

Unclassified

DSTI/ICCP/IE(2004)13/FINAL



Organisation de Coopération et de Développement Economiques
Organisation for Economic Co-operation and Development

12-May-2005

English - Or. English

**DIRECTORATE FOR SCIENCE, TECHNOLOGY AND INDUSTRY
COMMITTEE FOR INFORMATION, COMPUTER AND COMMUNICATIONS POLICY**

Working Party on the Information Economy

DIGITAL BROADBAND CONTENT: The online computer and video game industry

**DSTI/ICCP/IE(2004)13/FINAL
Unclassified**

English - Or. English

JT00184075

Document complet disponible sur OLIS dans son format d'origine
Complete document available on OLIS in its original format

FOREWORD

This report was presented to the Working Party on the Information Economy in December 2004 and was declassified by the Committee for Information, Computer and Communications Policy in March 2005.

The report was prepared by Yischai Beinisch and Caroline Paunov in conjunction with Graham Vickery and Sacha Wunsch-Vincent of the OECD's Directorate for Science, Technology and Industry. It is published on the responsibility of the Secretary-General of the OECD.

Copyright OECD, 2005

Applications for permission to reproduce or translate all or part of this material should be made to:

Head of Publications Service, OECD, 2 rue André-Pascal, 75775 Paris Cedex 16, France

PREFACE

Digital content and digital delivery of content and information are becoming increasingly ubiquitous, driven by the expanding technological capabilities and performance of delivery platforms, the rapid uptake of broadband technologies and improved performance of hardware and software. Network convergence and widespread diffusion of high-speed broadband has shifted attention towards broadband content and applications that promise new business opportunities, growth and employment.

At its March 2003 meeting, the Information, Computer and Communications Policy Committee (ICCP) discussed interlinked broadband and digital content developments and policy issues. The Committee adopted two tracks for this work, agreeing to work: *i*) towards a Committee statement on promoting broadband development; and *ii*) to develop a work proposal on digital content. At its October 2003 meeting, it was agreed that the ICCP Committee should undertake more comprehensive analysis on digital broadband content, focusing on growth and value creation, drivers and barriers to growth, and changing market structures and emerging issues with development of new delivery platforms.

In February 2004, following preparation in the ICCP Committee, the OECD adopted the Recommendation of the Council on Broadband Development (see Box 1), setting out ten recommendations for OECD member countries when establishing or reviewing their broadband policies. These policy recommendations recognise the increased policy attention towards broadband content and applications. The ICCP Committee has been asked to monitor the development of broadband in the context of this Recommendation within three years of its adoption and regularly thereafter.

At its April 2004 meeting the ICCP Committee agreed to the work plan on digital broadband content, with this work being undertaken in the Working Party on the Information Economy (WPIE) in conjunction with the Working Party on Telecommunication and Information Services Policies (WPTISP). The WPIE is undertaking stocktaking studies of sectors where digital content is transforming value chains and business models. Initial sectors studied are: scientific publishing, music, online computer and video games and mobile content services. The studies are designed to further identify analytical, policy and measurement issues, and prepare the ground for more in-depth analysis of horizontal issues and challenges to broadband content development and applications. The WPIE held a Digital Broadband Content Panel in June 2004 and a Digital Broadband Content Workshop in December 2004.¹

Further policy analysis is being undertaken in the area of digital content. For more information see: www.oecd.org/sti/digitalcontent.

Box 1. OECD Recommendation of the Council on Broadband Development, 2004

The OECD Council recommends that, in establishing or reviewing their policies to assist the development of broadband markets, promote efficient and innovative supply arrangements and encourage effective use of broadband services, Member countries should implement:

- Effective competition and continued liberalisation in infrastructure, network services and applications in the face of convergence across different technological platforms that supply broadband services and maintain transparent, non-discriminatory market policies.
- Policies that encourage investment in new technological infrastructure, content and applications in order to ensure wide take-up.
- Technologically neutral policy and regulation among competing and developing technologies to encourage interoperability, innovation and expand choice, taking into consideration that convergence of platforms and services requires the reassessment and consistency of regulatory frameworks.
- Recognition of the primary role of the private sector in the expansion of coverage and the use of broadband, with complementary government initiatives that take care not to distort the market.
- A culture of security to enhance trust in the use of ICT by business and consumers, effective enforcement of privacy and consumer protection, and more generally, strengthened cross-border co-operation between all stakeholders to reach these goals.
- Both supply-based approaches to encourage infrastructure, content, and service provision and demand-based approaches, such as demand aggregation in sparsely populated areas, as a virtuous cycle to promote take-up and effective use of broadband services.
- Policies that promote access on fair terms and at competitive prices to all communities, irrespective of location, in order to realise the full benefits of broadband services.
- Assessment of the market-driven availability and diffusion of broadband services in order to determine whether government initiatives are appropriate and how they should be structured.
- Regulatory frameworks that balance the interests of suppliers and users, in areas such as the protection of intellectual property rights, and digital rights management without disadvantaging innovative e-business models.
- Encouragement of research and development in the field of ICT for the development of broadband and enhancement of its economic, social and cultural effectiveness.

The Council also instructs the Committee for Information, Computer and Communications Policy to monitor the development of broadband in the context of this Recommendation within three years of its adoption and regularly thereafter.

Source: OECD (2004), *Recommendation of the Council on Broadband Development*, C(2003)259/FINAL, www.oecd.org/dataoecd/31/38/29892925.pdf.

TABLE OF CONTENTS

FOREWORD	2
PREFACE.....	3
SUMMARY	7
INTRODUCTION	8
Computer and video games: The online future	9
What are online games?	9
Hardware	11
THE COMPUTER GAME INDUSTRY IN OECD COUNTRIES.....	13
INDUSTRY STRUCTURE AND VALUE CHAINS	17
The established value chain.....	17
Changes in the value chain.....	22
BUSINESS MODELS AND COST STRUCTURES	25
Rising costs and the influence of consoles	25
New revenue models	27
Changing distribution models	29
DRIVERS OF THE COMPUTER GAME INDUSTRY	32
Technology	32
Demographic factors	36
Venture capital	40
Spillovers from computer games.....	40
BARRIERS TO DEVELOPMENT OF THE COMPUTER GAME INDUSTRY.....	43
Broadband coverage and latency.....	43
Game market factors	43
Industry development: Skills and business organisation.....	44
Financing issues	45
POLICY FRAMEWORK	46
Industry development.....	46
Skills and training.....	48
Intellectual property rights	49
Online business conditions.....	51
Social issues	52
ANNEX 1. ABBREVIATIONS	55
ANNEX 2. STATISTICAL DEFINITION OF THE COMPUTER GAME INDUSTRY	56
ANNEX 3. SELECTED COMPUTER AND VIDEO GAME M&AS: 2000-2003.....	57
BIBLIOGRAPHY	58
NOTES	67

Boxes

Box 1. What is an MMORPG. The example of Anarchy Online.....	10
Box 2. Sony - living room vision and vertical integration	18
Box 3. Korean online games: The example of NCSoft and Lineage	22
Box 4. Combined developer-publisher roles in MMORPGs.....	24
Box 5. Game player characteristics: Information for other countries	38
Box 6. Korea: social characteristics and online games	40
Box 7. The role of industry associations: The Interactive Software Federation of Europe (ISFE).....	54

SUMMARY

Computer and video games is a young industry with rapid growth underpinned by technological development. The global market in 2003 was estimated to be over USD 21 billion compared with USD 32 billion for the recorded music industry; US games revenue in 2001 surpassed film box office ticket sales. The main segments in 2003 were the console off-line (73%) and PC-offline markets (17%). Online and wireless games are still relatively small (6.4 and 3.4% respectively). However, there is a trend towards online games in PCs and consoles. New games are released with some online capabilities, and it is expected that nearly all will become at least in part online. Computer games are R&D and innovation-intensive and games programming and design are highly skilled occupations. Market expansion is coming through development of online network technology, diversifying content and developing large-scale online games. The industry is also increasingly seen as strategic by major media, Internet and consumer electronics firms.

