download additional games from their own portals[154] and a separate spending stream was generated.

From 2002 to 2007, the market was still characterised by relatively simple games similar to those that had been developed for consoles 10 to 15 years before, fundamentally because of the limited graphics and processing power capabilities of handsets. The majority of consumers still played the games embedded in their phones, although it was already possible to download games from the operator's portal or third-party stores[155] paying a one-off fee. Alternatively, and only for some mobile device models, games could be downloaded from a third-party website to a PC and then side loaded. Thus, the most popular mobile games of this type were single-player board games, word games and puzzles of different types. During this period, and because of the simplicity of the games, the average amount of time spent playing on the mobile was limited, around 30 minutes each time according to PWC (2009), rather different from the hours typically required to complete a console game, for instance. Another particular feature was that these game were mostly played casually to "fill in time" between daily activities. Nonetheless, this casual gaming style caused a widening of the demographics of mobile gaming, with the important consequence of including women as regular gamers.

However, this model was about to change: in 2006-2007,[156] mobile phones –the "first wave of smartphones"- were introduced. These phones had greater computing power, storage capacity and graphics and audio capabilities. Nokia had been the prime mover as early as 2003 with the N-Gage, though this attempt to put a mobile phone and a handheld console together failed on the market. Acknowledging the lack of response from users, Nokia transferred its experience in gaming to smartphones and showcased its "next-generation mobile gaming platform" in 2006 (Soh & Tan, 2008). This move was important not only because of its technical performance but also because it marked the shift of market power in mobile gaming from carriers to handset suppliers and application providers.

It was in 2007 that the availability of mobile broadband connections with relatively flat data fees (3UK launched these tariffs in late 2006) and, above all, the appearance of the iPhone (late 2007) changed the mobile gaming scene dramatically. The combination of new possibilities in the handset (touch screen, motion sensor, location, enhanced display, storage, high-quality audio, camera) and the ubiquitous connection to the network allowed many innovations:

152 The approach in this case study on the mobile gaming ecosystem, techno-economic and business models and the user perspective is mainly based on the IPTS research project on the future evolution of mobile content and applications (C. Feijóo et al., 2010, forthcoming). Challenges and potential disruptions were identified in the presentations and discussions at the workshop on games industry that took place in Seville in October 2009. These were enhanced by informal interviews with mobile games market experts. Publicly available industry data are widely used throughout the text to illustrate the findings and assertions.

153 This happened about three years earlier in Japan, see for instance Lindmark and Bohlin (2003).

154 Also referred as games (content and applications in general) "on-deck" the mobile operator, in contrast with "off-deck" or "off-portal" games located in third-party mobile portals. See the section on techno-economic models for further details.

155 Some popular stores in Europe were Buongiorno, Jamba or Gameloft.

156 This happened earlier in Japan due to the success of i-mode and the high-end handsets marketed within this model, see for example Bohlin et al (2003).

choosing easily an increasing number of games in application stores not necessarily through operator decks and downloading them immediately to the mobile device, subscribing to keep playing while on the move, using multi-player games from the mobile, playing across several media using social networks, context-aware gaming, etc. The first big hit in mobile games with some of these new possibilities was arguably Electronic Arts' "Spore Origins" (early 2008). However, iTetris (which appeared then as a download also) remained the most popular type of game in 2008 (PWC, 2009).

In addition, innovations in business models appeared on the market. For instance, in the UK, T-Mobile and Blyk[157] started experimenting with advertising-supported games. Greystripe and Glu Mobile also provide games in exchange for being the chance to advertise. There were also examples of blurring boundaries across media: for instance Facebook was used by a number of companies to distribute games to mobile players. Other popular games, like Sims, provided additional game content to be downloaded to mobile phones. It was also from 2007 that a relevant number of development studios decided to focus exclusively on the mobile devices instead of porting existing console or PC games.[158]

It could be said that from 2008 a process of convergence began between the more traditional world of mobile premium content (games), based on telecommunication operator-centric channels (short numbers, mobile portals) and a new mobile Internet model where both browsing from the mobile and applications stores are relevant.

Therefore, mobile gaming is no longer a delayed-in-time and modest extension of console or PC games, but is instead a distinct user experience with a number of unexplored avenues.

157 A mobile virtual network operator focused on free communications for users aged 18-24 in exchange for profiled advertising.

158 See, for instance, I-play.

In fact, the appeal and opportunities in this market are attracting innovators, entrepreneurs and many old and new industry players, which together configure a wide ecosystem,[159] described and analysed in detail in next sections.

7.3 Mobile gaming: the supply side

This section considers first the supply side of mobile gaming through the "architecture" of the ecosystem, the main techno-economic models, the tactics and practical procedures to deliver mobile games to users and the role of software games development in the ecosystem.

7.3.1 The mobile gaming ecosystem

The mobile gaming ecosystem follows the conventional three-stage model for digital mass consumption: (1) creation / production / publishing, (2) delivery / distribution / access and (3) use / consumption / interaction (C. Feijóo et al., 2009; Fransman, 2007). In the last "interaction" stage users can contribute to content creation within the game, and also to innovation and the social effects in the usage of games.

In the following paragraphs, the main activities and players within this scheme, (also see Figure 23) are briefly introduced. The lists below are not exhaustive but they try to present a relatively complete illustration of the main roles that players can adopt in the mobile game ecosystem. Of course, not all the activities below need to be actually implemented in a practical value-added offering.

The creation, production and publishing of mobile games includes (i) existing studios in the software games industry that go (or can go) mobile; (ii) new studios specifically devoted to

159 The ecosystem metaphor is used to refer to a high number of players who interact within a given environment in which none of them is able to control it completely: thus, both collaboration and competition occur at the same time.

the development of mobile games; (iii) existing game publishers; (iv) new mobile game publishers; (v) software developers for different types of engines and middleware required both in the game production and in the adaptation to the mobile environment; (vi) other media, content and cultural industries in general that count on the production and publishing of mobile games to increase the appeal of their products and services – e.g. a museum, a newspaper or a social network; (vii) marketing of mobile games; (viii) activities related with secondary business models in mobile gaming, i.e., not pay-per-use or product sales, such as advertising, product placement, sponsorship, etc; (ix) intellectual property rights management; and (x) enabling platforms for the development and adaptation to the specificities of the mobile environment. In this stage, the most relevant activities are the same as those in the conventional software games industry: studios and publishers, and the opportunities for studios and publishers which aim specifically at the mobile domain have been intentionally highlighted, see Box 26 for a recent success story. Apart from this, the most relevant addition from the mobile perspective is the enabling platforms –number (x) above.[160]

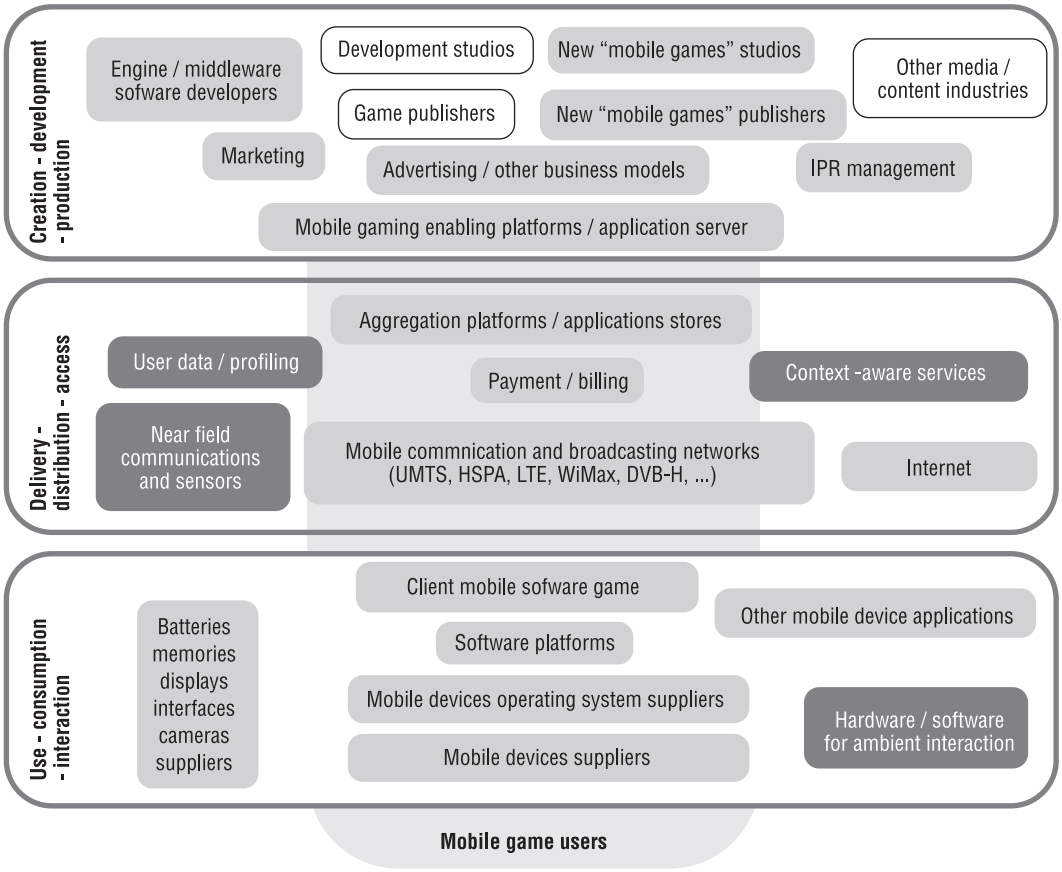
The delivery, distribution and access to mobile games includes (xi) the aggregation platforms, lately called "application stores"; (xii) the payment and billing systems; (xiii) the provision of user data and profiling for personalisation; (xiv) the provision of context information -location, for instance- for adaptation to the local environment; (xv) the mobile communications systems, from 2G, where some simple games could be delivered to handsets, to 3G and beyond where any possible type of game can be distributed to mobile devices; (xvi) other wireless systems –for instance, near field communications- able to distribute content and applications to mobile devices on a local basis; and (xvii) the Internet, in the sense that either mobile communications allow for unrestricted access to Internet, thus erasing the differences among accessing content and applications through any of those two media, or as noted in the introduction, enabling users to achieve content and applications mobility by their own means –side-loading games from the PC to the handset for later consumption. In this stage, the most relevant activities are the application stores and the mobile and Internet infrastructures to distribute mobile games. Looking into the future, the providers of personal and context information may contribute to a "new wave" of mobile games as we will discuss later. All of them are absent in conventional software game industries.

The use, consumption and interaction within mobile games includes (xviii) the mobile device suppliers: regular mobile handsets, smartphones, PDAs, ultra-mobile computers, mini-computers, portable players, and portable consoles for games, including key components and subsystems: batteries, memories, cameras, displays, interfaces, etc; (xix) software developers for mobile devices basic elements: operating systems, drivers, APIs, etc; (xx) software developers for different types of engines and middleware required for the usage and interaction with the mobile game on the device; (xxi) providers of hardware and software systems for interaction with the surrounding environment (NFC, RFID, tags, etc); and (xxii) providers of applications that could be linked with the mobile game, its discovery, the community around it or the Internet applications at large: mobile browsers, search engines, multimedia players, social networks, store fronts, content and application aggregators, portals, etc. As in the conventional software games industry, the most relevant activities in this stage are the platform hardware and software owners and the software that allows the discovery of the game.

As an overall comparison with the software games industry in terms of main players, it could be said that in the mobile domain games publishers' market power is counterbalanced by that of mobile operators, handset suppliers and

160 Among the many firms in this segment, see for instance Bango, a company based both in the EU (UK) and USA that provides a platform to market games directly to consumers.

Figure 23: Structure and main activities in the mobile games ecosystem



application stores providers. The user relates mobile games with the brand of the operator, the handset or the application store, therefore the relevance of the game publisher diminishes to a certain extent.

It has also become obvious from the number of activities presented that the resulting structure of the mobile game ecosystem is rather complex and putting a mobile game into the market involves more steps than in another gaming platform. In particular, in a typical scenario, mobile games have to match 5 layers of technical specifications that mainly impact on the software programming: the huge variety of relevant hardware parts of the device (display, interface, camera, etc); the several possible types of operating system in the device; the many applications in the device that could be connected with the game (browser, media player, etc); the different features of the technologies used in the network infrastructure (mobile communications, digital television, wireless, Internet); and last but not least, the highly specialised implementations of each operator support system, including portals, access, or systems for billing (sms, premium sms, wap, etc).

From the point of view of a game developer, of the four main components in a networked game: game engine, control and communication devices, data network and processing systems (Zyda, 2009), three of them face an array of constraints in the mobile environment. In addition to all of the above, there could be further specifications related to the business model implemented: an increasing number of application stores; the setting up of specific mobile customer care; cross-carrier common short code support; inserting advertising (if that is the business model) and marketing elements and potential personalisation according to user profile and/or context.

Figure 23 represents the resulting three-layered structure and shows the main activities previously described. In addition, the figure highlights the previous activities in the software game industries (white boxes), those elements directly connected to or needed by mobile games (pale grey boxes) and new activities (generally not yet implemented) for next generation mobile games (dark grey boxes).

The ecosystem is completed with the role of the users. In this regard, it should be recalled that the mobile game consumer is not isolated from other daily activities and has to split the time spent using the device between game playing and other main uses such as communications (voice, sms), Internet (web browsing, emailing, social networking, etc), a number of competing applications (music, video, etc) and gaming on other platforms (videoconsoles, PC, etc). The mobile gamer perspective will be examined in more detail in a later sub-section.

7.3.2 The techno-economic models: from walled gardens to platforms within the mobile ecosystem

Successful mobile gaming provision requires that the different players carry out most of the activities shown. But the high number of activities and players in the ecosystem increases the transactions costs (negotiations, agreements, etc) and the development costs (several devices, operating system, etc, as already mentioned). It would, therefore, be logical for some of the main players to try, and eventually succeed in integrating as many activities as possible or, at least, keep them under some type of control. In general terms, it can be said that the focus of the mobile industry has shifted "*from single-firm revenue generation towards multi-firm control and interface issues*" (Pieter Ballon, 2007), meaning that a single company –for instance, the mobile operator- can no longer control the full ecosystem and that the most valuable asset is now the creation and control of a platform where a number of players collaborate. This change in techno-economic model is explained in the next paragraphs.

Historically, the first model to be developed within the ecosystem was vertically integrated, with the mobile operator taking centre-stage. This is the notorious "walled garden" model.[161] In this model, mobile games were provided at the mobile operator portal[162] and they functioned on a particular set of handsets that were marketed and subsidised also through the decisive participation of the mobile operator. The revenues were generated by operators within their own value structure and users were guided to stay as much as possible within this structure. In fact, mobile business was traditionally characterised by the operators' pre-eminent position. They controlled as many elements as possible within their value chain, from network and services to applications and content. For game developers, the walled garden approach meant that their mobile offerings had to be technically and business compatible with -or even be developed within- a very specific mobile platform. Obviously, each operator used a different platform, and, therefore, it resulted in huge opportunity costs for developers. A further issue for game publishers was that operators would typically deal only with established brands, so for start-ups, getting their products onto the operator system was often time-consuming and expensive, if they succeeded at all. In addition, there were a number of exclusive deals precluding open agreements with game developers or publishers at large.

161 The concept behind the "walled garden" label refers to the exclusive provision of content and applications within a given platform. In the case of mobile communications, this platform was typically the portal of the mobile operator – for instance Vodafone Live! For further details on this model see, for example, Ramos et al (2002).

162 In the mobile industry, content and applications are sometimes distinguished as on-deck or on-portal, and the opposite: off-deck or off-portal. The former include content and applications that belong to the value chain set up by the mobile player, typically the mobile carrier, and the latter denote content and applications outside the control of the mobile operator.

However, the increasing pressure from demand to enjoy an unrestricted and wide choice of content and applications and the changes in the mobile industry structure are causing a rapid evolution of the techno-economic models in the ecosystem. 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 a direct consequence of these pressures, what is usually allowed by walled gardens has changed and all the major operators have standard agreements for content such as games, although they do not generally have them for other rich media content or for augmented content based, for example, on localization.

Notwithstanding the above, transaction and development cost issues remain. A new approach has emerged recently to address it in a different way. It consists of a "platformisation" of the mobile ecosystem (Pieter Ballon, 2009b), in which main players try to group together –in a loose or tight cooperative scheme- all the required roles for the provision of the mobile offering on a common set of hardware, software and techno-economic specifications. The resulting scheme reduces transaction costs (agreements are typically pre-defined) and also development costs as far as the resulting platform is massively adopted by final users. Each platform includes a number of "gatekeeper" roles (P. Ballon, Walravens, Spedalieri, & Venezia, 2008) as a way to control the evolution of the platform and to secure the revenues. Adapting the proposal of the same authors, in the case of mobile games the crucial roles would be: (i) the development environment, i.e., a set of development and hosting tools for third-party service developers such as game studios and publishers; (ii) the profile / identity / context management: a component that manages user data and user preferences for different situations; (iii) the provisioning / brokerage: it represents the reference point for end-users to retrieve, subscribe and use games (ownership of an application store as a main example, see Box 24); and (iv) charging and billing of mobile games, see also Box 24 for an example.

Box 24: The Apple App Store history and the role of games

Apple's App Store virtual storefront was introduced 11 July, 2008. It was launched in conjunction with the U.S. retail debut of the iPhone 3G. Initially it featured about 500 applications including educational programs, mobile commerce and business productivity tools, with games representing about a third of this "first-wave" applications. It was an instant, and somewhat unexpected, success as consumers downloaded more than 10 million iPhone applications in the App Store's first three days and 60 million in the first month, generating a US$21 million cash flow for Apple's developer partners. By December 2008, iPhone owners had downloaded more than 300 million mobile applications, with the total number of apps available via the App Store topping the 10,000 mark. In late January 2009, Apple reported that the number of applications available from the virtual storefront topped the 15,000 mark, and in early April 2009, it reached 30,000 applications. At that time premium titles, e.g., applications that need to be paid for, comprised 77.4% with games leading all iPhone categories with 23.1% of total App Store applications. Entertainment apps followed at 13.6%, trailed by books (9.1%), utilities (8.5%) and education (6.9%). The least popular category was travel apps, which made up just 3.9% of App Store inventory. The average price of applications was US$2.78.

The situation however has changed from September 2009.[163] Books outnumbered games in the App Store, marking the first time the games category has failed to dominate total iPhone and iPod touch applications, according to data issued by mobile advertising exchange Mobclix in March 2010. At that time the App Store boasted more than 26,500 books, representing 18.6% of the total 142,000 available applications while the storefront featured a little over 25,000 games, or 17.6%. Entertainment applications trailed behind at 11.9% of all iPhone apps, followed by education (6.8%) and utilities (5.5%). From late 2009, books accounted for one out of every five new iPhone and iPod touch apps according to in-application analytics provider Flurry.

Using data from Pinch Media,[164] November 2009, of the more than 2 billion iPhone and iPod touch applications downloaded since Apple's App Store opened in mid-2008, about 30% (approximately 610 million) fall into the premium app category, translating into total developer revenues of US$900 million. Simple arithmetic indicates that total revenues for game developers and publishers were about US$200 million by the end of 2009. On average, a premium App Store download averaged US$12,100 in revenue (US$8,500 net to the developer and publisher), although it is necessary to point out that averages can be misleading because the most popular applications generate a very disproportionate percentage of sales. Data also indicates that the average 99-cent iPhone app is not downloaded significantly more often than the average US$4.99 app. Finally, it is worth highlighting that consumers were downloading more than 100 million iPhone and iPod touch applications each month from Apple's App Store in November 2009 according to mobile advertising network Millennial Media, generating about US$20 million per month in game revenues. According to Mobclix, users of Apple's App Store average 11 application downloads per month, approximately three times the average number downloaded by Android users and six times the BlackBerry user average. Finally, during February 2010 about 2,000 new games were added to the App Store, the average price of the game category was US$1.36 and the average time for the approval of an application was 4 days (with a reported maximum of 38 days).[165]

The latest addition to the Apple mobile saga is the iPad tablet device. In the first week (April 2010), the device sold 300,000 units with users downloading more than 1 million applications (3 applications and 1 ebook on average according to Apple sources). The App Store offered roughly 2,400 applications optimized exclusively for the device in this first week, according to analytics firm Distimo.[166] Games represented 35% of all iPad titles, followed by the entertainment and education categories. However, it is worth noting that games and entertainment apps are more popular on the iPhone than on the iPad -the two categories make up 70% of the most popular iPhone apps, compared to about 40% on the iPad.

Source: data compiled from Apple's own statements and webpages cited in the box

163 See http://blog.mobclix.com/2010/03/01/books-outnumber-games-in-the-app-store/
164 See http://www.pinchmedia.com/blog/paid-applications-on-the-app-store-from-360idev/
165 See http://148apps.biz/app-store-metrics/ for the latest information on App Store statistics.
166 See http://blog.distimo.com/2010_04_distimo-report-ipad-and-iphone-apple-app-store/

Control over one or a combination of these four roles can lead to platform dominance within the ecosystem. Therefore, new platforms are emerging that try to include as many of these roles as possible. There are recent and important examples of this new approach: mobile device suppliers like Apple (from iTunes to App Stores for iPod and iPhone, see Box 24), Nokia (Symbian development platform and the Ovi application store), or application providers like Google (the Android suite, the new smartphones and also the application store). All of them are looking for new profits from the combination of mobile content and applications with their portfolio of products and services, lowering techno-economic barriers and increasing the usability of consumption and interaction with mobile content. Interestingly, each of them represents a different approach to the same concept. While Apple basically uses a proprietary software development kit on top of its operating system and own-controlled hardware keeping a tight control on the developments, Google's Android has opted for a model closer to open source software, keeping control of the evolution of the platform. Nokia's model seems to lie somewhere between the two, covering not only the smartphone segment but also the feature phone one, see Box 24 for further details. Other main players in the mobile ecosystem have followed the same steps: for instance, Microsoft (Windows for Mobile), RIM (Blackberry), Palm, Vodafone and Telefonica have announced –and set up- application stores and software platforms for interested developers. Table 15 summarises the main elements in each platform and next section on software platforms in mobile gaming considers each of the main ones in detail.

Box 25: Nokia, from hardware to services

A quote from G. Blaber, an analyst with CCS Insight (July 2008) is a good summary of Nokia's strategic move "… the margins on hardware are declining. It will be hard to gain more handset market share, so the move into services will be key". However, Nokia's revenues from the services and software division reached only €119 million in the second quarter of 2008, up from ;84 million in the previous quarter. This is still a very low figure measured against Nokia's handset business (sales rose 4% to ;13.2 billion in the quarter).

Nokia has been following a strategic line of development and selected acquisition of companies to create its portfolio of services. Most of them have been put together under the label Ovi and are accessible through Nokia's mobile handsets and devices. Products under Nokia's Ovi software and services umbrella brand include N-Gage (its gaming inroads), the Nokia Music Store, Nokia Maps, and the Comes With Music initiative.

According to Mobile Entertainment,[167] Nokia was doing about 30 million downloads per month in December 2009 and growing 100% month-on-month. It has also announced a complete rebuilding of its Ovi Store mobile content storefront for the spring of 2010.

Source: data compiled from Nokia's own statements and webpages cited in the box

Within this new platform paradigm, it is interesting to reflect on the roles left for mobile operators. The first possibility is at the opposite end of the spectrum with regard to the walled garden model: the mobile operator as a mere provider of connectivity or a "dumb pipe". Here the revenues for mobile content and applications –mobile games- accrue to providers, enablers and brokers. As a consequence, there is an obvious reluctance from main mobile operators to embrace this model in the short term. However,

167 See http://www.mobile-ent.biz/news/35349/Ovi-Store-1m-downloads-a-day-v20-coming-in-Spring

between the walled garden and the connectivity models there are intermediate possibilities, attractive enough since they could provide (at least a part of) the best of both worlds. All of these in-between models exploit to some extent the opportunity open to mobile operators to become wholesale providers of services for content-related players. Additionally, mobile operators can also offer their own private brands to users. The result of using this model resembles that of department stores or shopping malls. The main advantage of these models is that operators retain some of the revenues that otherwise would go to third parties through off-portal and side activities by end-users.

Looking back, it is noted that a new approach to mobile games, which completes those of mobile operators, content providers (game publishers) and device suppliers, has appeared with considerable strength: the application stores and the platforms that support each of them. We still lack enough market data to calculate the application stores full impact, but the new concept has given developers a direct-to-consumer channel that circumvents carrier domination. Game developers for application stores no longer have to adjust to operator platform conditions and users do not need to connect to carrier decks and retailer web sites to search for games optimized for their particular device or operating system. Application stores represent a new phase in market evolution, which strongly influences the users' perception of the value and experiences related to mobile content. As Feijoo et al (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 content exploitation models, although this could occur in practice".

In fact, the impact of new platforms and application stores has been considerable from the perspective of mobile gaming development. While development and marketing costs for a console or PC game can ran to millions of euros, typical costs for a mobile game were already in the range of the hundreds of thousands, sometimes even less (Soh & Tan, 2008) before the emergence of platforms. In the new platforms, these costs may even be an order of magnitude less.[168] Thus, the low entry barriers for mobile games have helped spawn a proliferation of small mobile-game software developers and the possibility to account for the long-tail of potentially interested gamers. At the same time, and due to the increasing competence, mobile software developers require marketing help more than ever, either through traditional publishing means or via the new platforms.

Finally, it must be said that none of the techno-economic models described is exclusive and their co-existence is forecasted to continue till the mid-term. Nevertheless, their relative degree of importance will affect the type of innovations we can expect in the mobile game industry and its evolution in the future, since this will define the type of players who lead this domain as later explained in more detail.

7.3.3 On mobile games delivery and consumption procedures

The mobile gaming ecosystem allows three basic mechanisms to deliver and consume mobile games: over mobile telecommunications networks, over some short-range wireless system (context delivery) and over some fixed "Internet access" and later side-loading.

For enjoying real-time delivery of games, mobile communications are the obvious. They are increasingly relevant for online and social gaming where a ubiquitous broadband connection is a key constituent. In this case, when mobile gaming users connect to the appropriate server via mobile communications, they are able, for instance, to

168 According to Nokia sources, this costs would be in the range of the 10 000 euros in 2010 for an average application.

Table 15: A summary of elements and strategies for main mobile development platforms

Platform	Main constituents	Main strategies	Main gate-keeping roles
Apple	iPhone-iPod-iPad + OS X App Store iTunes SDK	Closed model with tight control over hardware, software and applications	Development environment Provisioning / brokerage Charging and billing
Nokia	Nokia devices Ovi Symbian / SDK	Increasingly open model with control of software and hardware development	Development environment Provisioning / brokerage
Google	Nexus One + other devices Android marketplace Android / SDK	Open model with control of software development	Development environment Profile / identity / context Provisioning / brokerage
RIM	Blackberry Blackberry Store RIM / SDK	Closed model with tight control over hardware, software and applications	Development environment Provisioning / brokerage Charging and billing
Microsoft	Windows Marketplace Windows Mobile / SDK	Closed model with tight control over software development	Development environment
Linux	Linux for mobile	Open model with loose control over software development	Development environment
Sun	J2ME	Relatively open model with control over software development	Development environment
Qualcomm	BREW	Closed model with control over software development	Development environment
Mobile operators in general	Mobile networks Portals Handsets subsidising	Closed model with control over hardware and networks	Provisioning / brokerage Profile / identity / context Charging and billing

join multiplayer games or download new games or view their scores and status. In online game-play mode, players access the server remotely to play mobile games with other players.

The use of short-range wireless systems allows for mobile gaming downloading and playing in relation to context, i.e., the surrounding environment of the users. In this case, it would be possible to play the mobile communications system off-line, since players could use these short-range wireless technologies –Bluetooth is a main example- to form local area networks with other players –typically at distances of about 10 meters- to play mobile games in relation to context. Any spectrum issues here and elsewhere may be added to the final policy section

Finally, the Internet mechanism typically uses fixed and wireless networks to reach fixed computers or portable laptops. Once the game is downloaded, it can easily be made "mobile" by side-loading, using, for instance, cables, USB sticks or memory-cards, into a mobile device. From there on, the game can be used on an "anywhere/anytime" basis like any other delivered more directly over communication networks, and they can also be used for online gaming.

7.3.4 The software platforms in mobile gaming

The previous sections have introduced the ecosystem and the main relationships among players. This section now focuses on the software layers in mobile gaming and their peculiarities with regard to the more general games software industry. In the mobile domain, software for games, either for content or as an application, is developed for a particular platform, as explained in a previous sub-section. In the following paragraphs, we consider the most relevant of them: Apple, Nokia, Google, RIM, Microsoft,

Linux, Sun, Qualcomm and those from mobile operators.[169] As a general overview, Table 15 summarises their main features.

The most prominent platform today is Apple.[170] It is composed of four main pieces: the iPhone-iPod-iPad is its mobile/portable device (Apple´s OS X is the operating system, and the latest version, iPhone 4.0, was launched in April 2010); the App Store where applications are available for users to download (see Box 24 for further details and the role of games in the store); the iTunes software is the billing and control system and finally there is a software development kit (SDK) for interested parties.

iTunes and iPod, centred in music and images, predated the launch of the iPhone –the true "mobile game changer"- in 2007. It sold 4 million units in its first 200 days on sale,[171] capturing 20% of the smartphone market segment[172] just during the third quarter of 2007. According to FierceMarkets, there were 40 million units of the iPhone in the mobile market in February 2010. Initially, developers could only create third-party iPhone applications that run remotely via the Safari web browser installed in the device. However, the success of the iPhone and the availability of programmes to bypass the software restrictions[173] in the iPhone's operating system and allow other third-party applications to operate, caused a reaction from Apple and the availability from March 2008 of a software development kit which allows developers to produce sanctioned third-party applications on the iPhone. At the same time, Apple (March 2009) warned about the consequences of the "jailbreaking" practices of the third-party applications not approved.

The Apple strategy suits the "closed" platform model (Pieter Ballon, 2009c) where Apple reserves for itself a high degree of control of every element of the platform –hardware, operating system, software development kit- and in particular of the approval of applications. The main example, according to EFF,[174] is that Apple can "revoke the digital certificate of any of your applications at any time" as stated in the terms of the iPhone Developer Program License Agreement, a contract all developers must sign to distribute their software via the App Store. In fact, until end of 2009, there was no "adult" content on the iPhone and many applications suffer delays due to unknown causes in entering the App Store.[175]

According to the latest data available from industry sources (see FierceMarkets for instance),

169 There are many more and the list continues to increase. Very briefly, four of these additional platforms, not covered here, are: MeeGo, a platform formed by Nokia and Intel which aims to go beyond smartphones to some other portable device which will probably be a response to the increasing integration of Qualcomm's Snapdragon chip with Android devices and where applications would be accessible both from Nokia's Ovi store and Intel's AppUp centre; Bada, the platform for Samsung phones, which is a competitive answer to iPhone and at the same time able to work with Android or as a stand-alone operating system; webOS is the platform for Palm, pioneers in PDAs but losing market share from 2010; and Creation, an online platform from Sony Ericsson, which enables mobile users and developers to create and publish their own videos, audio and images, complete with applications and tools to foster content sharing, discovery and "remixing."

170 According to Millennial Media there were 100 million application downloads per month at the end of 2009.

171 Up to 14 January 2008. Data from FierceMarkets.

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

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

174 The license is available at the Electronic Frontiers Foundation webpage at: http://www.eff.org/files/20100127_iphone_dev_agr.pdf

175 There are many examples of this behaviour. Among the most notorious was the Google Voice application, an Internet-based service offering users free domestic calling and inexpensive long-distance calls alongside related voice and messaging tools. This was finally available to iPhone users, although not via App Store download, but as a web application accessed through the smartphone browser, effectively circumventing Apple's review process. As a consequence, in August 2009, Apple was the target of a Federal Communications Commission inquiry after rejecting Google Voice and removing a pair of third-party Google Voice applications from the App Store. Later in the month, Apple told the FCC it had not officially rejected Google Voice and "continues to study it." According to Apple, Google Voice and the related third-party apps were rejected or not included in the App Store because they interfere with the iPhone's "distinctive user experience". See for further information: http://news.cnet.com/8301-30684_3-10440880-265.html

Box 26: Lima Sky, a success case in iPhone games

Youth-focused game development studio Lima Sky announced in March 2010 that its *Doodle Jump* game has sold more than 3 million copies via Apple's App Store. The game, priced at 99 cents, has sold over 1.6 million units in the first three months of 2010 alone (#1 application during this time), topping the App Store's paid apps ranking in the U.S., the U.K., Germany and Australia. According to Lima Sky, *Doodle Jump* is now played 5 million times each day.

Conceived for users aged four and up, *Doodle Jump* features the character Doodle the Doodler and players guide him on his journey via the iPhone's tilt controls, acquiring jet packs, avoiding black holes and fending off enemies as they jump from platform to platform.

Lima Sky is a New York-based development studio dedicated to iPhone games and apps. It was founded in July 2008 by Igor Pusenjak, a graduate and faculty member at the MFA interactive design program at Parsons School of Design in New York, and Marko Pusenjak, a veteran mobile applications developer.

Source: elaborated by the author from data released by Lima Sky

by early 2010 more than 100,000 developers had signed for applications in the iPhone, see Box 26 for a recent success story in games on this platform. According to mobile application analytics provider Flurry,[176] the iPhone OS project "application starts" have almost doubled in a month since the Apple announced its iPad tablet device in February 2010.

Nokia, see also Box 25, is the second platform in terms of monthly downloads[177] and the first in terms of mobile phone market share.[178] It has three main elements: Nokia handsets, the Symbian operating system for mobile devices and the Ovi services and application store. Interestingly Nokia was the pioneer in blending mobile phones and games through its N-Gage products. However, this visionary proposal has been a failure in practical terms in the markets, see Box 27 for further details.

Symbian was originally a proprietary operating system specifically designed for mobile devices. Symbian has been fully owned by Nokia from 2008, after it bought the shares of Ericsson, Sony Ericsson, Panasonic, Siemens and Samsung in the original consortium. Symbian started the process during 2009 to become open source software, an aim reached in February 2010 with the creation of the Symbian Foundation and the release of the source code, Symbian 3. There are plans for a Symbian 4 release by the end of 2010. Symbian is also the leading operating system for smartphones, with a 47% market share in 2009 according to Gartner data,[179] see Table 16 for further details. However, while newer and faster smartphones are being released on almost a weekly basis, a study from the analyst firm Ovum,[180] claims that Nokia appears to be

176 See http://www.fiercedeveloper.com/story/iphone-developer-activity-185-advance-ipad/2010-03-15

177 According to Nokia sources, it had 30 million downloads per month at the end of 2009. See http://www.mobile-ent.biz/news/35349/Ovi-Store-1m-downloads-a-day-v20-coming-in-Spring

178 Nokia has revised down its global handset market share for 2009 from 38% to 34%, based on a new methodology for measuring the handset industry that now includes "fake" phones. Despite the revisions, Nokia is still the world leader in overall market share, and its next closest rival, Samsung, had a 21.1% market share in the fourth quarter, according to data from IDC.

179 See http://www.gartner.com/it/page.jsp?id=1306513

180 The report maintains that many of Nokia's rivals are already using the ARM Cortex A8 or Qualcomm's competing Snapdragon platform. Nokia's current smartphones run on ARM11 at below 500MHz (except the Nokia N900), using just 128Mb of RAM. According to Ovum, other smartphone vendors are queuing up to announce handsets with equivalent specifications to HTC's HD2 (a Snapdragon chipset at 1GHz with 448Mb of RAM). The report also points out that Nokia still has only one smartphone (the N900) in the top 20 handsets with highest screen resolution. Its touchscreen handsets typically use resistive screens rather than the capacitive type favoured by most consumers.