The advent of online capabilities and broadband are changing industry structure and value chains. The established value chain from developer to publisher to distribution is changing with digital distribution. The distributor and in some cases the retail role are being taken by the publisher either directly or via ISPs and game Web sites. This can be described as “dis-intermediation” by digital delivery, development of online games, or by the bargaining positions of major retailers in conventional distribution. At the same time ISPs acting as content aggregators, and game Web sites and portals acting as retailers, are new online distributors (“re-intermediation”). Developers and publishers are favourably placed in the new value chain, the new intermediaries (portals and possibly ISPs) may also move back into game publishing and development. For online games, specialised software (middleware) firms have to some extent been providing the support for developer/publishers, but the online game value chain is still evolving.

The traditional revenue business model in the computer games industry is to sell hard-boxed games. With diffusion of broadband Internet access there are now competing models for online games that firms can use alone or in combination. New online-enabled revenue models include retail purchase, subscription fees, pay-per-play, advertising, and new services. The most successful emerging model is the “pay monthly” subscription model, but it is expected that most computer game companies will have to rely on a mix including advertising and support services to increase revenue. However, significant changes in revenue models could occur if and when micro-payment options are more widely available for mass-market customers. Selling traditional boxed games direct to consumers by online download allows developers to build a close relationship with customers, but it requires investments in brand creation and marketing.

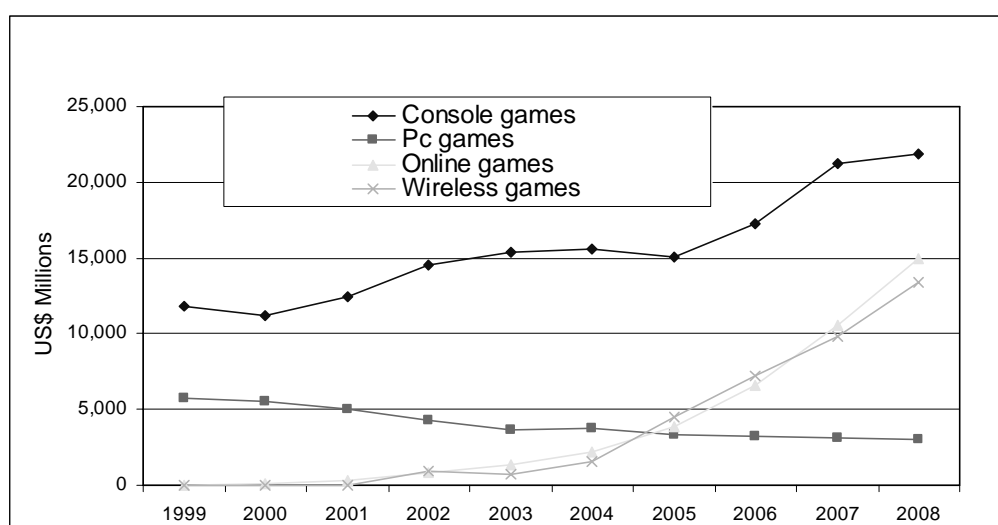
On the supply side, the spread of broadband provides increasing opportunities for new distribution mechanisms and potential for new business models. Games and their support networks are increasingly R&D-intensive (faster networks, multi-platform games, virtual reality animation, etc.). On the demand side, consumer demographics, income and preferences will structure the growth and shape of the industry. Barriers to development include the availability of network infrastructure, skills and management challenges and financing issues, and the legal and payments infrastructure to enable games software to be exploited by producers and used by consumers. The policy framework affecting the industry includes R&D and technology, market and skills development; IPRs and piracy issues; online business conditions including broadband quality and coverage, micro-payments, standards and taxation issues; and social dimensions including culture, age ratings and content issues games developments in education.

INTRODUCTION

Computer and video games are a rapidly growing entertainment industry characterised by intense competition and global scope. They are an additional platform for content distribution by the entertainment industry complementing music, films, TV and books. The global market was estimated to be over USD 21 billion in 2003 compared with USD 32 billion for the recorded music industry and US revenues in 2001 surpassed film box office ticket sales (, 2002). One recent study has suggested that turnover of the computer and video game industry will be *The Economist* higher than the recorded music industry within five years (DFC, 2004) and projections suggest that the global market will be around EUR 35.8 billion by 2007 (Kane, 2004).

It is a young industry reaching back only 30 years. The development of CD-ROMs and better graphics in the mid-1990s drove rapid growth, now being underpinned by the spread of broadband and the growth of online games. Online games, which allow consumer interaction, and mobile/wireless games are the most dynamic sectors of the computer game industry (see Figure 1), and the information technology industry in general (IDSA, 2001). In 2003 world PC-based online games had revenues of USD 450 million excluding advertisement and sponsorship, projected to triple to USD 1.5 billion by 2007 (IDC, 2003) and other estimates are higher (Figure 1), and online games contribute significantly to software industry growth. To give one example, Everquest, a large online game company, has 450 000 registered players and revenues of EUR 8-9 million per month. The main revenue sources for online computer games are paid subscriptions, pay per download, advertising and sponsorship. Market expansion is seen as coming through development of online network technology, diversifying content and developing large-scale, high-cost games. The sector is also increasingly seen as strategic by major media, Internet and consumer electronics firms. Computer games are R&D-intensive requiring advanced technology, creativity and innovation, and the industry employs highly educated staff in programming and design.

Figure 1. The world computer games market



Source: OECD based on PwC (2004).

Computer and video games: The online future

There is no single definition of the computer and video games industry, which is often referred to as the video game, interactive entertainment, leisure software, or interactive software industry. Statistical identification of the industry in current classifications is an even harder task (see Annex 2). In this analysis, the industry is divided along two dimensions: connectivity (online or off-line) and hardware (console, PC or wireless) (see Table 1). The largest market is the console off-line market (73% of the total in 2003) followed by the PC-offline market (17%) (see Figure 1). Online and wireless games (of all types) are still relatively small (6.4 and 3.4% respectively). However, there is a trend towards online games in PCs and consoles, as most if not all, new PC and console games are released with some online network capabilities. This is expected to lead to a decline in off-line PC computer game sales, and moderate growth rates in the off-line console market possibly to the point where all computer games will become at least in part online games. Projected market proportions by 2008 are: console games 41%, PC games (not online) 6%, wireless games 25%, and online games of advanced kinds 28% (PwC, 2004).

Table 1. Trends in the computer game industry

		Connectivity	
		Off-line	Online
Hardware	PC	Mature	Strong growth
	Console	Moderate growth	Strong growth
	Wireless	Strong growth	Strong growth

What are online games?

An online game is defined as any computer-based game played over the Internet including PC, console and wireless games. This includes extensions of stand-alone games so that small groups of players (2-16) can play together, to Massively Multiplayer Online Role Playing Games (MMORPG, see abbreviations Annex 1), with more than 10 000 players playing at the same time and more than 1 million players registered. MMORPG are different from traditional games, as they do not have a beginning or end but instead provide an evolving environment in which players come and go. These games currently work best on PCs because players spend much of their time chatting with friends via a functional keyboard. They are mainly fantasy/science-fiction games with mainly “intensive” players (sometimes termed “hard-core”, see below). However, new content is being developed to attract players of different kinds (*e.g.* the *Sims Online*). More generally, Web-based connections are now available on new PC games and are increasing in consoles and wireless devices (*e.g.* the Nokia N-gage mobile phone series).

In 1993, the first successful commercial Web-enhanced game, *Doom* (initially sold exclusively over the Internet) included “*networked play*” as an integral part of the game. Developers of CD-ROM products soon recognised that Internet games would attract additional customers (Costikyan, 1999). Over the following few years an increasing number of CD-ROM games offered Web-based options. Subsequently firms from other sectors such as Microsoft and Sony joined traditional computer game firms such as Electronic Arts, to offer access to online games in the consoles market (hardware and software) and in the PC market (software). Network firms such as Yahoo, RealNetworks and CNET Networks have subsequently entered the industry.² In the next few years consolidation is expected as media and Internet firms link up with game content owners or become content developers to enter and stay in the industry.

Types of online games

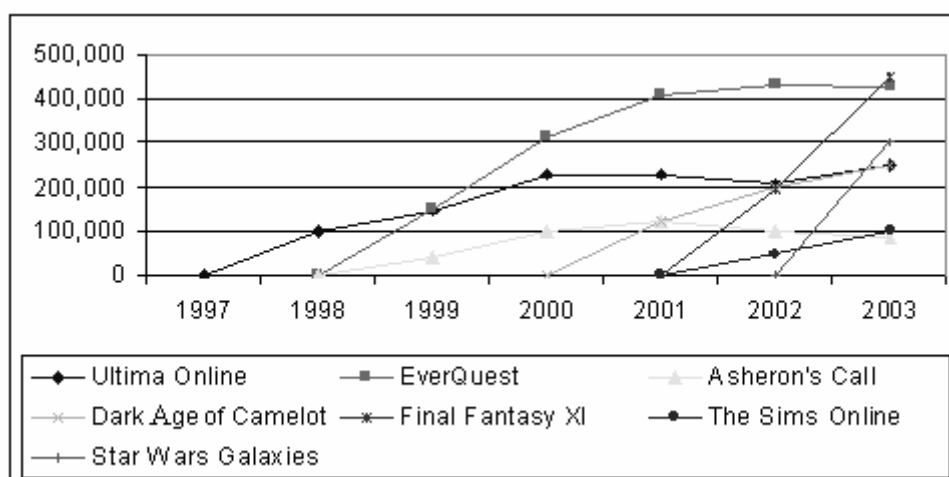
There are four main types of online game:

- Classic board and card games, mostly offered by Web portals such as Yahoo, MSN and AOL. The Internet enables two or more players to play games such as Poker, Bridge and Chess, use online chats and keep ranking and scores.
- PC or console games with network options, where the online option is mainly a supplement to keep scores, download patches and updates.
- Multiplayer games (the most developed is the Massively Multiplayer Online Game, MMORPG see Box 2 and Figure 2) are persistent games where players play individually or in teams in a virtual evolving world. New MMORPGs are also being developed building on user creativity. An example is *Second Life*,³ where users create the game, develop characters, objects and so on, and developers mainly manage the game and provide creative tools.
- Entertainment games that provide a platform for other types of learning, training and interactive applications. Private industry collaboration and government initiatives are exploring a variety of game techniques in other applications (Antikainen, H. *et al.*, 2004).

Box 1. What is an MMORPG. The example of Anarchy Online

Anarchy Online, published by Funcom, is a science fiction MMORPG. Funcom, a Norwegian developer and publisher, employs 95 people with 65 in development. In Anarchy Online's futuristic virtual world of 3D-graphics and sound, thousands of players can compete and co-operate simultaneously. 720 000 players have done so since the game was launched in 2001, with more than 120 million hours of entertainment - corresponding to roughly 60 million movie tickets or 6 million books. The game incorporates 140 000 different items in a 480 million square metre territory, and there is an evolving background story updated with new releases and in response to in-game character actions. In the game itself players co-operate to battle adversaries or sell services for cash and equipment, engage in virtual recreation activities, etc. The game has an online community active through fan-sites and societies. Earnings come from sales of boxed (or downloaded) software at USD 9.95 – 29.95 for different versions and monthly subscriptions from USD 7.95 - 14.95. Funcom's online business model is based on long-term players who will support the game for a minimum of four years, enabling them to release sequels and use the brand and associated game communities.

Figure 2. Selected MMORPG titles by number of subscribers



Source: IDATE as quoted in Fries (2003).

Hardware

Currently there are two main online game mediums: consoles and the classic PC with an Internet connection. A potential third is the portable device, still in its infancy.

Consoles

Console games are particularly popular in the United States and Japan. Three companies, Microsoft (Xbox), Nintendo (GameCube) and Sony (PlayStation2) compete in an estimated USD 6 billion global market. Proprietary game consoles (hardware) cost USD 150-500 and game cartridges (software) specifically for that console are USD 15-60. Games may be published by first-party publishers such as Sony, Microsoft, or Nintendo for their respective consoles or by third-party publishers such as Electronic Arts, Activision, Atari, and Vivendi Universal. Third-party publishers create games for different platforms through a system of royalty payments, where console manufacturers collect royalties from third-party publishers for each game sold for their platform. This guarantees a revenue stream for console manufacturing for which profit margins are slim or non-existent.

Developing a console videogame is often a two-year process whose costs have risen to reach a current average of USD 10 million per game (Olhava, 2003). To recoup development costs, the publisher needs a sizable base of videogame consoles. Additionally, developers often need considerable time and investment to adapt games to new platforms. To recoup initial development costs, they need to publish more than one game per platform. As a consequence there are longer development cycles between game and console generations. Consoles have traditionally been stand-alone, offering limited multiplayer capability. This changed with Microsoft's June 2002 Xbox Live, where users can log on to a broadband-based game network to play online. Sony launched its own network adaptor for PlayStation2 towards the end of 2002 and Nintendo followed in Spring 2003. By the time of the launch of the next-generation videogame consoles (probably 2006), many more consoles are likely to be used for online games.

Table 2. Popular console hardware specification

	Microsoft Xbox	Sony PS2	Nintendo GameCube
CPU	733 MHz (Intel)	295 MHz	405 MHz (Power PC)
Graphics processor	250 MHz	147 MHz	202.5 MHz
Total memory	64 Mb	36 Mb	43 Mb
Memory bandwidth	6.4 Gbps	3.2 Gbps	3.2 Gbps
DVD feature	DVD ready	DVD ready	DVD ready
Networking	Broadband ready	Broadband ready	Broadband ready

Source: Hong, 2002.

PC-based online games

PC-based games are the main online platform, especially for complex games where a keyboard is indispensable. Furthermore, advances in processing power, storage capacity, enhanced graphic cards, surround speakers etc. enables players to have a dedicated game PC. Online computer games are driving demand for better and faster desktops and laptops⁴ as well as bandwidth and network management tools.

Portable devices

Wireless telephone handsets are the next area of expansion for the online computer game industry. Frost & Sullivan project that mobile games will grow from around USD 800 million in 2003 to USD 6.2 billion in 2006 with mobile phone games being the most important (quoted in VUD, 2004a). Dedicated wireless telephone games hardware was first introduced in October 2003 when Nokia launched the N-gage series (Pelkonen 2003). Subsequently, Samsung and LG entered the market with Sony Ericsson announcing it would follow suit. Wireless telephone handset consoles are purpose-built phones primarily designed for computer games and not for talking. Games must be downloaded and subscriptions are usually necessary to play (OECD, 2004c). Although most new phones have Internet capabilities and multiplayer games are an option in some dedicated handsets (through Bluetooth or WiFi technology), there are still only a small number of online games. This is largely due to price and technology limitations and the lack of high quality content (OECD, 2004c). Other portable devices are consoles such as the Nintendo GameBoy, which had no online capabilities. However, the new network-capable Nintendo DS and Sony's portable PSP device should develop the portable console market segment.

Games platform convergence

The traditional division between PC and consoles devices is expected to persist at least until after the next generation of consoles. However, convergence has already started in the consoles and portable device segments and is likely to increase as wireless technology becomes more affordable. There is no technological reason why PC games and consoles will not converge providing console manufacturers allow it. Computers are increasingly enabled to handle more complex graphics and consoles are adding new non-traditional options (Sony's inclusion of a DVD player in the PS2 and Microsoft's addition of a PC-type hard disk to the Xbox), suggesting that convergence will occur at least in the high-end market.

THE COMPUTER GAME INDUSTRY IN OECD COUNTRIES

This section presents developments in the computer game industry in OECD countries. According to aDeSe, in 2002 the United States represented 37%, Europe 36% and Japan 27% of their combined videogame markets. Industry and market data presented below are drawn from various sources; these data are defined differently in these sources and are not necessarily comparable across countries. The most comprehensive data is on market size from private sources (*e.g.* see Table 3); data for the producing industry is less widely available and less comparable (see Annex 2).

The Asian market

Japan

The Japanese market is probably the most mature. In 2003, it was over USD 8 billion and it was projected to grow at 20% annually until 2008 (Hong, 2002, PwC, 2004). Japan is a major producer and user in all computer game segments (console, PC, online and wireless). Japan has the second largest computer game industry after the United States, and is home to two of the three console manufacturers and to a number of top development studios. Titles published by Japanese companies capture 35% of the world market. The Japanese industry is also a leader in mobile games consoles (OECD, 2004c).