Table 16: World smartphone sales to end users by operating system (million units) and market share (%)

Operating system	2009 (million units)	2009 market share (%)	2008 (million units)	2008 market share (%)
Symbian	80.9	47	72.9	52
RIM	34.3	20	23.1	17
iPhone OS	24.9	14	11.4	8.2
Windows Mobile	15.0	8.7	16.5	12
Linux Mobile	8.1	4.7	10.6	7.6
Android	6.8	3.9	0.6	0.5
Other	2.3	1.3	4.0	2.9
Total	**172.4**	**100**	**139.3**	**100**

Source: Gartner (2010).

lagging behind in the smartphone market in terms of CPU power and touchscreen technology.[181]

Ovi, launched in 2007, was originally the brand for Nokia mobile services. It focuses on five main areas: games, maps, media, messaging and music. From its inception, Nokia's objective was to include third party developments. With the arrival of applications stores, Ovi has also become a storefront for browsing and downloading applications to enabled smartphones. In this regard, the Ovi Store is currently the third in terms of number of applications with a reported 6,000 applications by February 2010. At this point, is worth remembering that, unlike the App Store, companies like Nokia, Android, BlackBerry, and Windows Mobile allow applications to be found and installed outside of the official stores, using the services of companies such as Handango, Handmark, GetJar, etc., and therefore the figure for all of these application stores are actually higher in reality than those reported in the official store data.

Box 27: The market failure of the N-Gage

In 2003, Nokia introduced the N-Gage which combined the features of a mobile phone, an MP3 player and a mobile gaming device. It was introduced as a direct competitor to portable gaming devices at the time: Nintendo's GameBoy and Sony's PSP. However, the results were disappointing for users, partly because the buttons, designed for a phone, were not well-suited to gaming, partly because, when used as a phone, the original N-Gage (there was a second version) was not very usable, and partly because of a number of problems such as the so-called "white screen of death" caused by a memory management issue. Sales figures of N-Gage are controversial and Nokia argues that it shipped around 2 million units by 2007, far fewer than originally forecasted.

In 2005, Nokia announced that it would move its N-Gage games capabilities onto a series of smartphones. These devices have been available since early 2007, and the N-Gage application, allowing users to purchase and download games, was made available in 2008. Finally, during 2009, Nokia announced that no new N-Gage games would be produced and the N-Gage service would cease at the end of 2010.

Source: elaborated by the author from Nokia's data

181 See http://www.digitimes.com/news/a20100310PR200.html

Though Google's platform is ranked third,[182] it has had considerable impact on the ecosystem. Google's strategy is based on three main elements: Android as an open operating system, basically -but not only[183]- for mobile devices, a set of software facilities for developers on this platform and the devices supplied by an increasing number of manufacturers and, lately, Google itself, through its own brand Nexus.

Android was unveiled by the Google-led Open Handset Alliance[184] in November, 2007. In the first two months, programmers downloaded the software development kit for Android more than 250,000 times, according to Google, although at the time there were no handsets supporting it in the market. By contrast, developers downloaded the Symbian OS Getting Started guide some 70,000 times in the 12 months ending in September 2007. HTC was the first device supplier to include Android in a mobile handset in 2008. During 2009, it was followed by an increasing number of manufacturers, most notoriously Motorola and Samsung.[185] At the end of 2009, Google decided to enter directly into the handset market with its own phone, the Nexus One. According to Goldman Sachs, the Nexus One sold 20,000 in the first week after its launch, and 80,000 in the first month, leading to an estimated one million sales in its first year. Assuming that Google would unveil a second Nexus handset later in 2010, Goldman Sachs forecasts Google will sell 2 million units in 2011-2012. Interestingly, there is a possibility that a stripped down version of the Nexus One for developing countries like India and Russia will be launched in the last quarter of 2010.

Google strategy follows very closely the "open innovation" model (Chesbrough, 2006) where available knowledge, both internal and external, is used to accelerate internal innovation and expand the markets for external use of innovation. In fact, Google subsidises the development of Android in exchange for deciding the most appropriate roadmap ahead for the software. Google also set –and still operates- the Android Market in October 2008 and the corresponding processes for charging, billing and sharing revenues with developers and publishers. Google retains 30% of revenues in its app store to "compensate for the expenses in steering and developing the Android software". Unlike Apple, in Android Market there is no mechanism for previous approval of applications in the store; their functionalities and contents are the responsibility of the developers and publishers. The main conditions for developers are relatively similar to Apple´s: there are 48 hours from the time of purchase (not download) for a full refund of any applicable fees, there is an unlimited number of reinstalls of each application obtained via the Android Market, Google retains the right to remotely remove applications from the device, Google is not responsible for billing disputes, Google does not provide customer support for applications distributed on Android Market and, finally, Google does not allow content that contains nudity and sexually explicit material, violent or bullying behaviour, hate speech, private and confidential information, malicious products, prohibited products, illegal activities or infringes copyright rules. Only users 13 years of age or older are permitted to use Android Market.

182 According to Mobclix, there were 20 million application downloads per month from the Android Marketplace at the end of 2009.

183 The ambition of Google is to extend this operating system to a number of other devices, mobile or not. It has already been ported to set-top-boxes for digital television. For further information, see http://gizmodo.com/5348128/1080p-android-set+top-boxes-are-set-to-invade-your-living-room

184 Supported –at least nominally- by a large set of mobile operators, handset suppliers and several semiconductor manufacturers. For further details see the complete list at:http://www.openhandsetalliance.com/oha_members.html

185 The full list of supported handsets (2009) is: Nexus One, HTC Dream (T-mobile G1), HTC Magic (T-Mobile myTouch 3G), HTC Hero (Droid Eris), HTC Tattoo, HTC Desire, HTC Legend, Motorola Droid (Milestone), Motorola Cliq (Dext), Motorola Backflip, Motorola DEVOUR, Motorola CLIQ XT (QUENCH), Motorola XT800, Samsung Galaxy, Samsung Behold 2, Samsung Moment, Samsung Spica, Acer Liquid A1, Acer Liquid E, Acer beTouch E110, Acer beTouch E400, Sony Ericsson Xperia X10, Sony Ericsson Xperia X10 mini, Sony Ericsson Xperia X10 mini pro, Garmin nuvifone A50, Alcatel OT-980, Huawei U8220 (T-mobile Pulse), Huawei U8230, LG GW620 Eve, and Dell Mini 3iX.

In December 2009, Google announced that there are 16,000 active applications in Android Market.[186] In February 2010, ZDNet reported that Android Market is the second largest application store with about 20,000 apps, compared to Apple's 150,000 apps. 57% of the applications in Android Market were free, compared to 25% in Apple´s Store.[187] In March 2010, Google announced that its Android Market mobile applications storefront had roughly 30,000 apps – almost doubling in just three months.

The share of games among the applications in the store seems relatively similar to that of Apple's. Mobile games for the Android platform had a 53% month-over-month gross revenue increase in October 2009 according to market research firm Fade.[188] However, Fade indicates that October's best-selling premium Android game, Lupis Labs Software's Robo Defense, sold 7,600 units at US$2.99 each, which translates into gross monthly revenues of just US$22,724 (see Table 21 for the top 10 mobile games at that time on the Android platform). The total Android game sales for 2009 were estimated to have reached US$1.75 million.

Microsoft's approach to mobile applications is based on Windows Mobile and Windows Market. Windows Mobile is an operating system combined with a suite of basic applications for mobile devices based on the Microsoft Win32 API. Devices that run Windows Mobile include netbooks, smartphones, portable media centres, and on-board computers for certain automobiles. It is designed to be somewhat similar to desktop versions of Windows, feature-wise and aesthetically. Additionally, a number of third-party software developments are available for Windows Mobile. Windows Mobile has been updated several times, with the current version (from 2007) being Windows Mobile 6. In 2010, Microsoft will introduce Windows Phone (formerly known as Windows Mobile 7),[189] with the first devices based on its Windows Phone 7 mobile operating system slated to ship in October 2010. The main new feature in Windows Phone 7 is a series of "hubs", integrating related content from the web, applications and services. The hubs include games, which transport Microsoft's Xbox Live gaming platform to mobile devices. Mobile gamers can earn Xbox achievements, update their avatars and track their progress on the gamescore leaderboard. In fact, Microsoft has been creating its own mobile gaming development team from August 2010 and has put games high on its strategy. It plans to introduce more than 50 new WP7-optimized games from main publisher partners as well as new games, targeting casual and hardcore gamers alike.[190]

Windows Marketplace for Mobile was launched in October 2009 with about 250 applications. According to industry sources (FierceMarkets) it has about 1 000 applications in March 2010.

Research In Motion (RIM) has also set out to become a full platform with an application store, using both its Blackberry operating system and a Blackberry storefront for applications. According to Mobclix, in early 2010 the application store had about 300,000 downloads per month and 3,000 applications. Its figures and prices suggest, in spite of RIM recent marketing tactics, that it is aimed at the professional segment, see relevant data in Table 22.

Linux for Mobile is represented through the LiMo Foundation, which has more than 50 companies, among them Motorola, NEC and Panasonic. Many handsets in the Japanese FOMA 3G network use this platform. Since June 2008, LiMo has included the members of another body

186 See http://androidfeeder.com/
187 See http://androinica.com/2010/02/25/57-of-android-market-apps-are-free-android-market-growing-faster/
188 See http://news.vgchartz.com/news.php?id=5777
189 See http://www.fiercewireless.com/press-releases/microsoft-unveils-windows-phone-7-series-0
190 See: http://blogs.independent.co.uk/2010/08/17/windows-phone-7-games-and-xbox-live-integration-announced/

promoting a Linux-based handset platform, the Linux Phone Standards (LiPS) Forum.

Sun Microsystems' Java 2 Platform Micro Edition (J2ME) and Qualcomm's Binary Runtime Environment for Wireless (BREW) were the two most prominent technologies used in the mobile gaming industry before the success of smartphones and today, they are still two of the leading platforms for feature phones. Both of them were adapted to mobile user interfaces, small screens and games that can be run off-line, eliminating the need for a network connection –no mobile broadband data connections then.

From the mobile operators' perspective, a common theme is the creation of platforms with application programming interfaces (APIs) that developers can use to tap into the network's intelligence and services. This would enable the creation of applications that can exploit the network's location information, subscriber personalization preferences or billing capabilities, for example. Until now, each operator has had their own approach to developer platforms. However, there are new attempts to create a sort of common framework. Among these, the main example is the Wholesale Applications Community, led by 24 operators and announced by the GSMA[191] in February 2010, which wants to create a harmonized platform to give developers a single point of entry to a large number of operator storefronts. GSMA has said the group will take advantage of the work already being carried out by the OneAPI initiative[192] and combine the efforts of two other initiatives: the BONDI initiative,[193] which is operated by the OMTP,[194] and the Joint Innovation Lab, which is operated by China Mobile, Softbank Group, Verizon Wireless and Vodafone. These three groups have a common focus on creating web-based solutions and attracting web developers, unlike device-centric platforms.

Box 28: Difference among platforms for developers

Typically, each platform uses a different programming language to develop applications. Android uses Java language, iPhone uses Objective C and web-based technologies, while Symbian is the most versatile of them allowing development in C++, Java ME, web technologies, and some runtime environments like Python and Flash. The other main difference is the tools available in each platform. Apple's platform, Ovi, BREW and Android are more like small ecosystems (including an operating system), whereas Symbian and Limo are closer to being operating systems. When a developer writes mobile applications which are compatible with the ecosystem approach, they can be immediately uploaded to a storefront. When the developers write software just for a specific operating system, then the distribution channels for that software are significantly more fragmented. On the other hand, for those mobile open source operating systems, there is the possibility to access and modify everything in the device. In exchange for that, when something is programmed directly on the operating system, access to many functions is less protected and difficulties could arise as regards quality and security.

191 The GSM Association (GSMA) is an association of mobile operators and related companies devoted to supporting the standardization, deployment and promotion of the GSM and related standards (GPRS, UMTS, HDPA, LTE) mobile communication systems.

192 The OneAPI initiative offers a common set of APIs that web developers can use to access network capabilities. It should be approved as an international standard by the Open Mobile Alliance (OMA) during 2010, with the first APIs providing access to network information for payment, messaging and location-based applications. OneAPI is also available on a commercial basis.

193 The BONDI Initiative offers a web services interface that developers can use to create applications and widgets that will run on different devices and platforms independent of the underlying operating system. It also offers a security framework. In early 2010, the organization published the full specification as release version 1.1 and demonstrated some implementations used on devices such as the Samsung Wave. LG has offered an SDK for widgets that supports BONDI and there are implementations from various software houses that use the Android operating system. BONDI products will be available in 2010.

194 The Open Mobile Terminal Platform (OMTP) is a forum created in 2004 by mobile network operators to discuss standards with manufacturers of mobile phones and other mobile devices.

7.4 The markets

To complete this analysis, the following sub-sections adopt a more holistic perspective examining business models, the user response and some market data and forecasts with a view on the competitive position of Europe.

7.4.1 The business models

The success of mobile gaming is linked with the appearance of consolidated and scalable business models. However, it is not yet known which the most successful business models will be and when they will be in place. Therefore, we must analyse the situation and the different possibilities for business models in the process of assessing the future evolution of the domain.

To begin with, the different origins and cultures of mobile gaming market players can be observed in the existing or emerging business models in the domain. In general terms, it can be said that the mobile industry focuses on how to generate revenues from mobile gaming as an additional –and secondary- source as compared to voice and data. Alternatively, content-entertainment industries have tried to figure out how to use the mobile channel as a supplementary source of revenues with regard to other gaming platforms. At the same time, the evolution of mobile applications towards delivery determined by users and their environment also requires a business model suitable for flexible, application-centric, user-determined configurations.

Since this case study focuses on the exploration of mobile gaming and not on the complexities of mobile business models from the firms' perspective, in the following sections these models are briefly presented in a simplified manner, roughly equating business model with revenue model.[195]

From this perspective, in principle there are no big surprises in the main business models for mobile games. In the case of games publishers (content providers), they are fundamentally a translation of the existing business models of the software game industry into the mobile domain: retailing (pay-as-you-go), premium retailing (the game with basic functionalities is free) and subscription (for gaming online). The business models for the other main types of players –operators, suppliers and application stores owners- derive from the discussion in the proceeding sections and basically rely on their market power in the mobile ecosystem to arrive at some form of sharing revenues with the games publisher, or to benefit from their position (gatekeeper role, as mentioned before) in the ecosystem.

Table 17 lists actual and potential revenue models classified by type of player. The table divides revenue models into primary, secondary and additional. The primary models are the main sources of revenue for each of the types of players. Secondary models are complementary to and compatible with the primary ones. The additional models are those on the mobile gaming "radar screen", some of which are already in use in neighbouring categories of mobile content and applications (music as the main example).

195 A business model describes the way value is created, while the revenue model just focuses on the source of income for the firm. The differences between them appear in the long term, where the business model explains the viability of the firm's approach.
The interested reader can consult the authoritative works of Bowman (2003) for mobile web models, and Ballon (2007; 2007; 2009a) or Bowman et al (Harry Bouwman, de Vos, & Haaker, 2008) for a general perspective on the mobile business model framework. For an analysis in the mobile area, following Bowman et al (2008, p. 33), we consider a business model as "a blueprint for a service to be delivered, which describes the service and the intended value for the target group, the sources of revenue, and provides an architecture for the service delivery". Note also that any business model in the mobile gaming ecosystem requires the cooperation of multiple players and it is no longer under the unique control of a single firm – the "platform" approach.

Table 17: Actual and potential revenue models for main types of players in the mobile gaming market segment.

Player	Main revenue models	Secondary revenue options	Additional revenue options
Game developers and publishers	Retailing (pay-as-you-go) Premium retailing (basic functionality free) Subscription	Advertising in general Advertising linked with some product placement Sponsorship Merchandising User profiling - marketing information Packaged with the mobile device Packaged with the (voice, data) services of the mobile operator	Value-added applications Packaged with some product or service not related with mobile ICTs Maintained by user community (not a commercial revenue model) Public service (not a commercial revenue model)
Mobile operators	Connectivity fee (indirect revenues) Retailing (sharing revenues) Subscription (sharing revenues) Packaged with operator's services Wholesale provision	Advertising Brokerage Billing services User profiling - marketing information	Branding Value-added applications
Hardware and software suppliers for mobile devices	Retailing (sharing revenues) Subscription (sharing revenues) Packaged with the device or software License fees / royalties for usage of platform (development kit)	Advertising User profiling - marketing information	Branding Value-added applications
Application stores	Retailing (sharing revenues) Premium retailing (sharing revenues) User profiling - marketing information License fees / royalties for usage of platform (development kit)	Advertising Brokerage Billing services User profiling – marketing information	Branding Value-added applications Maintained by user community (not a commercial revenue model)

Sources: compiled from (Feijoo & Gómez-Barroso, 2009; C. Feijóo et al., 2009; C. Feijóo et al., 2010, forthcoming; S. Ramos, Feijóo, C., Castejón, L., Pérez J., Segura, I., 2002).

In addition, it is worth noting that mobile game publishers are also typically involved in other categories of mobile content and applications due to economies of scope (similarity of value chains between games and, for instance, ringtones, wallpapers, images, etc) and scale economies (agreements with mobile operators or mobile device manufacturers, for instance). Therefore, in practice, they tend to use a combination of revenue models. Box 29 presents the Buongiorno case as an example of this involvement in several mobile entertainment categories and the evolution of its business models.

Box 29: Buongiorno, a mobile content provider case

Buongiorno, based in Italy, is a mobile media and technology company in the mobile phone entertainment and personalization industry. It was founded in Milan in 1999 and has been profitable since 2005. Revenues in 2008 amounted to €316 million with an EBIDTA[196] of €40 million. It has about 1,000 employees and 24 offices around the world.

It typically partners telecom, media and Internet companies in over 50 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 their products through proprietary labels, and sells directly through its Blinko brand (with 7.6 million subscribers to its BlinkoGold premium products in September 2008). It also offers a portfolio of services and content to wired and wireless telecom companies and media groups.

Buongiorno is a good example of the evolution in business models that mobile content and application providers are experiencing. Initially, it sold its products either directly via its own portal (with all the complications derived from the huge diversity of mobile phones) or in partnerships with mobile operators and/or mobile phone suppliers - what we could call the "mobile content 1.0". This is still in place mostly for the feature phone segment. Currently, it also has products for the smartphone segment in the main application stores.