Table 3. Computer and video game markets, 1999-2008 (estimates 2004-2008) million USD

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
US										
Console games	4 200	4 102	4 597	5 501	5 794	5 890	5 670	6 500	7 820	8 040
PC games	1 998	1 900	1 747	1 401	1 206	1 251	1 125	1 125	1 068	1 046
Online games	-	57	135	249	420	662	1 152	1 692	2 622	3 375
Wireless games	-	-	-	65	142	301	1 202	1 680	2 232	2 837
Total	6 198	6 059	6 479	7 216	7 562	8 104	9 149	10 997	13 742	15 298
Europe, Middle East, Africa (EMEA)										
Console games	2 569	2 496	2 801	3 410	3 611	3 688	3 620	4 094	4 974	5 190
PC games	1 433	1 365	1 266	1 109	939	951	925	914	890	866
Online games	-	14	60	157	302	548	871	1 706	2 784	4 086
Wireless games	-	-	-	112	208	408	996	1 935	2 835	3 948
Total	4 002	3 875	4 127	4 788	5 060	5 595	6 412	8 649	11 483	14 090
Asia/ Pacific										
Console games	5 003	4 594	5 025	5 610	5 920	6 052	5 823	6 680	8 400	8 625
PC games	2 352	2 236	2 037	1 728	1 472	1 518	1 300	1 249	1 167	1 120
Online games	-	50	155	389	630	1 020	1 881	3 168	5 115	7 470
Wireless games	-	-	8	717	367	845	2 295	3 605	4 800	6 600
Total	7 355	6 880	7 225	8 444	8 389	9 435	11 299	14 702	19 482	23 815
Total										
Console games	11 772	11 192	12 423	14 521	15 325	15 630	15 113	17 274	21 194	21 855
PC games	5 783	5 501	5 050	4 238	3 617	3 720	3 350	3 288	3 125	3 032
Online games	0	121	350	795	1 352	2 230	3 904	6 566	10 521	14 931
Wireless games	0	0	8	894	717	1 554	4 493	7 220	9 867	13 385
Grand total	17 555	16 814	17 831	20 448	21 011	23 134	26 860	34 348	44 707	53 203

Note: EMEA includes EU15, Czech Republic; Hungary; Poland; Romania; Russia; Israel; Saudi Arabia; South Africa; and Turkey; Asia/Pacific includes Australia; China; Hong Kong, China; India; Indonesia; Japan; Malaysia; New Zealand; Pakistan; Philippines; Singapore; Korea; Chinese Taipei and Thailand.

Source: OECD adapted from PwC (2004).

Korea

In 2003, the turnover of the Korean computer game industry was approximately EUR 3 billion, growing 10% from 2002, with the online market growing 28% (MIC, 2004b). Although the Korean game industry is relatively small, its online game industry is particularly strong accounting for 7% of the world market, and it is leading in the number of players involved in a single game and the age diversity of players. This has been achieved through designs specifically for Korean customers. A significant number of small- and mid-sized portals and content industry firms have entered the industry. It is projected that computer game exports will reach USD 113 million by 2005, with the Korean Internet industry focused on exports as the domestic market is expected to reach saturation by 2006-2007. Mobile game exports now account for 61% of game exports.⁵ According to the Ministry of Information and Communication export targets are China, Chinese Taipei and South East Asia. Korean firms have had difficulty in penetrating markets outside Asia, and to gain local knowledge they are establishing alliances overseas.

The North American market*The United States*

The United States video games market exceeded USD 7 billion in 2003 according to Entertainment Software Association (ESA) estimates. It is expected to double to USD 15 billion by 2008 (PwC, 2004). The console market predominates with relatively slower development of wireless games. In 2000 estimates suggested that the entertainment software industry and related industries employed 220 000 people (Table 4, from IDSA, 2001). Much game development takes place in southern California and New England, where universities teach computer programming through visual design. US companies are among industry leaders, notably Electronic Arts, the largest game software publisher with video-game franchises and online games such as *Ultima Online*, *The Sims Online* and the *Club Pogo* subscription service, Microsoft in console and PC markets, and Activision and Take-Two. Titles published by US companies take 44% of the world market. The US market is relatively consolidated, in 2002 the 10 largest publishers accounted for 65% of total US retail sales, and the top 20 91% of sales (quoted from Larta, 2003).

Table 4. US computer and video games industry by activity, 2000

Activity	Sales USD millions	Employment thousands
Information		
Direct	7 774	29.5
Indirect	n.a.	95
Subtotal	n.a.	124.5
Trade		
Direct	2 750	13.4
Indirect	n.a.	81.2
Subtotal	n.a.	94.6
Transport		
Direct	20	0.1
Indirect	n.a.	0.4
Subtotal	n.a.	0.5
Total		
Direct	10 544	43
Indirect	n.a.	176.6
Total	n.a.	219.6

Source: IDSA (2001).

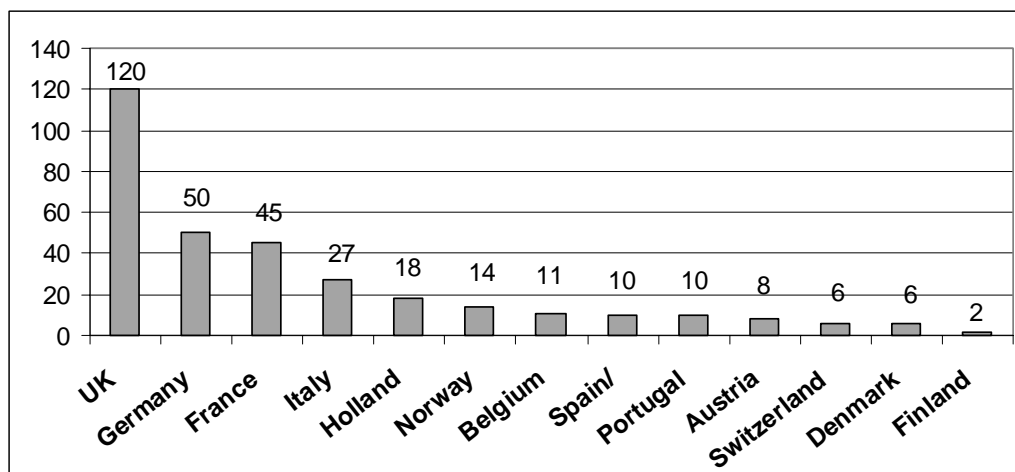
Canada

Canada's video game industry generated revenues of USD 746 million in 2003, a 13% rise from the previous year (ACNielsen estimates). Two major production hubs for the industry are in Montreal and Vancouver. Approximately 1 000 people in each hub are directly employed in development and publishing, mostly in SMEs (Alliance Numeric, 2003). Canadian broadband penetration in June 2004 was the third-highest in OECD countries (OECD, 2004) and online games penetration is increasing with the spread of broadband, with an estimated 65% of console owners playing online games and 67% of game players not currently playing online planning to do so in the coming year (Canoë, 2004). The Canadian industry could benefit from its strategic position linking the United States, France (Montréal and Quebec are alternatives to Paris and Lyon for French-speaking developers) and the United Kingdom (through the Commonwealth's agreements *e.g.* in immigration and education) and the Quebec government is actively promoting the industry to attract FDI and skilled labour, notably from France and French companies.

The European market

The European interactive software industry is a major world player in all segments of the value chain and is strongest in PC games (EPPA, 2004). The video games market was over USD 5 billion in 2003 and is projected to reach USD 11 billion by 2007 (PwC, 2004). Interactive software firms are widely located, with the United Kingdom, Germany and France of major importance (see Figure 3), and foreign-based publishers have set up local networks. Some of the major games firms are European, such as Infogrames/Atari, UbiSoft, Eidos, Vivendi Universal Games and Codemasters, and many top games are European. The Harry Potter series and The Lord of the Rings are good examples: the original story is from the United Kingdom and the game was developed there. There are also other examples with the *Grand Theft Auto* series originating from Scotland and selling more than 30 million units worldwide. Other important European-made games are *Tomb Raider*, *Donkey Kong Country*, *GoldenEye*, *Black & White*, and *Rollercoaster Tycoon*. There are also many successful games aimed specifically at European audiences, including *The Settlers* (Germany), the *Adi* series (France), *Backpacker* (Sweden) and *Hugo* (Denmark).

Figure 3. Number of game development studios by country in Europe



Source: ISFE (2004a).

United Kingdom

The UK video game market has grown by more than 100% over the last six years, reaching more than GBP 1.1 billion (USD 2 billion) in 2003 (Screen Digest for ELSPA-Entertainment and the Leisure Software Publishers Association, 2004). More than 25 million game consoles have been sold since 1995, equivalent to one for every household, and the United Kingdom is the third-largest market after the United States and Japan. Some 270 games-related companies employ more than 20 000 people in the United Kingdom (Alliance Numeric, 2003; ELSPA, 2004). With 8 000 people in development, the United Kingdom is the largest development community in Europe, and Sony and Electronic Arts have their European headquarters in the United Kingdom. However, the industry also has weaknesses notably in publishing (Kerr, 2004a). Government support of the industry is significant, and UK Trade and Investment provides trade support services for UK companies and promotes inward investment. Industry organisations ELSPA and The Independent Game Developers Association (TIGA) support UK companies at industry conferences and publish market data (e.g. ELSPA's annual Britsoft-Book).

Germany

Germany is the second most important video game market in Europe, around EUR 1 billion in 2002 increasing by 8% over the previous year, with turnover at the same level as DVDs and videos. Sales of necessary hardware such as consoles and PCs were of the order of nearly EUR 4 billion. The market has an estimated 1.5 million customers. The German industry is particularly successful in the production area of simulation (VUD, 2004).

France

France is the third most important computer game market in Europe with turnover of EUR 990 million in 2002. French publishers have a global market share of 15-20%, although their share in the domestic market has been smaller. The number employed in development in France is around 2 600 (Kerr, 2004a). There are two major hubs, Paris and Lyon, and three leading publishers: Infogrames, Ubisoft and Vivendi Universal Games. Lyon has a structured industry promotion programme (Alliance Numeric, 2003) with promotion projects and an education institution. The French games industry has declined recently and this has been attributed to lack of incentives and venture capital for small developer firms. The government is revising its policy regarding the entertainment industry to incorporate some of the recommendations of the Fries report (Fries, 2003).

Spain

The Spanish game market has grown rapidly and had revenues of EUR 800 million in 2003, up almost 13% from the previous year. Consoles and console games dominate the market with sales of EUR 675 million, 85% of the total up, 15%, and action games are popular. In the PC market over one third of games sold are strategy games. Despite rapid market growth, the Spanish industry is not one of the leading videogame producers, with only 6.6% of the European market in 2002 (*Asociación Española de Distribuidores y Editores de Software de Entretenimiento, 2004*).

Australia

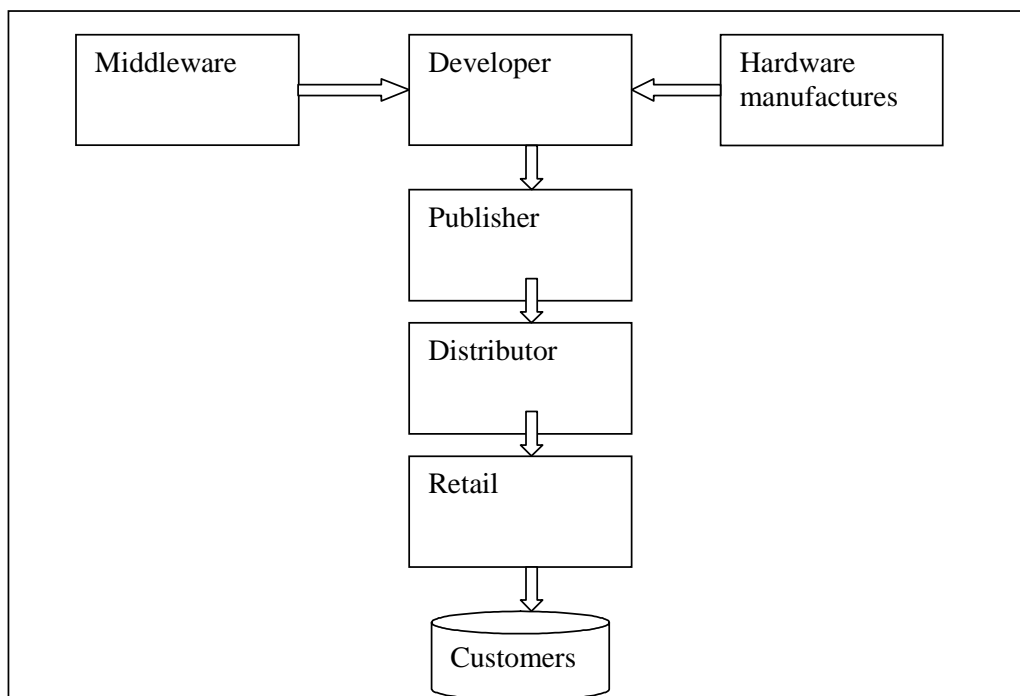
Australian annual entertainment software sales are worth USD 800 million (Bishop, 2003). Melbourne is the regional center for computer game development and serves as the Asian and South-Pacific headquarter for leading publishers Infogrames, Acclaim Entertainment and THQ. This development is largely a consequence of the State government's recognition of the potential of the computer game industry, and it has been actively involved in supporting the industry since releasing the Game Plan policy in November 2000 (Bishop, 2003).

INDUSTRY STRUCTURE AND VALUE CHAINS

The established value chain

This section analyses the computer game industry value chain and its dynamics. The established value chain is displayed in Figure 4, and this is changing with the potential for selling and playing games online. The individual links in the value chain are analysed in turn.

Figure 4. Current computer game industry value chain



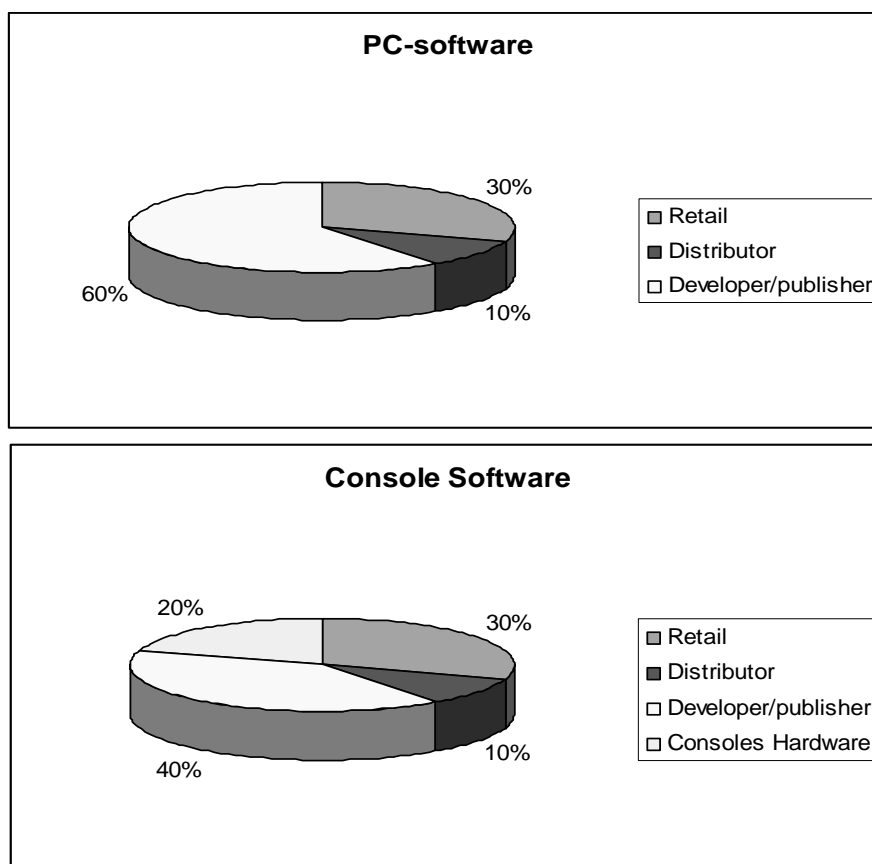
Hardware manufacturers

Console manufacturers are the main focus as console games are still the largest games segment and the role of console manufacturers is far more important than that of individual hardware manufacturers in the PC market. The console market is characterised by large cost barriers to entry. It may cost up to USD 2 billion to develop a competitive console platform and returns on investment may take several years. There are three console manufacturers: the Japanese Sony and Nintendo, and the US Microsoft. There is widespread agreement that there is little room for more and it is highly unlikely that other companies will attempt to establish themselves in this field in the near future. Console manufacturers' business models consist of three income flows:

- Hardware sales.
- Sales of own software.
- Royalty fees from other software developers that use the console platform.