In addition, since 2008, it has been offering customers free ad-supported games, video and messaging services. According to innerActive,[197] earlier trials of its platform produced click-through results of about 40%, with downloads 10 times higher than premium games. innerActive adds that 78% of games players who participated in the trials were new users who had never downloaded a mobile game before.

Source: data compiled from Buongiorno own statements and webpages cited in the box

Of all of the business models mentioned, it is worth briefly considering the options of advertising and value added applications.

Advertising has been signalled as a main alternative for generating revenues in the deployment of advanced mobile applications (Leppaniemi & Karjaluoto, 2005), although some firms prefer advertising possibly and simply because, initially, there was no better idea on how to make mobile applications profitable. From the advertising point of view, there is a crisis in its conventional approach and specifically in marketing through television, with more sophisticated techniques -for instance, product placement- increasingly being used. Advertisers feel that "business as usual" ads will not give their brands the same impact and sustainability. In particular, the progressive fragmentation of the audience calls for novel ways (ideally 'real-time') to identify and approach a target audience. Thus, advertisers are beginning to move their advertising budgets from television to other –more interactive- media (Heath & Feldwick, 2007). The so-called "advergaming", although still relatively little used, is a real option as a –at least secondary- revenue model for mobile games. Advergaming refers to the combination of advertising and gaming. In practice, it can be done in multiple ways: banners, ads before or during the game, product placement, etc. See Box 30 for a case of mobile advergaming. There is also a very recent interest in advertising within the mobile applications themselves, i.e. as an alternative to transporting the user somewhere else typically through a browser –the Google search model. The launch of iAd from Apple in April 2010 will probably set the tone for the possibilities of this "reach media" advertising.

196 EBITDA stands for earnings before interest, taxes, depreciation, and amortization.

197 See http://www.fiercewireless.com/press-releases/inneractive-and-buongiorno-team-provide-free-ad-funded-mobile-entertainment

Box 30: Puma, a case of mobile advergaming

Puma, a German running shoe brand, set up a racing game for mobile devices, called F-Wan (meaning "play" in Chinese) that coincided with the Shanghai F1 race in 2008. It was a multiplayer game, allowing four gamers to race against each other on this track. The game was free and included rewards for success, so top 3 best scores each week would win some Puma merchandise. But those who were most active in spreading the advergame virally were also rewarded with Puma merchandise. In addition, each person who downloaded the game, received as a bonus coupon delivered via MMS that offered them a free item of mobile content, if they visited one of the authorized Puma stores in China. Interestingly, the game was multiplayer, viral, and bridged the virtual and real worlds.

Source: data from Ahonen (2008)

With the success of application stores, there has been a recent interest in finding new business models which could build on their particular features. Value-added applications, i.e. applications downloaded from an application store from which -during its use- it is possible to access to new functionalities, provide a way for mobile game developers and publishers to utilise business models which have evolved beyond the traditional pay-per-download to incorporate billing from within the app itself for a variety of additional content and services (Holden, 2009). These can include time-based billing for game subscriptions, event-based billing (subscribing to an event –music, video, etc.- through the game) or item-based billing (e.g. payment for an additional level or piece of weaponry on a game). It is expected that this new type of business model will bring in a relevant part of the overall revenues of the mobile content and applications market, see Table 19.

7.4.2 The user perspective

In the following paragraphs, the main attributes of mobile gaming from the user perspective are examined. Some of them are the same as those for other mobile/digital content and applications segments (wide demographics, long tail, being confident with technology, ease of use, need of availability and affordability of networks and devices), but others are more specific to the mobile gaming domain (personalization, social networking, adoption and acceptance, culture and lifestyles, use of context, hedonistic vs. information elements). All together, they offer a multi-faceted view of the most intriguing element in the mobile gaming ecosystem: the consumer.

The first attribute of interest is the already wide and potentially even wider demographics of mobile gaming due to the huge and still increasing penetration of mobile technologies in general, and mobile devices in particular. In terms of penetration, they are much more ubiquitous than any other gaming platform, with predictions of above 5,000 million users in 2020 (Williams, 2008). This fact opens up many opportunities for game developers and publishers beyond the average mass media user. While the mobile early adopters group could be characterized[198] as: male or female, 20-something, middle-upper class, educated, working, entrepreneur, well-travelled, social, cultural, media hungry, e-gadget users, high speed wireless – mobile connected, casual, fashionable and trend conscious, this no longer applies to mobile gaming. Here, the demographic process has been relatively similar to that of the video console games, where their initial use by early adopters led to broader age and income profiles.[199] A survey (Accenture, 2009) of US consumers in the winter of 2007-2008 revealed that numbers of baby boomers (aged 45 and older) playing video games on the go via mobile devices accelerated by 52% compared with a

198 Adapted from marketing trends published by Synovate, 2007.

199 See Nielsen (Nielsen Games, 2008) for an account of the European demographics of video gamers.

very modest increase of 2% for generation Y (ages 18 to 24) consumers.

In addition, this shift in demographics explains the relevance that the long tail[200] could have. The diversity of potential consumers of mobile games and the low costs involved in reaching them allows games to appear that suit not the average mass consumer but some specific segment or need. Even other digital media are not able to keep up with the rhythm of deployment, the variety of choice and the rise of the "casual" gamer that uses "dead" time to play on the mobile platform, which is emerging as the natural media for keeping updated with novelties and connected with the social network.

The ease of use is another of the attributes traditionally associated with the mobile platform. In general terms, it can be argued that we are reaching a first phase of early maturity with the mobile digital revolution, at least for the privileged users. However, the mobile variety of the complex phenomenon called digital divide must be acknowledged, since pricing of mobile data and devices remains an issue for mobile gaming, especially in developing countries (De Souza e Silva, 2008). In fact, users are beginning to get used to and feel confident with the technology. They are able now to switch on and off from mobile technology. Mobile devices are no longer seen as strangers, but as partners and useful tools. Of course, this process of adoption and acceptance of technology reinforces new behaviours of users that in turn impels further acceptance, see Box 31 for a case on the use of the iPhone. To this regard, according to a survey from research firm Compete[201] conducted in January and February and covering 1,246 smartphone users, it was found that most smartphone users are actively using their devices throughout the day: while waiting in line or for an appointment, while shopping and while at home. The survey found also that 74% of smartphone owners use their device for personal reasons.

Box 31: A case on the use of the iPhone

Ling and Sundsøy (2009) have analysed how iPhone devices are used in comparison with other devices. The data for their analysis was generated from anonymous records derived from actual traffic data of a total of 3,917 Norwegian users. They conclude that users of the iPhone clearly used more mobile internet data than did users of the other phones. iPhone users downloaded approximately 35 megabytes per month, while general users downloaded about 2 megabytes. While nearly nine out of ten among iPhone users had become mobile internet users, about half of the general users never did so. They further come to the conclusion that iPhone-users do not only use the mobile for internet more than other users but they have altered their behaviour as a result of the adoption of the iPhone. Among the possible explanations, suggested by the authors of the survey, are the socio-demographics of the iPhone users, the nature of the iPhone devices and the data plan subscriptions associated with them.

Source: Ling and Sundsøy (2009)

200 The "long tail" concept refers to a number of user expectations and demands that are not covered by the mainstream products and services. The prototypical use of this concept in the online world comes from Amazon.com, the retail store. Since they had no need for physical storage of books, unlike a conventional library, they could market any book, therefore catering for a "long tail" of consumers that were previously very difficult to reach.

201 http://blog.compete.com/2010/03/12/smartphone-owners-a-ready-and-willing-audience

Personalisation of mobile content and applications while keeping connected with the social network, apart from its mentioned effects on the long tail of game choices, has been considered for long as the main differential attribute –together with ubiquity- of the mobile platform. However, empirical surveys show that the process of acceptance of advanced mobile services, gaming in particular, is more complex than just providing these two attributes (a mere "supply side" approach). They also prove that a gap still exists between the intention to use and actual usage and, from here, that a more comprehensive demand side approach is still missing as discussed in the following paragraphs.

Verkasalo (2008) used a panel of 579 active smartphone users in Finland to show that the short-term intention of usage of gaming on a mobile is a meagre 21.7%, falling down to a practical usage of 12.9%. The case of Finland is particularly relevant since it is considered to be a leading EU mobile market, technologically advanced and with a population ready and willing to adapt to new services. The explanation for these low results seems to lie in the combination of three factors: no value perceived (no need), pricing, and the existence of alternative devices, i.e., mobile devices have an advantage only in those situations that derive value from the ubiquitous nature of mobile handset, and when alternative devices are not accessible or available. In spite of the wider demographics, gender and age are correlated with the no need factor. In the same country, Kolmonen (2008) has confirmed that flat-rate tariff pricing is a driver for the diffusion, while low usability is a barrier, especially the small screen resolution and the difficulties involved in typing. In a more recent study of the Finnish market with three main applications, maps, games and mobile Internet, Verkasalo et al (2009) conclude that people who own a smartphone will not automatically use all the available services in spite of being the likely devices with which users are going to access advanced mobile services in the future. They also show that behavioural control is a very important concept. The idea that people can control their own applications, as is the case with smartphones, makes it more likely they will adopt advanced mobile services, implying that lack of usability and technological barriers have a negative effect on behavioural control. In the particular case of games they conclude that rather logically perceived enjoyment is a main driver for adoption.

It is also true that the situation is changing rapidly as a consequence of the deployment on new infrastructures and devices. To this regard, while back in 2006 in the USA less than 4% of subscribers downloaded games, the consumption of games was three times stronger in 3G handsets. In the same country, a survey of 1163 US respondents (Rice & Katz, 2008) done in 2007 showed that demographics (digital divide factors, social support), privacy concerns, and prior communication technology use should be also included as factors explaining the interest of users in new mobile services for entertainment.

Japan, one of the paradigmatic countries for the adoption of mobile services, is a good example to highlight the influence of culture and lifestyles in the mobile content and applications acceptance. For example, Barnes and Huff (2003) state that mobile gaming is highly compatible with the Japanese cultural values, in particular enthusiasm for novelties and group conformity, which helps adoption once a technology reaches critical mass. Other authors (Heres, Mante, & Pires, 2002) have concluded that mobile content and applications have had a wide diffusion because Japanese spend much time outdoors due to their small living space, which offers little privacy. A recent study in the Netherlands with 542 users (Harry Bouwman, López-Nicolás, & Molina-Castillo, 2009) proves that lifestyles, i.e., "how people live, how they spend their money and how they allocate their time" have a decisive influence on the adoption of mobile entertainment solutions.

Another finding of relevance from these studies was that the consumers need to find a

context (place, environment, emotional situation, social relationships, etc.) for using these advanced services. The research of Vos et al (2008) confirms that "context aware service bundles with utilitarian elements have a higher perceived value than bundles with hedonic elements".

Finally, some words on privacy, trust and consumer protection. Privacy is a key aspect in the personal relationship with the mobile devices, which now belong to a greater extent to the intimate sphere of the user than any other device in the past. The knowledge of the context and situation of use of the mobile is a major source of potential appealing applications. However it is unclear whether users are interested in the exchange of privacy for usefulness. User response to continuous exposure to advanced mobile services and, in particular, to some of its business models, is, as yet, unknown. To this regard, only social perception will dictate what it is considered correct for mobile content and applications. For example, mobile content contextual advertising promises higher levels of advertising expenditure, but user sensitivity to invasive proposals could cause a counter-reaction (Okazaki, Katsukura, & Nishiyama, 2007; Peters, Amato, & Hollenbeck, 2007). From a wider perspective, it would be possible to talk about users' trust instead of just privacy.

In addition to privacy, trust covers a myriad of issues: user in control, skills, past experiences, and security to name the main ones. They are basically the same type of issues of concern that were known in the fixed networks (Wang & Emurian, 2005) but again with the qualitative difference of the proximity of the mobile device with the individual. It is obvious that a generalized distrust on mobile advanced services, see the extreme case developed in Hatmaker and Rethemeyer (2008), instead of just a barrier would be a "wall" for the development of the mobile content and applications market. Unfortunately there have been, and still are, some cases of consumer abuse.[202] Screen Digest (2006) reports the consequences: "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 …", see also Box 32. As another instance of the dimensions of this issue, mechanisms for restricting access from a mobile to gambling or adult content are very inconsistent across EU.

Box 32: 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 US$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", for instance when you downloaded one ringtone, you were offered others. This turned into interactive advertising, for which the mobile user was charged, sometimes unknowingly. This created controversy in Europe, and was quickly withdrawn. In the United Kingdom, the Mail on Sunday[203] 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 analysts[204] argue that "[this case] probably single-handedly set back the mobile content industry by about 3 years with their deceptive marketing practices".

Source: elaborated by the author from data compiled from companies and webpages cited in the box

202 A 2008 EU-wide investigation into websites offering mobile phone services such as ring-tones and wallpapers resulted in 80% of the sites checked need to be further investigated for suspected breaches of EU consumer rules. See EC (2008) for additional information.

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

204 E. Lum from EJL Wireless Research. See: http://wirelessinprogress.blogspot.com/2007/06/mobile-advertising-reality-check.html

Table 18: Value and forecasts of main entertainment and media market segments.

Market segment	2007 (B €)	2008 (B €)	2013 (B €)
TV advertising	128	129	129
Internet advertising	40	46	67
Recorded music	25	23	20
Video games (total)	33	40	56
Console games	19	23	31
Online games	5.3	6.2	11
Mobile gaming	2.1 – 4.1	2.6 – 6	4.8 – 12

Source: author's own compilation of industry data.

Consumer protection covers also many different aspects of the mobile entertainment domain. One of its most relevant facets is availability of age-inappropriate content. To this regard a report of the US Federal Trade Commission (FTC, 2009) identifies concerns over the availability of age-inappropriate content in mobile games. For instance, the FTC notes that most mobile games are not rated according to the standards established by the Entertainment Software Rating Board (ESRB): "Given the sheer volume of game applications currently available for mobile devices and the dramatic rate at which applications are proliferating, in the near term, responsibility falls on wireless carriers and individual publishers to provide content information and effective parental controls," the report states. The FTC study examined the Apple, Verizon Wireless, AT&T, Sprint and Nokia websites to assess their respective efforts to rate advertised mobile game titles, and determined that all five websites offered games containing violent content, some of them mobile versions of home console titles tagged with the ESRB's M-for-mature rating. While none of the three U.S. operators offered rating information for their mobile games, the FTC reports that Apple assigns games age-based designations and content descriptors (e.g., "Frequent/Intense Realistic Violence"), while Nokia displayed the age-based rating and content icons used by the Pan European Game Information system, created by the EU Interactive Software Federation (ISFE).[205] The FTC commends mobile game sellers for instituting rating systems for their products, but adds the proliferation of different systems could create consumer confusion. "Further, it is important that these alternative systems be credible and comprehensive," the report states.[206]

As a summary of the section, the available data on mobile games user perspective confirms that it has some differential characteristics compared with other gaming segments: ubiquity, personalization while keeping contact with the social network, influence of the lifestyle and context. In addition, it provides as wide demographics as possible, therefore supply access to a potential long tail of games. It also confronts roadblocks related with privacy, trust and consumer protection, maybe not different from other platforms, but possibly more intense due to the very personal nature of user relationship with the mobile device.

7.5 Mobile gaming market data and prospects. The EU competitive position

Second to music, mobile gaming is one of the fastest growing segments in the mobile creative content industry. The latest figures available from market analysts (C. Feijóo et al., 2010, forthcoming) show that the global value of the market was estimated at €3-6 billion in 2008, i.e. around 10% of the €40-50 billion global video games market, about 20% of the mobile content

205 See www.isfe-eu.org

206 European Framework on mobile content: http://ec.europa.eu/information_society/activities/sip/self_reg/phones/index_en.htm

Box 33: The Gameloft case

Gameloft, founded in France in 1999, is an international publisher and developer of video games for mobile phones. The company creates games for mobile handsets equipped with Java, Brew, Symbian, Apple or Android technology, among others. 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 has a distribution network covering more than 100 countries. Gameloft has offices in more than 20 countries worldwide and 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 US$92 million in 2006, US$140 million in 2007, and a growth of 25%-30% was expected for the year 2008. Gameloft is also profitable since 2003.

Source: data compiled from Gameloft own statements

Table 19: Value and forecasts of main mobile content and applications market segments.

Market segment	2007 (B €) EU market share (%)	2008 (B €) EU market share (%)	2012-2013 (B €) EU market share (%)
Mobile TV	0.7 – 1 (45%)	1 -	2- 8.7 (23%)
Mobile advertising (total)	0.6 – 1 -	1 – 2 -	4 – 8.7 -
Mobile gaming	**2.1 – 4.1** **(20%)**	**2.6 – 6** **-**	**4.8 – 12** **(22%)**
Mobile music	6 – 6.5 (23%)	8.8 -	12.8 (11%)
Mobile social networking and user-generated content	0.4 -	1.3 (24%)	7.4 – 8.2 (20%)
Mobile search	- -	1.1 (37%)	2.8 – 3.5 (21%)
Mobile location based services	0.4 (42%)	- -	9.4 (19%)
Mobile application stores (including value added services)	- -	5 -	16 -

Source: Feijóo et al (2010, forthcoming).

and applications market and a tiny 0.01% of global mobile revenues. According to the same sources, the EU market share in mobile gaming was about 20% in 2007, see Table 19 and Table 20.

Mobile games represented 3% of total video games spending in the U.S. in 2009, according to a survey issued by market research firms TNS and Gamesindustry.com.[207] Home and handheld consoles dominated the gaming budget, accounting for 57% of all sales -PC titles represented 20%, online game portals 11% and massively multiplayer titles made up 9%. Among the six international markets surveyed, mobile gaming represented the largest share of video games sales in the U.K., accounting for 4% of total sales. In Germany, mobile titles represented 3% of sales, while in France and Belgium, mobile made up 2%, falling to just 1% in the Netherlands.

207 See: http://www.gamasutra.com/view/news/26293/Study_20_of_US_Game_Spending_Devoted_To_MMOs_Portals.php

Regarding global mobile gaming market prospects, it is expected that gaming on this platform will double its value, according to optimistic forecasts, in the period up to 2013-2014, reaching around €10-12 billion of global value with estimations for CAGR ranging from 8 to 25%. Interestingly, it is the only one of the main mobile content and applications market segments where it is forecast that the EU share of the market will slightly increase (up to 23%), see Table 19. A 2010 forecast issued by research firm DFC Intelligence[208] expects Apple's iPhone and iPod touch devices to account for about 24% of total portable game sales in 2014. Smartphone analytics firm Flurry reported[209] in March 2010 that Apple's iPhone alone had nabbed 5% of the US's $10 billion gaming market, with 30,000 games released on the App Store since July 2008.