Competition has put the three manufacturers under pressure to reduce console prices. The need to reach a critical user mass has further contributed so that machines are often sold at or below marginal production costs, *i.e.* at a loss, and this has been a prevalent pricing model in the industry (Evans, *et al.*, 2004). This reflects the manufacturers' main objective to have attractive titles developed for their console and subsequently receive a royalty fee for each game sold for use on their console. This enhances the value of the console as attractive titles make particular consoles more interesting to potential users. This pricing model is also opposite to the one used by computer software platforms (Evans *et al.*, 2004). Games developers have to negotiate to get their games onto particular consoles, whereas PC games are useable on all PCs with appropriate technical characteristics.

Figure 5. Share of games consumer revenues



Source: KPMG for the Danish Ministry of Culture (2002).

Box 2. Sony – living room vision and vertical integration

With the spread of broadband and the shift to digital content, Sony like other media firms is looking to new ways to sell music, films and video games content. It is pursuing vertical integration so that consumers will use entertainment content developed, published and distributed by them with a range of their devices. Sony's network strategy assumes that audio-visual and computer devices, besides talking to one another, will also share with a wide range of smaller gadgets. The ability to network game consoles, which allow players to access content and play online, points the way forward in other electronic equipment sectors. Some experts see consoles as the core of living room entertainment alongside a large flat screen TV and surround sound system connected to a wireless network and to other devices and able to play and store any form of entertainment media (*The Economist*, 2003a).

Middleware

Middleware is software that runs the graphics necessary for game development, including game-optimised high-speed code compilers, software libraries (to simplify control of hardware), game engines and platforms. Middleware suppliers have usually been small- to medium-size firms with highly skilled staff (mathematicians, programmers) able to exploit economies of scale in R&D by focusing on new technology development across multiple projects, and then licensing their software to games developers. However, as the middleware market expands, a number of large established firms have entered, including Microsoft and Electronic Arts (Microsoft, 2004), along with new companies, for example Kaydara a leader in character animation technology (Kaydara, 2004).

Technological advances have increased the complexity of games, their development time and costs. Generally applicable, interchangeable, interoperable middleware tools may be a solution to contain rising costs, allowing developers to focus mainly on the creative side of games and licence middleware technology (Spectrum Strategy Consultants, 2002). Currently, the majority of game developers rely on their own technology and many solutions are ‘reinvented’, suggesting inefficiencies for the industry as a whole (Hyman, 2004). Licensing-in middleware may provide smaller developers with the technology to better compete with large ones. However, if larger development firms dominate the middleware market, smaller firms may become either dependent on these large middleware suppliers or be squeezed out. Much will thus depend upon middleware market developments, which may be crucial for the future structure of the games industry.

But despite expectations for further middleware market expansion, middleware is not yet predominantly relied upon for game development. According to Jason Della Rocca (program director, IGDA), for every video game based on bought-in middleware, 10 are built from scratch. He attributes part of this to game developers’ unwillingness to include software solutions produced by others. This may partly be due to the developers’ wish to work on the underlying software either to accommodate it better to their game or to update it. If licensed technology is used, contracts will often stipulate that improvements made by third parties will not confer property rights over the improvement to them.

Developers

The developer is the “artist” of the industry, producing new games with the latest technological tools developed either in-house, licensed from middleware companies, or in the case of consoles, provided by hardware manufacturers particularly Sony and Microsoft (Evans *et al.*, 2004). Revenues for developers are among the largest in the value chain (Figure 5 and Alliance Numeric, 2003). However, this has to be set against the risks developers take when developing new titles. Apart from large established companies (see Table 5) developers are often small start-ups employing from five to a few hundred people. The roles of developers and publishers are often linked. In most cases, publishers have in-house development competences, whilst other titles are developed by pure development companies and marketed by or in co-operation with publishers. Agreements between developer and publisher vary a great deal and depend to a large extent on the experience of the developer and the development cycle of different games and platforms. Initially, developers’ primary competitive advantages were technological. Firms such as id Software (developers of the *Doom* and *Quake* games) gained market shares due to their sophisticated 3D technology (KPMG, 2002). Now for mass market audiences, story-telling content is gaining in importance, requiring different skill mixes in development.

Table 5. Selected large developers (alphabetical order)

Acclaim	US
Activision	US
Blizzard Entertainment	US/France
Electronic Arts	US
Firaxis Games	US
id Software	US
Infogrames	France
Konami	Japan
LucasArts	US
Microsoft	US
Midway Games	US
SEGA	Japan
Sierra Entertainment	US/France
Sony Computer Entertainment	Japan

Publishers

Publishers account for the bulk of revenues in the value chain (see Table 6 for large game firms / publishers, Table 7 for online game publishers). Their main task is identifying titles and marketing these to distributors, retailers and end users. Typically they are large global companies employing thousands of people mainly in marketing, and they often finance development costs and acquire the intellectual property rights for new games. They undertake product management, marketing, funding, pricing, and inventory management. They operate either directly in foreign markets or, as is usually the case in Europe, through local partners. Income generated is highly dependent on each title and its marketing. Similarly to the film industry, publishers seek to reduce risk by spreading the mix of titles to target supply for a range of buyer segments. In addition, firms look for strong titles which they can advertise. Some titles are designed by developers/publishers themselves (*Sims*, *SimCity*, *Medal of Honor*), whereas other titles are developed on a licence basis (*StarWars*, *Harry Potter*, *Lord of the Rings*) (KPMG for the Danish Ministry of Culture, 2002). Publisher strategy is to have the same title on different game platforms (*e.g.* Xbox, PlayStation 2 as well as a PC version). In this way fixed costs are spread across higher sales. Publishers' cross-platform strategies often conflict with console manufacturers' strategies to have titles exclusively for their console.

Table 6. Computer and video game firms by operating revenues, USD million

Rank	Company	Country	2002
1	Sony Computer Entertainment ⁶	Japan	4 681.2
2	Nintendo Japan	Japan	4 195.9
3	Electronic Arts	US	2 482.2
4	Microsoft ⁷	US	2 453.0
5	Activision	US	864.1
6	Vivendi Universal Games ⁸	France	832.7
7	Infogrames / Atari	France	768.1
8	Konami	Japan	728.1
9	Ubisoft	France	588.2
10	Sega	Japan	553.9
11	Capcom	Japan	516.3
12	Namco	Japan	295.6
13	Acclaim	US	268.7
14	Eidos Interactive	UK	198.2
15	Take Two Interactive	US	79.4
16	THQ	US	48.0

Source: European Audiovisual Observatory, 2003.

Table 7. Online games publishers December 2003

Rank	Company	Country
1	NCSOFT	Korea
2	Sony Online Entertainment	Japan
3	Electronic Arts	United States
4	Vivendi Universal Games	France
5	Microsoft	United States

Source: DFC Intelligence 14 January 2004 by gross revenue generated from online games only, including subscriptions, advertising and sponsorships.

Box 3. Korean online games: The example of NCSoft and Lineage

NCSoft's Korean MMORPG *Lineage* has 4 million players, making it the largest strictly online game by number of subscribers and revenues. NCSoft was established in 1997 as an online game company and in mid-2004 had 1 150 employees. *Lineage* was launched in 1998. NCSoft's success was achieved with relatively simple technologies compared with US and European online games. *Lineage* uses a 2D isometric perspective with fairly limited characters, but it was offered as a free download with a USD 15/month service charge, which contributed to its immediate success in Korea. *Lineage* and other Asian games are built around player-versus-player dynamics, and its success outside of Asia is limited. However, it demonstrates that a business model based exclusively on online games can be viable. NCSoft is also publishing and developing games in Chinese-Taipei, Japan and the United States.

Distributors

The distributor is the connecting link between the developer/publisher and retailer. Responsibilities are mainly in sales agreements as well as in the logistics of the distribution chain. Many international publishers, such as Electronic Arts and Activision, have in-house distribution to retailers. Other publishers choose to licence distribution (*e.g.* Sony has issued a licence to Egmont in a number of countries). The trend appears to be towards publishers undertaking distribution either through acquiring existing distributors or establishing their own distribution channels.

Retailers

Retailers need to optimise agreements with suppliers of the numerous titles for all three consoles and PCs to be able to fill shelf space in the most profitable way. For console manufacturers and game publishers it is important that their products obtain the best possible shop display. Retailer responsibilities include: pricing, mark-downs, priority, and presentation. The retailer is often in a good bargaining position when negotiating prices. However, the development of download distribution models and free-CD business models will probably erode retailers' market power.

Changes in the value chain

Broadband diffusion and technological developments are driving major changes affecting established value chain distribution, enabling the entry of new intermediaries in the form of ISPs and Web sites and potentially changing the sources of middleware (Figure 6).

Changing distribution systems. Changes affecting established actors are:

- Digital distribution.
- The publisher going directly to retail distribution.
- Developing content with wider appeal to penetrate the mass market.

Digital distribution allows users to download games directly over the Internet instead of purchasing them from the retailer. Developers/publishers gain while distributors and retailers lose. Distributors are also increasingly cut out of the value chain by publishers entering into agreements with retailers. With the consolidation in retail markets, large retail chains such as *Walmart* and *Toys R Us* are increasingly setting up direct agreements with publishers (similar to developments in most distribution value chains). Thus, there is a trend towards marginalisation of the distributor role ("disintermediation"). Finally, the mass market puts higher demands on the story and design in content, and content producers have new opportunities and potentially larger gains from directly distributing to this new market. Figure 7 illustrates this power shift and the more favourable position of the developer/publisher.

Figure 6. The changing value chain

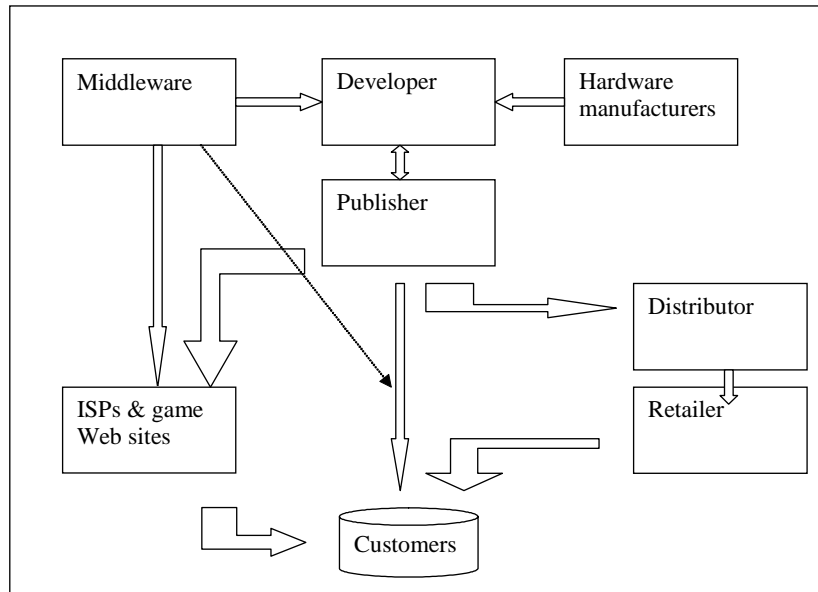
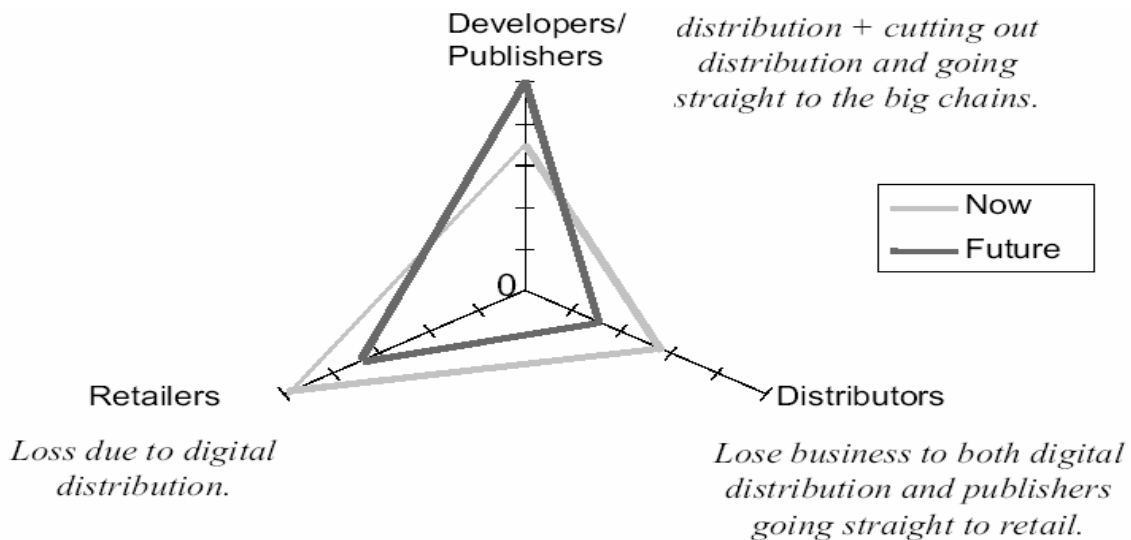


Figure 7. Changing roles in the value chain



Source: KPMG for the Danish Ministry of Culture (2002).

Entry of ISPs and game Web sites: Internet Service Providers (ISPs, such as AOL), are increasingly important in the changing value chain. Their role as content aggregators enables them to position themselves as new online distributors (“re-intermediation”). Network operators are also increasingly involved (as ISPs or directly) in new upstream and downstream roles in supporting games distribution and downloading and supporting online games. Network operators are in some cases redefining their revenue models from being simple network conduit suppliers to providing not only ISP and portal services but also to being content aggregators. Responsibilities such as distribution, pricing policy, sales priority, billing, and product and network management are becoming an integral part of the content aggregators’ tasks. These functions are shared with game Web sites/portals, such as Yahoo, which act as retailers in the old value chain. Game portals can benefit from their Internet traffic and their brand name to attract customers.

An example is the BT-Yahoo broadband service specifically designed to attract online game players. However, in the future the role of ISPs and portals may not be restricted to the delivery of games to end customers. Already simple free online games played on Yahoo Games and MSN Gaming Zone attract millions of players, and it is likely they will become involved in handling databases, customer support and game development.

New sources of enabling technologies. An increasing number of companies offer enabling technology for online games and in particular for MMORPGs. This cuts development costs and time for these games. Companies such as Zona, Butterfly, Quazal, Open Skies, Exent and Rebel Arts provide enabling technologies to developer-publishers (see Box 5) (IGDA, 2003). Lithtech's licensable system will be tested in its *Matrix Online* project. There is still considerable uncertainty about developments because future design requirements of MMORPGs are not clearly defined (IGDA, 2003). If the business model for these technology providers fits into the revenue model for MMORPGs, there will be an incentive to outsource some enabling technologies. However, publishers who can fund the creation of a successful MMORPG may also have resources to fund internal development. The form of market organisation adopted will depend on the costs involved in these and other production value chains.

Box 4. Combined developer-publisher roles in MMORPGs

Nearly all working MMORPGs have been developed internally by publisher studios (see Box 2, Funcom) and there are few precedents for distinct long-term developer-publisher relationships, apart from *Asheron's Call*. In terms of roles, live developments and community management rest with the developer and server operations and technical support with the publisher. Publishers will usually insist on source code rights, billing and customer service activities to protect themselves from unstable developers. There are two main reasons why the majority of MMORPG games have been internally developed by publishers. The first is to retain the expertise to develop and operate MMORPGs. The second is high development and marketing costs that make it hard for small developer firms to develop online products. However as MMORPG development and operation skills become more widespread costs will be driven down and this will possibly boost external development and value chain specialisation (IGDA, 2003).

Mergers and acquisitions

There have been numerous predictions of industry consolidation, but the games software industry remains fragmented. This contrasts with high levels of ICT sector M&A activities overall (OECD, 2004e). There are two recent trends in M&As (DFC Intelligence, 2004b). First, established publishers are buying small developers (e.g. UbiSoft's acquisition of Tiwak or the THQ acquisition of Outrage entertainment and Shabba). Second, new players are acquiring companies for network-based technology and titles. Examples are Nokia's acquisition of Sega.com to access online multiplayer game platform technology (Nokia, 2003) and RealNetwork's acquisition of publisher GameHouse. Table 8 and Annex 2 provide further selected M&As. In general large players prefer endogenous growth, although Infogrames has been a major acquirer. One reason is that with technology stabilisation and rising costs it has become more difficult for independent developers to make the breakthroughs that make them attractive acquisitions (Rogers, 2004). However, the growing wireless and online markets may start a wave of industry consolidation.