It is worth exploring the behaviour of the market further by looking at the demand side of mobile gaming on a regional and country-by-country basis. Using data from Netsize (2008, 2009) and PWC (2009), Table 20 shows the size of mobile gaming markets across main countries. Several results are relevant. First, comparing main regions, it is the EU where the highest regional growth took place from 2007 to 2008 (42% for EU-5, with growth around 50% in France and Spain). Second, Asia has been leading this market with Japan and Korea in front. Since there are –and there will be- more mobile subscribers in Asia than in the rest of the world combined, it is foreseeable that this region, helped by mobile communications technology upgrades, maintains the lead. According to PWC (2009), the CAGR in this region for mobile games will be about 16% until 2013. As a main example of the interest of this market, Apple is reportedly in negotiations to acquire Chinese mobile gaming developer Handseeing Information Technology.[210]

In addition, analysts (Holden, 2007) believe 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". Some more recent data from Mediascope Europe (EIAA, 2010), where 15 European countries were surveyed, show some interesting trends along the same lines of increasing usage of mobile Internet and substitution of other media. In fact, the Eastern European countries show a higher usage of mobile Internet, with Poland topping the list at 10.3 hours per week (Europe average at 6.4 hours). Other EU countries with use above average are Italy (7.9 hours), Belgium (7.7 hours) and Portugal (7.7 hours) while for instance Spain is below average at 5.5 hours. These data suggest that each national market behaves in a particular manner, complicating a homogeneous approach. Two data on big mobile markets are also worth highlighting: Russians spends 7.1 hours per week on mobile Internet usage, and in Turkey there are already more users of mobile Internet (21%) than fixed Internet (20%). Third, North America (USA) is behind the EU and Asia in terms of adoption of mobile gaming –and other advanced applications- because of the historical delay in the deployment of 3G technologies, a gap that it is expected to close in the next few years. Analysts (PWC, 2009) expect a CAGR of mobile games in the North America region of 8% up to 2013.

208 See: http://www.fiercemobilecontent.com/story/mobile-titles-now-3-percent-total-u-s-game-spending/2009-12-01?utm_medium=nl&utm_source=internal

209 See: http://www.telecomseurope.net/content/gaming-firms-target-mobile-phones?section=HEADLINE&utm_source=lyris&utm_medium=newsletter&utm_campaign=telecomeurope

210 Apple has so far struggled to gain a foothold in the massive Chinese consumer market. It opened its first Chinese store in Beijing in 2008, with plans to open an additional 25 locations by the end of 2011. Apple's iPhone is officially available via China Unicom, the nation's second largest mobile operator, but a flood of grey market devices have compromised sales. There is also increased speculation that Apple is seeking to launch in-house game and application development efforts for devices running its iOS mobile operating system. To date, Apple has created just one iPhone game, 2008's Texas Hold 'Em. See: http://news.yahoo.com/s/afp/20100806/tc_afp/chinaitapplehandseeingmerger

Table 20: Mobile games market across main countries (million €)

Country / Region	2004 (M €)	2005 (M €)	2006 (M €)	2007 (M €)	2008 (M €)	Growth last y-y (%)
France	58.7	75.2	107.7	133.6	197.4	48
Germany	36.0	53.7	54.8	81.8	115.8	41
Italy	19.8	39.6	56.7	87.2	116.5	34
Spain	30.1	56.0	66.4	78.3	122.4	56
UK	95.6	158.4	189.1	224.8	307.9	37
EU-5	**240.2**	**382.9**	**474.7**	**605.7**	**860.0**	**42**
China	67.6	121.8	170.0	232.9	290.2	25
India	4.9	10.2	15.7	27.4	42.4	55
Japan	204.9	375.6	546.6	610.5	719.0	18
South Korea	161.1	297.1	333.3	356.9	480.5	35
Asia-4	**438.5**	**804.7**	**1065.6**	**1227.7**	**1532.1**	**25**
USA	**200.9**	**261.0**	**346.5**	**480.1**	**539.9**	**12**

Sources: Netsize (2008, 2009), PWC (2009).

Last but not least, some leading markets could be showing symptoms of some saturation or, at least, slowdown. Data from industry sources is still too anecdotal and subject to interpretations to be definitive proof of this trend, but it is interesting to note that it is shown in a leading market: Japan with "only" 18% growth from 2007 to 2008 (less than in previous years) or even a decrease of 8.0% from 2007 to 2008, according to Netsize data. Since the slowdown has not happened in other markets it cannot be attributed to the economic crisis. Additionally, as the latest data are from 2008, it is too early to show if other effects on mobile gaming, such as applications stores as platforms, are affecting the growth of the market.

To complete the market overview, some data on the supply side are presented in the following paragraph. Table 21 displays some rankings of main mobile games and companies across different regions, years and platforms. Evidence is anecdotal but it highlights some general ideas about the dynamics of mobile games suppliers. In the first place, mobile gaming is truly a multinational domain with companies from several countries providing contents in every other market. It also shows some signs of consolidation, with some companies appearing consistently across rankings (Electronic Arts and Gameloft as main examples) and some others being the target of acquisitions by relevant entertainment-oriented players.[211] At the same time, there are also some highly successful small companies and even individual developers (Team17, Firemint or Lupis Labs as recent examples), showing that there are no high entry barriers in terms of competition. Finally, from a European perspective, it seems that a significant number of companies that have been successful in the mobile market segment are already present.

As a final summary from a game developer perspective, Table 22 presents some relevant figures for the main emerging mobile gaming platforms compiled from previous sections. Data on the table highlight the differences

211 Disney purchased music game developer Tapulous, the startup behind the bestselling iPhone series *Tap Tap Revenge, in July 2010.* More than 30% of iPhone and iPod touch users have downloaded the 99-cent *Tap Tap Revenge* since Tapulous was founded in 2008. In late 2009, the firm said its sales were approaching $1 million per month. In addition to premium-type downloads, *Tap Tap Revenge* generates revenue via advertising and in-app music purchases. Its game portfolio also includes *Riddim Ribbon* and *Tap Tap Radiation*, the latter very popular on Apple's iPad tablet. Some of Disney's mobile games –such as *Alice in Wonderland Lite*, *Fairies Fly Lite* and *JellyCar 2*- all top the million download benchmark. See: http://www.fiercemobilecontent.com/story/disney-acquires-iphone-game-hitmaker-tapulous/2010-07-02?utm_medium=nl&utm_source=internal

Table 21: Several rankings of games and companies in the mobile gaming market

Europe. Companies Top 10 (2007)	USA. Mobile Games Top 10 (2008)	Spain. iTunes Games Top 10 (2009)	Android. Games Top 10 (Oct 2009)
1. Gameloft (France)	1. Tetris – Electronic Arts (USA)	1. Sims 3 – Electronic Arts (USA)	1. Robo Defense – Lupis Labs (?)
2. InfoSpace (now Motricity) (USA)	2. Bejeweled – PopCap (USA)	2. Monkey Island – LucasArts (USA)	2. Farm Frenzy – Hero Craft (Russia)
3. Sumea (Australia)	3. Guitar Hero – Vivendi (France)	3. Worms – Team17 (UK)	3. Jewellust – Smartpix (USA)
4. In-Fusio (France)	4. Wheel of Fortune – Sony (Japan)	4. Trivial Pursuit – Electronic Arts (USA)	4. Devily Huntress – Smartpix (USA)
5. I-play (now Oberon Media) (USA)	5. Pac-man – Namco (Japan)	5. Assassins' Creed – Gameloft (France)	5. Baseball Superstars – GameEvil (Can?)
6. THQ Wireless (USA)	6. Oregon trail – Gameloft (France)	6. Real racing – Firemint (Australia)	6. GameBoid – yongzh (?)
7. Sorrent (now Glu Mobile) (USA)	7. Ms Pac-man – Namco (Japan)	7. FIFA 10 – Electronic Arts (USA)	7. BeatDown Boxing – Requiem (USA)
8. Living Mobile (Germany)	8. Are you smarter than – Capcom (Japan)	8. Modern combat – Gameloft (France)	8. Snesoid – yongzh (?)
9. Electronic Arts (USA)	9. Super Tetris – Electronic Arts (USA)	9. Gangstar – Gameloft (France)	9. Gang Wars – GameBoss (?)
10. iFone (now Glu Mobile) (USA)	10. Surviving high school – Centerscore (USA)	10. Let's golf – Gameloft (France)	10. UNO – Gameloft (France)

Sources: Informa Telecoms & Media (2007), Nielsen (2008), Apple (2009) and data compiled from industry by the author.

in the profiles of each of them, as stated in a previous section.

7.6 Challenges and potential disruptions

7.6.1 Mobile gaming: an industry in quest of its next stage

Mobile gaming could still have a long way to go before it reaches saturation point. As discussed previously, it is currently only used by a –although increasingly wide- minority of mobile users and the short-term forecast to use mobile games has not been fulfilled. However, this potential growth faces serious issues in the medium term as it will have exhausted the simple model of mobile gaming as a "time filler" and also as it has not projected itself as a "serious" industry, able to offer value and usefulness to users. Indeed, some of the economic data previously considered –i.e. signs of saturation in some markets, percentage of gaming applications in mobile stores- show that mobile gaming growth has reached a "plateau". This is also confirmed by some user surveys. For instance, Pew Internet (Horrigan, 2009) shows that 27% of US mobile users adopted gaming, a percentage that did not change between 2007 and 2009, in spite of the success of smartphones and application stores. Industry insiders, however, consider mobile games to be a basis for mobile entertainment, along with music and social networking, and that it is still a land of "opportunities" (Netsize, 2009).

The disruptive types of mobile games that can impel this market segment into new growth require intensive use of the new facilities brought both by mobile communications (mobile broadband, context-awareness) and 2.0 Internet (online and social gaming) as discussed in the next sections. A survey of 876 mobile industry experts in 2008 seems to confirm this hypothesis, see Netsize (2009), since mobile game publishers thought the key drivers for the industry were the porting of games across platforms, the building of communities around the game and the access to marketing and advertising tools, while from the consumers perspective the key drivers were

Table 22: Economic data for platforms from a mobile games developer perspective in 2009

Data (year 2009, or Dec 2009 when applicable)	Apple platform	Nokia platform	Android platform	RIM platform	Windows platform
Expected mobile gaming market share (%) of platform in 2014	24	-	-	-	-
Annual revenues of mobile games (million euros)	150	-	1.4	-	-
Number of mobile games in the platform	23 000	1 300	3 000	600	120
Games added to the platform in the last month	2 000	-	-	-	-
Percentage (%) of free applications in the platform	25	15	57	24	-
Average price of a paid application in the platform (euros)	2.6	2.1	3.1	6.6	5.7
Percentage (%) of revenues for the developer	70[212]	70	70	80	70
Average net income for developers per mobile game (euros)	6 500	-	-	-	-
Net income of the top seller game per month (euros)	270 000	-	18 000	-	-
Number of games downloads per month (millions)	20	6	4	-	-
Average number of games download per user per month	2	-	1	0.3	-
Number of developers signed for the platform	100 000	-	-	-	-
Developer fees (euros)	75 (per year)	50 (sign up)	20 (sign up)	150 (per 10 apps)	75 (per 5 apps)[213]
Average total cost of development of the first mobile game (euros)	-	8 000	-	-	-

Source: compiled and estimated by the author from publicly available industry data.[214]

thought to be mobile data billing transparency, innovative business models able to balance the interest of users for games and their price, and new types of games.

7.6.2 Online mobile games, mobile broadband and the evolution of the smartphone

The availability of a suitable mobile broadband connection is a necessary condition for the fruition of new types of online mobile gaming, which in turn implies the deployment of next generation mobile infrastructures. Currently, there is coverage of such type of networks in all the major urban areas of the EU and although they cannot yet be compared with the transmission capacity of fixed infrastructures, they could be enough for many of the innovative offerings of gaming. However, it should not be forgotten that it could take a very long time for rural areas –or, in general, areas with low density populations- to enjoy true mobile broadband, unless some type of public intervention helps to deploy the required infrastructures.

The appearance of mobile broadband connection fees not very dissimilar to the fixed ones is another cornerstone for the development of the domain. However, they

212 60% in case of advertising within the application (free for the final user).

213 And €75 for each additional application bought after the first 5.

214 Note that some of the data are not completely congruent due to the diversity of sources used. In spite of this, these data have been kept on the table to give a more realistic view of the available figures and their disparity.

are still comparatively expensive, particularly in the case of international roaming. Mobile broadband connection can also contribute to overcoming the limited capabilities of mobile devices. With some form of mobile "cloud computing", it would be possible to balance the processing power between the device and the network. In fact, mobile devices would only need to bear a small portion of the informational burden, while "the cloud" could carry most of it. Obviously this could only be viable in a scenario of ubiquitous and affordable mobile broadband connections.

Together with the affordable and ubiquitous mobile broadband connection, the other necessary condition for the expansion of mobile gaming is an adequate device. The increasing multiplicity of choice in mobile devices capable of using content and applications (smartphones, PDAs, ultra-mobile computers, mini-computers, portable players, portable consoles for games, …) and the recent innovations[215] in both hardware and software for mobile devices will increase the speed of change and bring about new developments of interest for the market. Technological improvements like device-embedded technologies (accelerometers, gyroscopes, etc) and location technologies will also contribute to increasing the appeal of new mobile devices. However, "advanced-smart" devices are still modestly deployed in the market and are comparatively expensive. For this reason, the area has considerable appeal for the main players.[216]

To sum up, the adequacy of the mobile device depends on its utility, affordability and usability; the latter linked with human to machine interfaces, displays, memories and batteries. Usability refers to both the device as such and the way it is used (Chae & Kim, 2004) and should include the different skills, experiences and conditions of potential users (Hong, Han, & Kim, 2008; Ziefle & Bay, 2005) particularly to extend the market reach of mobile gaming.

Box 34: Botfighters, a case of massively multiplayer online game

Massive Multiplayer Online games (MMOG) can provide mobile operators with an ongoing revenue stream in contrast with mobile games sold as a product. MMOG players typically subscribe –monthly fee, for instance- to be able to play with thousands of other players worldwide. Maybe for this reason they attracted early attention.

A successful example was Botfighters, a combat game in which players use their mobile handsets to locate and "eliminate" opponent robots. The game was released originally in 2000 by the Swedish mobile game developer It's Alive. It was used by thousands of gamers in Finland, Ireland, Russia and Sweden. In 2004, the game was able to generate more than one million sms per week in Moscow alone (Soh & Tan, 2008). The company was sold to the Swedish computer games developer Daydream Software AB in 2004, which in turn sold it to the gaming and gambling company, 24hPoker AB, in 2006, which later changed its name to Entraction in 2007.

Source: data compiled from companies own statements, papers and webpages cited in the box

215 Such as the platforms already discussed (iPhone from Apple, Android from Google, Nokia, etc).

216 For instance, Sony Ericsson is working on a gaming-centric Android smartphone, according to the blog Engadget. According to the blog, the handset maker - through its partnership with parent company Sony - is developing a device that will run on version 3.0 of Google's mobile platform and feature a slideout keyboard with gaming

7.6.3 Social and context-aware mobile gaming

In addition to online mobile gaming, which requires available and affordable mobile broadband and smart devices as discussed, the main potential disruptions in mobile gaming lie in the leverage of context and the social network.

Multiplayer games are in fact an early version of a social network for gaming, see Box 34. Social networks add two additional possibilities to the concept: building a community around the game –that could extend much beyond it- and the viral distribution. The integration of the most popular Internet social networks, such as Facebook, in the mobile phone and the emergence of purely mobile social networks, like Twitter, will help the combination of mobile gaming and social networks. In fact, a survey (Lai, 2007) run amongst US students revealed that mobile phone and social networking usage are correlated, in terms of intensity and scope of use. People who spend more time on their mobile phones would also spend more time on online social networking. In addition, those who use their mobile phones more are likely to carry out more diverse online social networking activities. Available data[217] suggests that consumers do not wish to create new and separate social networking profiles for the mobile platform, but instead prefer to access their existing social networking accounts on the go.

Consequently, a new panorama opens up whereby mobile users take on new roles of service delivery. On the supply side, mobile social computing allows interested actors to use social innovation as a new resource for providing more useful and cost-effective applications. New mobile techno-economic models take the user as consumer, creator of content and also a source of inspiration. They see the mobile device as a means of harnessing collective intelligence (Jaokar & Fish, 2006). For instance, in 2010 Sony Ericsson presented a platform called Creation which allows users and developers to co-create new content and tools.

With regard to the use of context in gaming, context characteristics are typically derived from sensors, which capture both users' bio-parameters and their physical environment, and from cognitive technologies[218] (Klemettinen, 2007). It is expected that the use of context will open up undiscovered needs and interactions. For instance, as mobile devices have rich sensing capabilities, they allow augmenting the real world with the Internet (Griswold, 2007). The mobile device will be, then, the natural tool to bridge the physical world surrounding us with the wealth of information on the net and users will put the many situations of their real daily lives at the core of mobile usage. As an example of this future potential, users leave traces that can be used, anonymously and/or with privacy matters solved, as a way of gaming. In terms of opportunities, Fish[219] argues that the mobile device opens up the possibility of sharing 90% of the daily pattern, in comparison with a mere 10% in a fixed access web model. Among many existing cases is a Brazilian location-based mobile game in an urban environment, see Box 35.

controls. The device is said to have a screen of between 3.7 and 4.1 inches, and will probably have a 1 GHz Qualcomm Snapdragon processor. The phone is described as a cross between a Samsung Captivate, the Galaxy S phone for AT&T Mobility and Sony's PSP Go device. The blog said the device could be released by October 2010.

217 See additional references at Feijoo, Pascu, Misuraca and Lusoli (2009).

218 Cognitive technologies are used in a loose sense to "understand" user behaviour, user intentions and personal context. Strictly speaking, they are systems that perceive the environment and take actions that maximize the chances of success. For instance, semantic processing of text messages sent by the user would allow identifying whether the user can use voice communications at that very moment, she/he is in a professional situation, with friends, with family, planning to go to the cinema, to dinner, etc.

219 Tony Fish on 'Bothered by 2.0" at http://opengardensblog.futuretext.com/archives/2007/05/bothered_20_by_tony_fish.html

Box 35: Alien Revolt, a location-based mobile game in Brazil

Location-based mobile games (LBMGs) are basically mobile games that use physical –mostly urban- spaces as the game scenario.

Alien Revolt was the first Brazilian LBMG, released in 2005 by the company M1nd Corporation and the operator Oi in Rio de Janeiro. The game used Java-enabled cell phones equipped with location awareness to transform the city into a battlefield. Following much of the Swedish game Botfighters idea, Alien Revolt's goal involves virtually shooting other players within a specific radius in the city space. Alien Revolt exemplified how cell phones strengthen users' connections to physical space, because they are used as collective communication devices, rather than personal private technologies. It also showed how limitations in available technologies (the game was played with 2.5G-3G mobile communications) and in affordable pricing can be partially overcome with the right user experience.

Source: Souza (2008)

Mobile augmented reality (MAR), where information coming from the virtual –Internet- world is superimposed on physical objects and browsed through a mobile device, is the concept usually associated with the use of context. Reports from industry analysts (Juniper, 2009) expect that the market for mobile augmented reality services will reach US$732 million by 2014, with revenues derived from a combination of paid-for app downloads, subscription-based services, associated content revenues, per-event billing and advertising. The size of this market is negligible in 2010 since only a small minority of smartphones are MAR-enabled. However, this proportion will rise dramatically in the medium term as a result of increasing adoption of smartphones and the greater deployment of MAR enablers such as digital compasses and accelerometers. Although initial service adoption will probably be driven by MAR location-based search, analysts expect the first substantial revenues to be derived from MAR-enabled games from 2011-12 onwards.

7.6.4 The ecosystem challenges for mobile games developers

The heterogeneity and current fragmentation of the mobile ecosystem causes the unavailability of widely accepted common technical rules. This absence of standards means that innovators and established companies are unable to profit from economies of scale and increases the transaction costs involved. This barrier emerges in every layer of the ecosystem, be it on the mobile device (operating systems, applications, content players, location-based services, etc), in the infrastructure or in any part of the mobile platforms (billing, aggregation, content and applications management, context management, etc).

As a consequence, the mobile gaming ecosystem is evolving towards a collection of "open, but not open" approaches; the already-mentioned platformisation (Pieter Ballon, 2009c). This platformisation also implies a clash of business models and cultures. Content and application providers would like the network to be neutral and a mere system of transport and distribution, while operators want to complement connectivity with value-added content and applications. In addition,hardware and software suppliers of mobile devices are now looking into silo models to extend their control along the value chain. This partly latent conflict implies that the market is still in an early stage of competition, focused on platform control.

At the same time, the lower entry barriers for the development of games in each of the mobile platforms in comparison with other game platforms have caused a proliferation of small mobile game software developers. However, the other side of the coin is that they face a major challenge in

getting their products to consumers since they generally lack strong marketing and distribution networks. Because of this, they usually seek out partnerships (publishers, device suppliers, mobile operators) or platforms that include marketing tools (the emergent app stores). The relatively low costs of mobile game development also help the creation of the "economics of long tail" (Jaokar & Gatti, 2010) where developments for a minority of users may be profitable. However, this long tail reinforces the role of application storefronts, since developers need a virtual marketplace to reach the scattered demand.

Finally, due to the increasing relevance of mobile gaming, a number of big players are crafting their own strategies into the domain (refer to data provided on Disney, Microsoft, Sony-Ericsson and Apple, for instance). Most of them include building an in-house development team for mobile gaming. This team can be created from existing knowledge within the company and/or hiring/acquiring external knowledge. If this becomes the usual case for mobile games development, the precedents in the console industry indicate that in-house developer teams will be favoured, at the expense of publishing partners.

8. Gargoyles, Babewyns, Angels, Saints and Demons: Opportunities and Policy Implications

Source: Funcom.

The video games market, because of its sheer size and its software-related segments, is of great significance. This market is also expected to grow in the coming years. The importance of this industry is likely to be strengthened by its successful investment in the development and introduction of disruptive technologies. Through technology transfer, other industries can benefit from the research and development, experiments and large-scale implementation carried out for video game-related products. This digital native may turn out to be the living lab of the digital economy. For some experts *"games are the innovation catalyst of information society"*.[220]

8.1 Challenges and hot debates

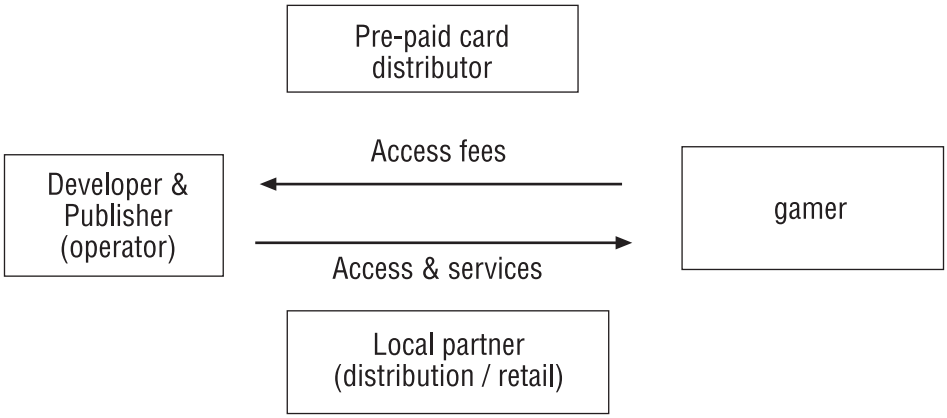
Of disruptions and turbulences: where is the value chain?

This living lab is characterised by instability and some turbulences between players, which may be linked to the state of infancy/ lack of maturity of this market. As pointed out earlier on, the structure of this industry is still work in progress. The relative position of each player in the value chain is not stabilized (hardware producers, game developers, publishers, software producers).

Additionally, mobile games are challenging the monopolies of existing OS owners and offer a new distribution channel to developers. Online games (e.g. Massively Multiplayer Online Games: MMOGs) offer new roles to users, which could allow existing publishers to be bypassed and create different revenues streams. These emerging trends are expected to affect the current and future

220 Malte Behrmann, Secretary General, European Games Developer Federation (EGDF).

Figure 24: Directions of changes in the value chain



Source: Funcom.

dynamics in the video game software industry. Broadband (depending on the limitations of the speed) enables a direct relationship with the consumer.

Video games are not technology driven, but technology enabled. However, technology can still be a wild card. For instance, will the "natural user interfaces" revolutionize gaming and entertainment in the home? It remains to be seen to what extent such enabling technologies will remove the last barrier to gaming and entertainment: i.e. the controller, freeing consumers to have the experience they want with technology they will perceive as "natural".

Furthermore, one of the disruptive trends in the video games business is the emergence of new actors from different businesses, which may be able to bypass existing actors in currently dominant positions. New companies, such as online portals (MSN, Google, Yahoo, pogo.com), Internet service providers, online social networks (Facebook) or even telecom operators (Orange, Vodafone) or telecom equipment manufacturers companies (e.g. Nokia) may become essential intermediaries in the video games value chain. These entries will bring new form of intermediation that may or may not be welcomed by incumbent players. At the same time, the technological move toward network gaming is also allowing some disintermediation, as the section on online games has clearly shown. Fewer parties involved in the value chain may mean more revenue for the remaining parties. For instance, developers may benefit from direct contact with the consumers which will make them less dependent on the established publishers.

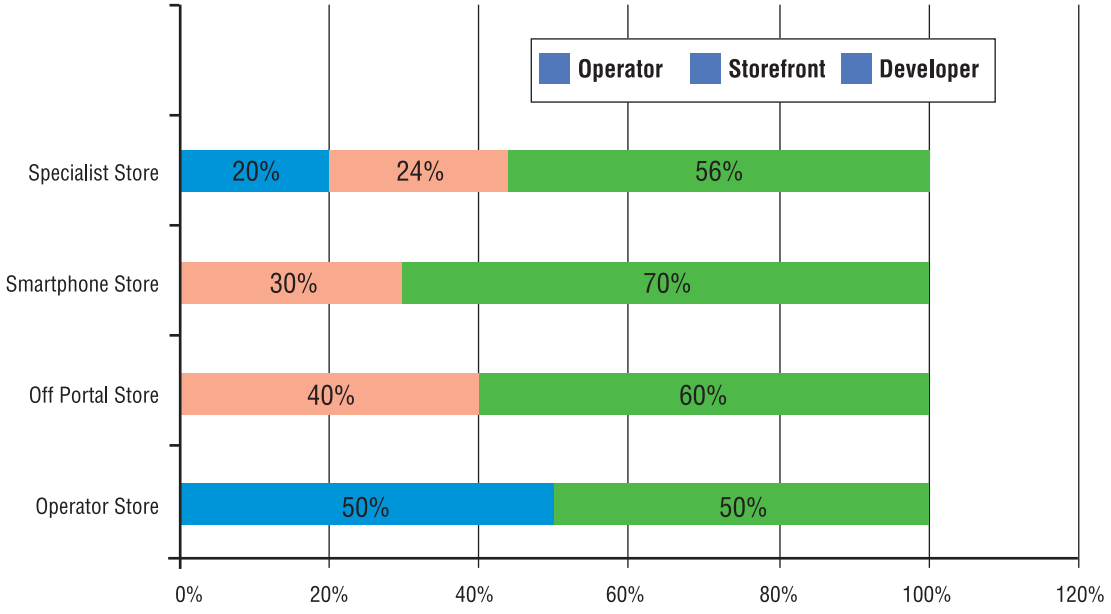
However, this impact is not likely to be either mechanical or linear. The new "intermediators" will try to get their share as well, initiating another hot debate on how to share value.[221] The existing players could try to circumvent the newcomers, for instance by limiting the role of telecom operators to "dumb pipe providers" as these operators appear to increase the pressure on the developers' margins as illustrated in Figure 25 (revenue sharing for four categories of stores). The actors could eventually find ways to cooperate so as to limit the fragmentation due to numerous technical standards and to what NCC[222] describes as a "*fragmented fight against fragmentation*".[223] In any case, the management of the relationship with the customers is a strategic issue for the

221 Bigpoint, a German video game company with a game portfolio of 50 games, claims that his browser games *"need no retailer, no operator"* e.g. no further down payments (or *"smaller and smaller"*) to these parties.

222 Noyons Content Consultancy (NCC).

223 In the mobile field: JIL, Joint Innovation Lab, OMTP Bondi (Open Source standard for mobile web), Wholesale Application Community (24 operators), LiMo (10 operators) Mobile Linux Open Source consortium, One API (GSMA), Open Mobile Alliance (OMA). Presentation at the IPTS workshop.

Figure 25: Revenue sharing for four categories of stores (mobile distribution)



Source: NCC, Strategy Analytics.

players. This includes customer services that are growing with the shift from products to services.[224]

A new market dynamic is being created, also allowing new partnerships with other organizations (movie industry, sports organizers…) and more lifestyle partners to appear, opening up new experiences. These dynamics result in further changes in already differentiated business models, which in fact are still an open issue. Who benefits economically, now and in the future, from the growing video games market remains to be seen.

The importance of being "cultural"

These changes and turbulences are generating different expectations and triggering tensions and conflicting views of the industry. For example, there are opposing views on how to label games: as software or as cultural products. The Interactive Software Federation of Europe (ISFE) favours the term software, as does the ESA in the US.[225] The European Games Developer Federation (EGDF) backs the use of the wording "cultural content", as do some EU Member States such as France, Germany and more recently Spain. For the EGDF, "*games are cultural objects*".[226] For the European trade association, this feature makes this industry unique and "*important*" because it blends three aspects: " *an economic, cultural and technological challenge, because they are at the crossroad of three issues: cultural diversity, economic development (e.g. jobs),*

224 Aphra Kerrr (Dublin University) underlined a *"huge growth in jobs for customers service"* in the Ireland case.

225 The European video game industry federated within ISFE (European Interactive Software Federation of Europe) has always considered its products to be interactive computer programmes or software and the national case law and legal, regulatory and trade structures that have naturally evolved around video games during the past twenty years have endorsed their classification as software e.g. 2007's EU Audiovisual Media Services Directive Recital 18 excludes online games from its ambit.
On its website ISFE points out that for transatlantic trade the US share of the EU market is of 34% and the EU share of the US market of 11% (source: Screen Digest) *"These numbers, achieved in a quota-, subsidy-free environment, compare favourably with those, respectively 5.02% (half) and 66% (double), observed in the regulated movie sector. "Source: Focus 2002, world film markets trends"*, European audiovisual Observatory.

226 M. Behrman at the validation workshop.

technology".[227] A Decision of DG Competition[228] stated that "*certain video games may constitute cultural products*" and "*that the fact that video games can be regarded as software rather than as audiovisual products in no way affects the fact hat some of them can also be regarded as cultural products* (…)".

For others, gamers are not viewers; they enjoy a very different experience. Microsoft considers video games to be software products and holds they should be characterized as interactive software. Video games are about interactivity and "playability" and are totally distinct from other linear audiovisual media, such as movies and television. For the software company: "*although video games sometimes make use of historical or cultural references as a backdrop to the game play, the focus in creating of a video game is to develop and provide software which provides the end user with an interactive game play experience.*[229]"

This is not just a theoretical/ academic debate. It has implications for regulation, funding and WTO trade negotiations to name but a few. Indeed, video games are not subject to, or regulated by, any legislation applicable to audiovisual works. With a software classification as its foundation, some players are keen to underline the fact that the European video game industry has grown and prospered to become a truly global phenomenon. This, for them, is a sufficient reason to question a classification under "cultural product". Others claim that they could gain benefits from this classification such as a lower VAT, or access to specific funds. Without siding with any specific viewpoint, one should nevertheless be careful about the potential adverse effect of extending existing regulation to a new field. Admittedly, the current regulatory status of video games may be full of loopholes; however this should be weighed up properly. The cultural/ audiovisual regulatory framework, while apparently attractive, may become a quagmire for non "cultural" natives.

8.2 The present situation of the European video games software industry

The pictures drawn clearly show a global market with international players. Currently, Europe appears to be present in all stages of the games value chain, albeit unevenly.

- While Europe is absent from the consoles hardware segment, which is dominated by American (Microsoft) and Japanese firms (Nintendo, Sony), some EU firms are challenging the incumbents in the mobile segment: for instance, Nokia's Symbian operating system environment. However, this console segment of the market is by far the most significant (60% of the market). This dominance is further strengthened by the fact that these actors play a major role as publishers and therefore tend to "*control the food-chain*".[230] A domination that amounts to a "*cultural/ game tax of 30% raised on all European parties*".[231] Besides, EU companies do not act as gatekeepers in this segment or in most other segments.
- There are only a few European companies among the major publishers, one of which is Ubisoft, a top world video games publisher (since Atari European operations were bought by Namco Bandai[232]).
- The European industry also supplies a large share of world's middleware needs. Middleware (games engines) plays a central role in a new era of modularised engines.

227 This is reminiscent of the famous quote of the former (and first appointee) French Minister of Culture, Andre Malraux: *"Le cinéma est un art… Par ailleurs, le cinéma est une industrie». Esquisse d'une psychologie du cinéma*, Nouveau Monde édition, 2003.
228 DG Competition, C 47/06 (ex N 648/05).
229 Interview.
230 Jørgen Tharaldsen, Funcom.
231 Jørgen Tharaldsen, Funcom.
232 A Japanese company. See: Table 6 Top Game Publishers.

Middleware from Unity3d (a Danish firm) is used by 10 to 20% of the top 100 games.[233] Middleware solutions also help EU companies to compensate for the fragmentation of the EU markets as it provides the studios with an incomparable advantage in terms of cost reduction.

- Europe hosts a large population of developers' studios; often the creators of major market successes. Most of these highly creative small development studios can be found in the UK, France, Germany, the Nordic countries and, to a lesser extent. Spain. In Europe, the UK is the absolute leader with 23 out of the 27 European top ranking companies. Ubisoft (France) is the top non-UK European developer company, and ranks 39th globally. The Nordic countries are the third largest "developer area" in Europe with companies like Funcom, DICE, CCP, Remedy, IO, and Starbreeze. Funcom is the leading "big" MMO online developer in this area.

The EU industry is likely to grow strongly[234] over the next few years and will focus more on the online market place as new broadband penetration stimulates growth and as consoles increasingly offer online game play options. For instance, in Germany in 2009, two browser-based game companies (Bigpoint, Gameforge) were among the five fastest growing IT companies of the country.[235] The EU is seen as a "hotbed" for games development overall and may, according to some players, become even more important as the national markets are still unevenly developed, leaving room for more growth. As underlined in the European Competitiveness Report 2010, the EU still does not have a clear comparative advantage in the fast-growing video games sector, but has nonetheless made considerable progress.[236]

The presence of a "creative workforce" (skilled human resources) is a major factor for growth.[237] This lesson has informed policy implementation in Canada and South Korea. The importance of improved matching of skills has also been recognised in a recent European Commission Green Paper[238] on Cultural and Creative Industries (CCIs) which states: *"At the crossroads of creativity and entrepreneurship, it remains difficult for companies in the CCIs, in particular SMEs, to find staff with the right mix of skills. Ensuring a better match between the supply of skills and the demands of the labour market is crucial in the medium and long run to boosting the sector's competitive potential"*.

Games today are among the most advanced, sophisticated resource-demanding types of software applications, and may therefore become a strategic area for EU expertise. From a policy viewpoint, it is all the more important to understand where the EU stands.

8.2.1 Policy intervention by governments to foster competitiveness, inside and outside Europe

Given the strategic potential and relevance of the video games market for the economy and the importance of its software segments, it is somewhat surprising to find that such a vibrant global, digital industry has not received much

233 According to Steffen Toksvig, Unity3d, presentation at the workshop.

234 By a compound annual rate of 6.9 % from Euro 13.5 billion to 18.8 billion. *Source:* Price Waterhouse Coopers, *Global entertainment and media outlook*; 2009-2013.

235 Source: http://www.deloitte.com/view/de_DE/de/branchen/article/5bcc6816ec574210VgnVCM100000ba42f00aRCRD.htm

236 Cf., Chapter 5. *"Innovation and competitiveness of the creative industries"*.

237 A closer look at the distribution, of the creative workforce could provide a better indicator of the shape of the EU industry that the mere location of headquarters. The role of some clusters is also stressed in the Competitiveness Report.

238 European Commission (2010), Green Paper: "Unlocking the potential of cultural and creative industries", COM(2010)183, at 3.2 p.10. Adding: *"Partnerships between art and design schools or universities and businesses can contribute to this aim"*.

attention from policy makers in the EU, with the exception of a few Member States (France,[239] the Nordic Countries and the UK, for instance). This contrasts sharply with the proactive sectoral policies designed by Canada or South Korea. It runs counter to the increased awareness of the positive role of the creative industries (CIs) in fostering growth and innovation. The European Competitiveness Report 2010 stresses that the economic rationale for government intervention in favour of CIs is based on the notion that this sector constitutes a significant locus of economic dynamism in the post-industrial world.[240]

This digital native could turn out to be the living lab of the digital economy, and other (service) industries could benefit, through technology transfer, from the research and development, experiments and large-scale implementation carried out for video game-related products. The modularity of video game software, a feature shared with other digital goods, has a positive influence on firms' innovation strategies and facilitates product innovation (M.Bourreau, P.Dogan, M.Manant, 2007). This interest is likely to be strengthened by this industry's capability to invest in the development and the introduction of disruptive technologies.

Some necessary conditions seem to have already been met to supply a sound basis for the competiveness of the EU video games software industry:

- The EU benefits from a rich milieu of developers and an important population of middleware producers,
- The EU is strong on telecom services especially mobile, with seasoned customers, described as "*super users*"[241] by some experts as they are supposedly "*leading the pack*".[242]

However, these positive conditions may not be sufficient to overcome European weaknesses in publishing and the device segments. Specific enabling policies could play a key role here. For instance, the deployment of the next generation of broadband (wireline and wireless) or adequate business conditions for creative developers (funding, venture capital…) could contribute to support. By the same token, the issue of a "creative workforce" is still around: are the required skills available to companies or do we still need a pro-science, pro-technology and pro-entrepreneurs EU education policy?

Before entering into the specifics of European policies, a short overview of some other policy interventions will provide an introduction. First, we will look at the Canadian and South Korean cases, and then quickly review quickly that of the Nordic countries.[243]

"Quebec, cradle of digital animation"? From The National Film Board of Canada to video games

Quebec claims a 600% growth in the games business since 2003 and shows an impressive track record: the creation of 7,000 jobs, over 90 companies, international leaders for the most part.[244] Quebec is now the fifth development cluster in the world.

239 In France, under *"the auspices of the National Centre of Cinematography (CNC) , a videogame tax credit, modelled on the tax credit for research, was started in 2008 to support production, followed two years later by support funds (FAJV) and a video game monitoring body"*. Sebastien Genvo, Boris Solinski, "The video game: a cultural asset ?". INA Global, last accessed October 12, 2010: http://www.inaglobal.fr/en/video-games/article/video-games-cultural-asset. See the CNC website: http://www.cnc.fr/Site/Template/T3.aspx?SELECTID=3005&ID=2055&t=2

240 European Competitiveness Report 2010: at 218.

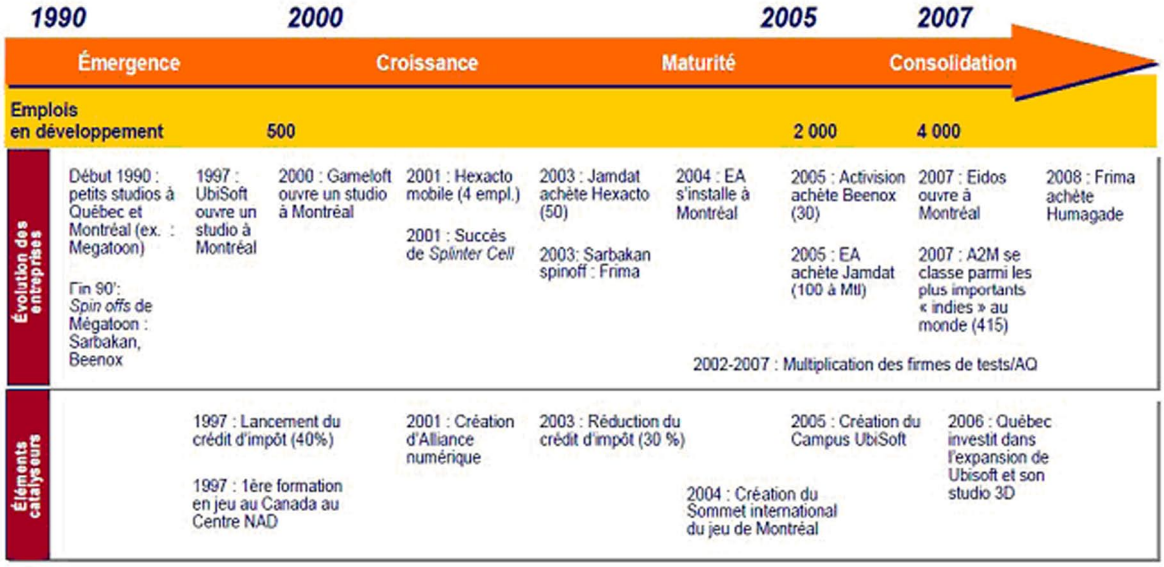
241 Jørgen Tharaldsen, Funcom.

242 Jørgen Tharaldsen, Funcom.

243 This section is based on the presentations given during the validation workshop of 10 June 2010.

244 *"3 new international companies announced the opening of an office in Montreal – within the last seven months!"* Added Marie-Claude Bernard from the Quebec association Alliance Numérique representing Quebec's digital industry network.

Figure 26: Stages in the development of a video games industry in Quebec



Source: Alliance Numerique, presentation given by Marie Claude Bernard at the COMPLETE validation workshop, Brussels, 10 June 2010.

Source: Alliance numérique

This success is the result of both federal and state (provincial) government policy. This combines not only the much talked-about tax breaks (Quebec provincial tax credit of 37.5%, the Canada Media Fund at the federal level which can cover up to 75% of a project's eligible costs or a maximum of US$ 1 million) but also Canada's location (close to the US, not too far from the EU), its education system focused on the industry's needs, the fact that it offers an attractive location for employees, has a highly creative workforce, is a cost effective location (26.8% lower than Europe, 25.5% lower than the USA), and has among the lowest tax rates in North America.

Broadband, Internet cafe and addicted players: the South Korean way

South Korea provides a parallel success story. Here, the domestic games market grew from 3 trillion KRW[245] in 2001 to nearly 9 trillion KRW in 2005 but was hit by a recession in 2006 and 2007 mostly due to a sharp fall in the PC games market and above all a *"chronic and painful depression in 2006 and 2007"* in the arcade games market. However, the number of firms went from 694 (278 developers, 416 distributors) up to 4,573 (1,256/3,317) in 2008, accompanied by an increase in jobs of nearly 30,000 between 2000 (13,500) and 2008 (42,730), reaching a peak of 60,669 in 2005. The market grew again in 2008 with a 30% growth rate.

As for platforms, online games dominate with 75% in 2008, followed by consoles with 14% and mobile with 8.5%. This domination combined with the globalization of online games yielded more than US$ 1 billion sales in foreign markets in 2008. The Chinese market became the most important market with 23.5% of export revenues. Korean online games achieved roughly 50% of market share in China, Japan and Southeast Asia and a total market share of 36.5% in 2007.[246]

The South Korean government intervened in this sector with, for instance, the Game Industry Promotion Act of 2006. Agencies such as the Korea Creative Content Agency (KOCCA)[247] and the Game Industry Total Information Service System (GITISS) were set up to enable development. Other accompanying measures were introduced: creation of a Game Rating Board (GRB)[248] and an official certification system (for game planners, computer graphic designers, and programmers), and alternative system to military service whereby the industry have benefited from skilled workers since 2000.[249] This government involvement took place as online gaming was progressively recognised as a serious industry and the industry was already growing successfully. This feature is rather unusual in the Korean environment (Wi, J.H., 2009) where, historically, industries are *"kick-started by governmental work"*.[250]

The South Korean government has just released its "new vision". South Korea wishes to be among the three world leaders in the games market. The goal is to reach 10% of global market share by 2012 by implementing seven action lines. For us, the main interest of these action lines is their encompassing nature and long-term perspective:

"– Expand global market share,
– *Build the Infrastructure for next-generation game,*
– *Develop creative manpower and new technology,*
– *Create cultural value of game,*
– *Develop the advanced distribution environment,*
– *Lead the world e-sport,*
– *Systemize new policies for convergent environment."*[251]

The government will further intervene:

– *"to support exporting the Korean games,*
– *Promote independent game development studios,*
– *Develop investment funds for game industry,*
– *Foster professionals for game industry,*
– *Support Arcade games,*
– *Vitalize e-Sports and develop educational games"*.[252]

245 One South Korean won = 0.000682 Euros or 0.000841 US$. 3 trillion South Korean won: approximately €2 billion.
246 Wi, JH. at 139.
247 (KOCCA) http://www.kocca.go.kr, (GITISS) http://www.gitiss.org.
248 (GRB) http://www.grb.or.kr.
249 Wi, J H at 134, a system implemented in 1973 to provide skilled workers to key (eligible) industries.
250 Id at 131.
251 *Source:* presentation of Professor Hangjung Zo, Korea Advanced Institute of Science and Technology (KAIST), at the validation workshop. KAIST is well known for its role in the development of the online game industry around 1990. See Wi, JH at 87.
252 Id.

As stressed by J.H. Wi (2009): "*Currently, the Korean game industry maintains about a two year lead in technological innovation over its Chinese, Japanese and American competitors*".[253] He adds: "*This is significant in the development of Korean industry, as* ***this is the first time Korean companies represent the pioneer in a major market***".[254]

It is worth noting that these two cases show policies that are consistent with existing approaches by both Governments.[255] In the Canadian case, government interventions since World War II have helped to create the basis of a national cinema in animation[256] and also set up the well known "école documentaire". In the South Korean case, the emphasis on the ICT sector dates back to the attempt to recover from the 1997 economic crisis. In both cases, the policies are rooted in national policies aiming at long-term rather than short-term solutions.

The lesson that came in from the cold: the Nordic country case

The "Nordic" game industry employs 3,700 people working for some 260 registered companies but plans to increase the numbers of these employees to 7,000 by 2015, and 20,000 by 2020. This region is leading in Europe for online games (their development, use, and purchase).[257] Two countries have developed specific policies for games, Iceland and Norway.

The Norwegian support programmes are funded by the Ministry of Culture (Film Institute / Nordic Game: €1.2 million for "cultural" support plus €0.4 million for local launch support), a specific entity, Nordic Game (€0.8 million yearly, max €80,000 per game) and the Ministry of Commerce (Innovation Norway / Research Council). The latter provides various forms of support such as establisher funds, tax refunds on R&D, and risk loans.

8.3 Are policies needed?

Source: Karl M. Kapp, presentation on Innovation in Technology and what it means to Learning and Training, based on Kapp, 2007.[258]

As often highlighted by the players, the European video game industry flourished without any focused EU policies, other than some broader horizontal policies (e-commerce…). Intervention is also an area where the lack of consensus noted earlier is likely to be found. For instance, even though the harmonisation at EU level of national legislation simplifies the regulatory framework for enterprises inside the Internal Market, some enterprises may still consider that it is not yet sufficiently harmonised, or that the EU

253 Wi, J H.(2009), at 2.
254 Id, our emphasis.
255 To be noted: India is now seen as a leading destination for high end, skill-based activities. As a consequence, the Indian animation industry is estimated to grow at a CAGR of 22% and gaming industry is estimated to grow at a CAGR of 49% by 2012. Source: *The Animation and Gaming Industry in India* – A report by Ernst & Young, August 2009 updated March 2010.
256 With luminaries such as Norman Mc Laren.
257 Only a handful makes traditional console games. This is based on Jorgen Tharasen presentation.
258 Source: this is a picture already commonly reproduced in posters and gadgets in 2005.

Box 36: The MEDIA Programmes

The European Commission has provided aid to the games and audiovisual industries through its development support from the various MEDIA Programmes. Initially, such support was included as development support for multimedia projects. However, due to poor take-up of these provisions, it was decided to specifically target companies working on the development of interactive works. The revised provisions, launched in 2008, were targeted at "Interactive works for computer, internet, mobile handsets and games consoles (including handheld), presenting interactivity, scenario and innovation. New format concepts destined for digital television, internet or mobile handsets where interactivity and narrative elements are significant" (*Guidelines Call for Proposals* 17/2007 & 25/2008).

The available budgets for each year were €1.5 million and €2.5 million respectively. The funding provisions were between €10,000 -60,000 for the development of 'standard projects' and up to €100,000 for the development of prototypes for video and computer games. The requirements for companies applying for development support were greatly relaxed compared to those placed on applicants for support for the development of audiovisual works.

For the most recent Call for Proposals (21/2009), with a reduced budget of €2 million, it was decided that the support should be focused on "the concept development (up to a first playable application) of digital interactive content complementing an audiovisual project (drama, creative documentary or animation) specifically developed for at least one of the following platforms: Internet, PC, console, handheld device and interactive television. This digital content must present: substantial interactivity with a narrative component, originality, creativity and innovation against existing works and European commercial potential". This change was made to ensure that the MEDIA 2007 Programme's support for Interactive Works reflected the overall aims of the programme itself.

Furthermore, the results from the Calls for Proposals 17/07 and 25/08 showed that having too wide a variety of projects supported diminished the real impact of limited MEDIA funding to both the audiovisual and interactive sectors. As the amount of available funds is not sufficient to address such a variety, it was decided to better focus the scheme and allocate the available budget to best effect. This was to encourage the creation of Interactive Works complementing an existing audiovisual project or one in development; the establishment of a bridge that will be clear to the audiovisual sector and more closely relate to the goals at the core of the MEDIA Programme itself, namely support for independent producers in the audiovisual sector and lead to better cooperation between operators in sectors where the environments appear to still be compartmentalised. The grant levels were increased to a maximum of €150,000 per project.

	2007	2008	2009	2010
Applications	17	174	141	87
Allocated	€250,000	€2,025,140	€2,499,549	n/a

The MEDIA 2007 Programme also provides assistance to the industry through its support for a number of training programmes specifically targeted at multi-platform and cross-media projects.

Source: DG Education, Audiovisual & Culture, Executive Agency, http://eacea.ec.europa.eu

harmonised rules are less favourable to them than those existing in other jurisdictions. This notably concerns copyright, personal data protection, anti-defamation law, consumer protection, the protection of minors and the e-money directive. In this fragmented environment, it remains difficult to get a precise notion of what is really needed, or what is really a hindrance. What constitutes a hindrance for some may turn out to be a welcome enabler for others, as the debate over the "cultural" aspect illustrates. At best, there is some ambiguity or potential misunderstanding.

In spite of this lack of agreement on topics, other concerns are shared within the industry. The lack of an integrated digital market is one; the "misperception"[259] of the industry is another. This industry considers itself to be almost grown-up after twenty years. It went through the continuous development of new forms of entertainment, and of an increasing number of devices upon which interactive software may be enjoyed. Increasingly, games are played online and the majority of new games are being developed for online play at all levels of dexterity. Online and wireless/mobile games are expected to be the fastest growing segments of the EU video game market over the next few years and are respectively the second and third biggest parts of the industry. Casual games, as shown in this report, constitute an important and rapidly growing subset of online games and are now greatly expanding the numbers of gamers across various demographic variables.

It is not surprising then that this industry wonders why *"games are not 'accepted' (understood) in 'old' society"*.[260] Some players, are under the impression that they are not taken properly into account: *"game developers should feel 'addressed'"*[261] which raises the question of adequate support mechanisms[262] in a global market where *"European game developers compete every day in the market place against other parts of the world with massive support programs"*.[263] Most of the firms are rather undercapitalized.

Some limited funding was made available, for instance, in the MEDIA 2007 Programme (see Box 37). Although the reviewed programme of 2010 was in line with the specific objectives of the programme, the conditions were found to be too restrictive for the games industry by some players. The link with the film/ audiovisual industry was questioned by players from various angles, either as too restrictive or as non-relevant for a software industry. In any case it indicates a potential void to fill (see Box 38 for some industry views).

Some players still believe that there is the room and the means for Europe to grow large global companies rapidly in the video games arena. However this may require some intervention or at least more focused attention. Most of the segments are faced with difficult access to funding and, as could be expected, little willingness from potential finance providers to take risks.

The new digital agenda may open up some new avenues. The European Investment Bank (EIB) is considering *"a new thinking in the context of EU2020 as the ICT sector is a key sector of EIB's policy objectives in its implementation of the EU2020 strategy through the Knowledge Economy (KE) eligibility rule. The bank has already decided to:*

- *set up an EU2020 Task Force,*
- *to make support to innovation more effective,*
- *to deepen and broaden financial instruments (e.g. risk sharing),*
- *to grant intermediated and direct loans for projects (over €15 million),*
- *to allow risk sharing finance facility for RDI projects within low/sub-investment grade corporations,*
- *Indirect lending through global loans,*
- *facilitate access to venture capital."*[264]

259 This segment of the media and content industries is often perceived as the "unacceptable face of the entertainment".

260 Jørgen Tharaldsen, Funcom.

261 Malte Behrman, EGDF.

262 With the above mentioned exceptions as well as the case of France often quoted for more favourable policies. *"In March 2010, the UK chancellor decided to offer tax breaks to the UK gaming industry. This was welcomed by Tiga, the trade association that represents UK games developers. Tiga said tax relief would create 3,500 more jobs over the next five years"*. BBC News March 24, 2010.

263 Id. Or similarly: *"We are fighting against other governments - Canada, South-Korea, China, USA"*, Jørgen Tharaldsen, Funcom.

264 Harald Gruber, EIB.

This revised agenda from the EIB hints at some features that could be taken into account to determine whether policies should be devised for this industry. For instance, among the potential policy options, the following options could be considered:

- Promotion of the EU Standardization of middleware (APIs) to facilitate the portability of game software over multiple platforms, so as to increase the market opportunities for SMEs and a more competitive game market,
- Public support to private venture capital to finance game development,
- Creation of a European network of EU Game Software enterprises to advise Universities and training centres in order to adapt e-Skills curricula of Universities and permanent training of employees to the needs of EU Game Software enterprises,[265]
- Improvement of the collection of sectoral statistics on Gaming Software in the framework of e-Business Watch.[266]

8.4 Conclusions

In line with our analysis so far and with most of the actors' positions, the authors deem this industry to be clearly a growth industry. It therefore has the potential to create value added and jobs.

This sector has important spill-over effects on other industries and also offers essential core lessons to eGovernment, eHealth, eCulture and eEducation which, though they are seen as more serious than games, they have failed up until now to meet their targeted audiences with well adapted offers of e-services. In other words, games and related technologies could become a large industry and thereby boost many other sectors.

However, in sharp contrast with these more 'legitimate' sectors, the video games sector does suffer from its perceived lack of seriousness. It may just be an awareness issue that will fade away as time elapses. The perception may nevertheless remain ambivalent; on the negative side it may end up being perceived as an addiction which seems to be raising some concerns in South Korea.[267]

Indeed, the video games market is growing, not only in value but also in audiences. The demand has changed under pressure from a variety of factors such as technological ease, the emergence of social computing and communities and the supply of simple and short games, capturing an until-now unsatisfied demand across age categories, socio-economic classes, or gender.[268] In other words, as this industry goes

265 European e-Skills Week 2010: http://ec.europa.eu/enterprise/sectors/ict/e-skills/support/
http://ec.europa.eu/enterprise/sectors/ict/e-skills/extended/index_en.htm
McCORMACK, Ade: "The e-Skills Manifesto - A Call to Arms" http://eskills-week.ec.europa.eu/web/guest/news/-/journal_content/56_INSTANCE_m7wX/10404/30663/NEWS_MAIN_DISPLAYhttp://files.eun.org/eskillsweek/manifesto/e-skills_manifesto.pdf
INSEAD "eLab" report: http://www.insead.edu/elab about best practice to improbé e-Skills currícula: "Strengthening e-Skills for Innovation in Europe": http://eskills-week.ec.europa.eu/web/guest/news/-/journal_content/56_INSTANCE_m7wX/10404/27842/NEWS_MAIN_DISPLAY
Contact point in EU Member States: http://ec.europa.eu/enterprise/sectors/ict/files/e-skillsweek_highlevelcontact_points_15122009_en.pdf

266 http://ec.europa.eu/enterprise/sectors/ict/ebsn/ebusiness-watch/ebusiness-watch_index_en.htm

267 *"Some lawmakers say South Korea must fight Internet addiction by targeting the gaming industry, limiting the hours at which their games are available. Others see the industry as a still-growing moneymaker -- even a hallmark of Korean culture -- and they want it left alone. For at least five years, the government has tried to combat Internet addiction through education for parents, counselling, discussions about alternative activities"*. Chico Harlan, *"Obsessed Internet gamers in South Korea now have a league of their own"*, washingtonpost.com Tuesday, 17 August 2010.

268 As the ISFE puts it in its most recent survey of video gamers: *"The success in recent years of the new consoles and new games like Wii Fit, Guitar Hero and Dr Kawashima's brain Training to attract new people gaming demonstrate the possibilities of expanding further participation in games." Video gamers in Europe*, 2010.

more and more mainstream, the more likely it is that it will be treated as a more serious "new kid on the block" and not as the "*unacceptable face of entertainment*". Born digital, the industry shows growth that is taking advantage of many opportunities to offer user-friendly, intuitive services on very large scale. Evolving from mere entertainment into virtual worlds, the online game segment is providing a marketplace for online economic activities (Wi, J H., 2009).[269]

To sum up, if all the elements were handled more positively, the recognition of the game industry could become a pertinent policy issue, in other words an important industrial policy issue. Let us stress, as a final note, that this is not the case now and this may result in some missed opportunities for Europe to become a leading environment in the field by building on some of its strengths. Then an appropriate framework for growth may be welcome.

Box 37: Two views on potential support mechanisms

During the validation workshop, the participants from EGDF and Funcom suggested some support mechanisms. There was agreement that specific funds should be really tailored to the need of this industry. The funds could complement but not distort the market[270] and enable the companies to better deal with the risks[271] associated with the production of innovative digital goods.

1. European Games Developer Federation
- Reliance first on market forces with some level of subsidy (but not up to 100%).
- Plus necessary support for: infrastructure, prototypes, production, and digital shift.

2. Funcom
2.1. General
- Strong knowledge of people in Government bodies (what is innovation, good? etc.),
- Dedicated funds to games over a number of years (R&D, dev, launch, live etc.),
- Money for initial set up, and also for establishing new "branches"),
- Prioritized money in prototype phases (tax refund, research councils, low self-fund),
- Country and system alliances (calls, networks),
- Study and contact trips for countries to other countries (to learn, network),
- Leader and development courses – Mentor programmes, business sense,
- Application systems and calls with wording adapted to games that are not physical goods,
- Arena projects supported by local regions and governments,
- Map national and European competence, improve the use of public projects (museums, schools, state TV etc.),
- Support schools, and company / school programmes,
-And the pipe-dreams: unified payment systems, super-fast bandwidth, flat data rates.

2.2 Large international projects
- Large export "credits" (i.e. towards publisher estimates),
- Larger government project risk loans (i.e. against "vertical slices"),
- Large tax refunds in the early phases, dedicated large amounts of money from research council,
- Post launch support: for new continents, cultures,
- Support for new divisions in already successful companies.

269 This in line with the analysis of Yochai Benkler on open-source economics, *The Wealth of Networks: How Social Production Transforms Markets and Freedom*, Yale University Press 2006.
270 Cinema was quoted as a "negative" example.
271 See Box 13 -Video game publishing: A risky business.

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Annexes

ANNEX 1 - International definitions of software and computer games (OECD, 2004)

Activity	ISIC Rev. 3.1	ISIC Rev. 4 (proposed)	NAICS 2002
Software publishing	Computer and related activities 722 Software publishing, consultancy and supply 7221 Software publishing	532 Software publishing	5112 Software Publishers 51121 Software Publishers
Computer services potentially leading to software	Computer and related activities 722 Software publishing, consultancy and supply 7229 Other software consultancy and supply Potential overlap with software publishing 7221	571 Information technology service activities 5711 Computer programming activities 5712 Hardware and software consultancy activities	5415 Computer Systems Design and Related Services 54151 Computer Systems Design and Related Services 541511 Custom Computer Programming Services 541512 Computer Systems Design Services 541513 Computer Facilities Management Services 541519 Other Computer Related Services
Video games including animated pictures	Not separately identified	Not separately identified	Not identified separately but part of software: 51121 Software Publishers 511210 Games, computer software, publishing
Retailing (examples only)		4454 Retail sales of music and video recordings 4461 Retail sales of books, newspapers, and stationary 4462 Retail sale of games and toys (including video game consoles)	443120 Computer and Software Stores 45122 Pre-recorded Tape, Compact Disc, and Record Stores

ANNEX 2 - Video Game Genres Taxonomy (Crawford, 1982)

The classification proposed here is based on the original one proposed by Chris Crawford in 1982 (Crawford, 1982) in his well known "A taxonomy of computer games", and refined by the work of the ieXBeta[272] wiki site in order to keep it up to date.

Skill and Action Games
- Combat Games
Fighting Games
Shoot 'em Ups

- Maze Games
Platform Games
First-Person Shooters or FPS
- Sports Games

- Paddle Games (outdated)
- Race Games

- Miscellaneous Games
Music Games
Party Games

Strategy Games
- Adventures
Third Person Adventure
Stealth Games
Survival Horror

- D&D Games
Massively Multiplayer Online Games: MMOG or MMORPG
Role Playing Games or RPG

- War games
Real Time Strategy or RTS

- Games of Chance
Puzzle Games

- Educational and Children's Games

- Simulation Games

272 ieXBeta is a wiki focusing on operating systems and software, accessible at http://iexbeta.com/wiki/index.php/Main_Page (last accessed 7 September 2009).

ANNEX 3 - Develop 100 List (Source: www.develop100.com – 05.05.2010)

1	Blizzard Entertainment	USA
2	Nintendo	JP
3	Rockstar North	UK
4	EA	Canada
5	Capcom	JP
6	Ubisoft Montreal	Canada
7	Treyarch	USA
8	Infinity Ward	USA
9	Epic Games	USA
10	Bethesda Softworks	USA
11	Konami	JP
12	Traveller's Tales	UK
13	Sega Studios	JP
14	LucasArts	USA
15	Neversoft	USA
16	Sora	JP
17	Kojima Productions	JP
18	Media Molecule	UK
19	Nexon	South Korea
20	EA Black Box	Canada
21	Valve	USA
22	Lionhead	UK
23	Level 5	JP
24	EA Tiburon	USA
25	Yuke's	JP
26	Harmonix	USA
27	A2M	Canada
28	EA Redwood Shores	USA
29	Jagex	UK
30	Gamefreak	JP
31	Maxis	USA
32	Cat Daddy	USA
33	EA The Sims Studio	USA
34	Insomniac	USA
35	PopCap	USA
36	SCE London Studio	USA
37	Criterion	UK
38	Sports Interactive	UK
39	Ubisoft Paris	France
40	Rockstar San Diego	USA
41	Krome Studio	Australia
42	Gameloft	France
43	Crystal Dynamics	USA
44	Square Enix	JP
45	Bandai Namco	JP
46	Black Rock Studio	UK
47	Relentless	UK
48	EA Pandemic	USA
49	Eurocom	UK
50	EA LA	USA
51	Rebellion	UK
52	Luxoflux	USA
53	Bungie	USA
54	Atlus	JP
55	EA Mythic	USA
56	HB Studios	Canada
57	Monkey Bar Games	USA
58	Codemasters	UK
59	The Creative Assembly	UK
60	Big Fish	USA
61	Crytek	Germany
62	NCsoft	South Korea
63	Firaxis	USA
64	EA Dice	Sweden
65	Koei	JP
66	Relic	Canada
67	Rare	UK
68	Digital Chocolate	USA
69	Club Penguin	USA
70	CCP	Iceland
71	Zoe Mode	UK
72	Evolution	UK
73	Volition	USA
74	Bizarre Creations	UK
75	The Cooking Mama Company	JP
76	Heavy Iron	USA
77	EA Bioware	Canada
78	Gearbox	USA
79	Sumo Digital	UK
80	EA Bright Light	UK
81	Polyphony Digital	JP
82	SCE Japan Studio	JP
83	Funcom	Norway
84	Team 17	UK
85	Silicon Knights	Canada
86	EA Montreal	Canada
87	Rockstar Leeds	JP
88	Grasshopper Manufacture	JP
89	Inis	JP
90	Amusement Vision	JP
91	Ubisoft Shanghai	China
92	Beenox	Canada
93	Blue Tongue	Australia
94	Matrix	Japan
95	Blitz Games	UK
96	Dimps	Japan
97	Intelligent Systems	JP
98	Playfish	UK
99	Frontier	UK
100	Q Games	JP

ANNEX 4 - List of middleware modules and producer (GameMiddleWare.Org)

Available online at: http://www.gamemiddleware.org/middleware (last accessed: 17 December 2009)

+7 Systems us
3Dconnexion us
AdCell Media us
Ageia us
Agency9 se
AhnLab kr
AiLive us
AiSeek il
Allegorithmic - ProFx fr
Allegorithmic fr
AM3D dk
Andago es
Annosoft us
Araxis uk
ARM - RealView us
Artificial de
ATI Developer Tools ca
AtOnce Technologies fr
Audiokinetic Wwise ca
Autodesk - Maya us
Autodesk Kynapse fr
A-Volute fr
BabelFlux us
Bigfoot Networks us
BigWorld au
Binary Worlds es
Bionatics fr
Bionatics fr
Blade - HydroEngine uk
Blade Interactive uk
Bohemia Interactive Studio cz
Boston Dynamics us
Caligari us
Cascada Mobile ca
Chaos Software us
Chatblade us
Chattering Pixels uk
Codeplay uk
Conitec Datasystems de
CRI Middleware - CRI Audio jp
CRI Middleware - CRI Movie jp
CRI Middleware - CRI Vibe jp
Crytek de
Cybernet Systems us
DARWARS us
Daz3d us
Daz3d us
Digimask uk
DTECTA nl
Dunia ca
Dynatmos fr
E&S us
ECD Systems us
eDimensional us
Egerter Software ca
Emergent Game Technologies us
EMotion FX nl
E-on Software us
Epic Games us
Ex hina nl
Exit Games de
eyeon Software ca
Eye-Sys us
Filter Forge us
Firelight FMOD au
Fonix us
Fork Particle us
FreeDesign us
Freescale - CodeWarrior us
Fresh3D fr
Gaijin Entertainment ru
GameShadow uk
GameSpy us
GarageGames us
Garritan us
Gekido Design Group ca
Genemation uk
Geomerics uk
Ghost 3D us
GPU-Tech fr
Graphic Remedy il
Gugila si

Hansoft se
Havok - Animation ie
Havok - Behavior ie
Havok - Physics and FX ie
Helios Software de
HeroCraft HiTech ru
IBM - Rational, XLCC, Informix us
Ideaworks3D uk
IDV us
Illuminate Labs se
Indiepath uk
In-Fusio fr
Innaworks nz
Instinct Technology ie
Intel us
InterAmus Music Systems se
J2X Technologies ca
Javaground us
Lanner uk
Lightsprint - Vision cz
Loud Ant Software us
Lumonix - ShaderFX ca
Luxology us
Lyra Network us
MÄK us
Mental Mill us
MetaVR us
MetroModeler us
Microsoft - XNA us
Mobile Distillery fr
MOG us
Monumental Games uk
Moven nl
Mudbox nz
Multigen-Paradigm us
NaturalMotion uk
NeoAxis Group ru
Nevercenter us
NiceTech uk
Nocturnal Entertainment au
Nuance us
Nvidia - Developer tools us
Nvidia - NVPerfKit us
OC3 Entertainment us
Offset Software us
Omegame fr
OpenAL us
OTEE dk
PathEngine fr
Perpetual Entertainment us
Philips - amBX nl
Phonetic Arts uk
Phyar Lab cn
Pixbend SDK - Nexilogic.com fr
Pixelgene fi
Pixelux ch
Plenoptics uk
Presagis AI.implant ca
Princeton Digital us
Procedural Arts us
Quad Software ro
Qualcomm au
Quantum3D us
Quazal Technologies ca
Qube Software uk
RAD Game Tools - Bink us
RAD Game Tools - Granny us
RAD Game Tools - Miles us
RAD Game Tools - Pixomatic us
Radon Labs de
RakNet us
RapidMind ca
Realviz - Movimento fr
Rendering and Compositing
Replay Solutions us
Replica Software uk
Reyes Infográfica - VF Costumer es
Richmotion us
Scaleform GFx us
Scenomics us
Screaming Bee us
SecurePlay us
Shark 3D de
Simutronics us
SlickEdit us
SN Systems uk
Softimage - Alienbrain ca
Sony Ericsson se
Spirit DSP us
SpirOps fr
StarForce Technologies ru
Steinberg Media Technologies de
StoneTrip fr
Storytron us

Stottler Henke us
Stream Theory us
Sundog Software us
Sundog Software us
Terathon Software us
Terraplay Systems se
The Game Creators - DarkVOICES uk
The Game Creators uk
The Multiverse Network us
Tincat de
Tira Wireless ca
Touchdown Entertainment us
TransGaming Technologies ca
Trinigy de
TruSoft - Artificial Contender us
Umbra Software fi
Un4seen Developments ru
Unigine dm
Valve Software us
Venus Blue MMO player simulator us
Vicious Cycle Software us
Virtools fr
Visual3D.NET us
Visual3D.NET us
Vivox us
VRcontext be
VWorld fr
Wintsch Labs us
Wizaid fi
Worldweaver uk
X-aitment de
Xfire us
Xoreax Software il
Xtreme Strategy us
ZeroC us
ZUXXEZ Entertainment – ParticleGe DE

ANNEX 5 - List of Participants at the COMPLETE Video Games Workshops

Workshops:

- Workshop on "Software games technological and market potential: how can EU compete now and in the future?" - Seville, 16 October 2009
- Validation workshop "Born Digital, Grown Digital. Assessing the future competitiveness of the EU videogames software industry" - Brussels, 10 June 2010

Participants list:

Malte Behrmann, Secretary General, European Game Developers Federation (EGDF), Sweden
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Hangjung Zo, KAIST, Korea

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Author(s): G. De Prato, C. Feijóo, D. Nepelski, M. Bogdanowicz, J.P. Simon

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Abstract

This report reflects the findings of the JRC-IPTS study on the video games Industry, with a focus on two specific activities: online and mobile video games. The report starts by introducing the technologies, their characteristics, market diffusion and barriers to take up, and their potential economic impact, before moving to an analysis of their contribution to the competitiveness of the European ICT industry.

The research is based on internal and external expertise, literature reviews and desk research, several workshops and syntheses of the current state of the knowledge. The results were reviewed by experts and in dedicated workshops. The report concludes that the general expectations for the next years foresee a speeded up migration of contents and services to digital, in a scenario of rapidly increasing convergence of digital technologies and integration of media services taking advantage of improved and permanent network connections. The role of the so-called creative content industry is expected to increase accordingly. Communication services and media industry will co-evolve on the playground of the Internet of services, along with a product to service transformation of the software market in general. In this general context the video games software industry plays and is expected to play a major role. The games industry may become a major driver of the development of networks as it has been in the past for the development of computer hardware.

The mission of the Joint Research Centre is to provide customer-driven scientific and technical support for the conception, development, implementation and monitoring of European Union policies. As a service of the European Commission, the Joint Research Centre functions as a reference centre of science and technology for the Union. Close to the policy-making process, it serves the common interest of the Member States, while being independent of special interests, whether private or national.

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