Table 8. Selected M&As in the computer game industry, early-2004

Target	Acquirer	Date	Value USD million
Tiwak Video game developer	UbiSoft	January	n/a
GameHouse Developer, publisher, distributor of download PC games	RealNetworks	January	35.6
VIS Entertainment Develops interactive software	BAM Entertainment	February	4
Core Websystems European games management technology	Game Trust	March	n/a

Source: Corum Group Ltd. (2004) and industry sources.

BUSINESS MODELS AND COST STRUCTURES

In this section revenue and distribution models and cost structures in the game industry are described and their strengths and weaknesses discussed, paying particular attention to online developments. Many of the models and developments described below are relatively new and evolving as they are currently being tested.

Rising costs and the influence of consoles

The cost of developing computer games, particularly online computer games, has increased rapidly. The technological sophistication that enables the creation of complex media-rich games (*e.g.* video quality 3D animation and sound) requires additional creative input. For example, the transition from PS1 to PS2 was described as follows: “*The amount of time it took to develop a game was doubling. The amount of people it took was doubling hence the cost was going up about five times*” (Rogers, 2004). A PlayStation title from Sony-owned development firm, Naughty Dog, cost USD 12 million to develop, and other titles over USD 35 million (Kerr and Flynn, 2003). With the next generation of console systems (PS3 and Xbox 2), many developers believe it will be even more costly to develop and maintain leading-edge technology (Hermida, 2004a). Large publishers such as Electronic Arts and others are investing large sums in technology that can be used throughout their company, so that the ability for independent developers to compete primarily on technology may be more difficult. Furthermore, online games have ongoing maintenance and customer support costs. The average cost of developing a top online game is at least USD 5 million⁹ and can be easily twice the amount for ambitious MMORPG projects (see Table 9 for a simplified cost and revenue structure).

Because of the increase in cost and the risk involved the industry is increasing the number of games based on licensing successful products in other areas, including Hollywood and TV blockbusters (see Figure 8, *The Economist*, 2004; Daglow, 2004). Advantages for building a film-based game include economies of scale in advertising and, given stronger public attention to big Hollywood film productions, significantly higher sales. Although licensing costs may be high, risks that development costs will not be recouped are lower than for independently developed games.

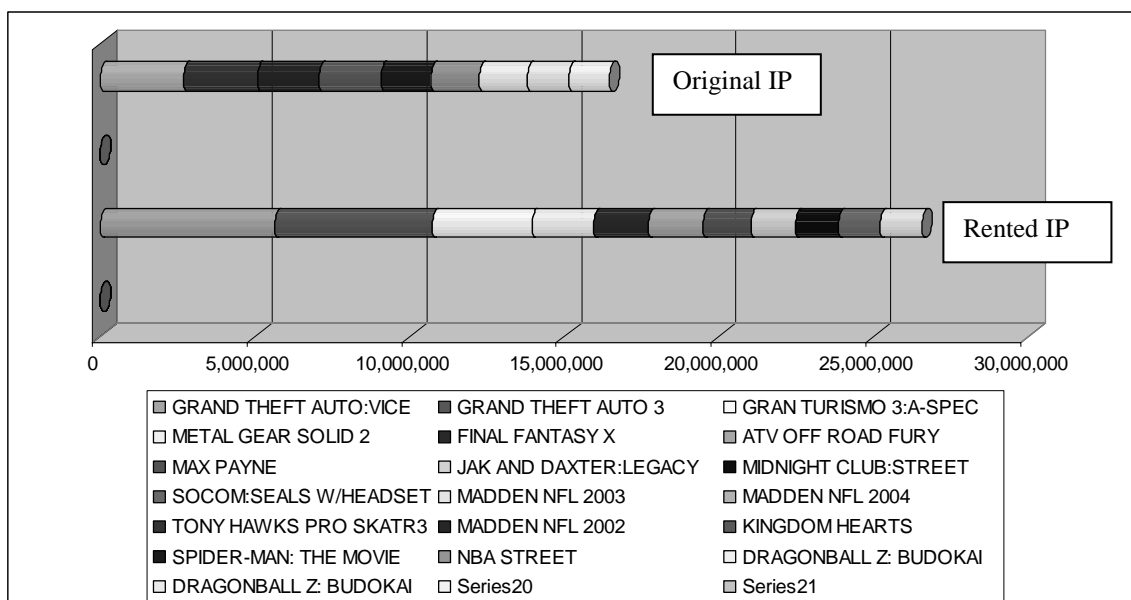
There are major differences between the PC and console business models. In the PC market entry for content providers is not legally restricted while consoles manufacturers have exclusive control on titles for their hardware. However, hardware suppliers have until now used different strategies for independent games software. Sony and Nintendo have so far relied on a hands-off approach, not charging additional royalties or fees above the standard royalties, or extra conditions for their online content providers and Sony has provided developers with development tools to reduce costs, increase the number of titles and the volume of royalties although at a lower per unit license fee (Evans *et al.*, 2004). In contrast, although Microsoft has also provided Xbox development tools, game developers and publishers have been obliged to follow Microsoft’s technical specifications for Xbox Live, and have to offer online connectivity only through authorised Microsoft sites (IGDA, 2003, Evans *et al.* 2004). Some large publishers including Electronic Arts have refused to adapt online games for the Microsoft Xbox (Sieber, 2004), although this has changed recently, with Electronic Arts making popular sports games available for the Xbox.¹⁰

Table 9. Simplified MMORPG cost and revenue structure

	USD million
Costs	
Initial development	5
Annual bandwidth	0.6
Annual computer/hardware	0.6
Annual marketing	0.3
Annual general/admin	0.6
Sub-total first year	7.1
Ongoing annual development	0.3
Subsequent cost per year	2.4
Revenues	
Retail sales (100 000 x USD 25 per unit)	2.5
Average monthly subscription revenue (50 000 players x USD 10 monthly flat fee)	0.5
Subscription revenue first year	6
Total revenue first year	8.5
Revenue subsequent year	6
Profits	
First year profit	1.4
Subsequent years profits	3.6

Source: Screen Digest (2002).

Figure 8. Top 20 games ranked by unit sales



Source: OECD, based on industry sources.

New revenue models

The traditional revenue business model in the computer games industry has been to sell hard-boxed games. However, with the diffusion of broadband Internet access there are now competing models that firms can use alone or in combination. In this section, the main online-enabled revenue models will be analysed: retail purchase, subscription fees, pay-per-play, advertising, and premium and customer services.

Retail purchase – play online for free

In this model all revenues come from the one-time sale of the boxed game software. After that, all online aspects are provided for free by publishers who use the online section of the game primarily as a marketing tool for new releases and updates of the game sold at retail stores. Usually, publishers attempt to support online access by advertising on their Web site. An example is Blizzard entertainment's Battle.net game service. Apart from offering free play of Blizzard titles, its main objective is to support retail sales.¹¹ The main disadvantage is cost as companies need to program the server, support the hardware and have bandwidth to provide the service, and because of extended game lifetimes, it also requires long-term maintenance of Web sites. Although this revenue model was satisfactory for last generation online games that essentially were extensions to off-line games, it is less likely to be compatible with new generation games with different and more onerous online cost structures and customer support requirements. A possible future development may be to combine this model with the subscription model described next.

Subscription – paying a monthly fee

Flat-fee subscriptions enable players to play one or several titles online for a monthly fee of around USD 13 (see Table 10). The game itself can be bought (boxed or downloaded) or distributed for free. Flat-fee subscription has become a widely-used model for most complex online games for three reasons:

- It is simple, and similar to what ISPs charge.
- It is predictable for people considering signing up, unlike connect-time charges.
- It is reasonably well suited to most online-only games, which tend to be massively multiplayer and ongoing, having no end, conclusion and win criteria.

The subscription model has a major drawback. There is an incentive for people to be online in the game for as long as possible. It is estimated that roughly 10% of subscribers will use the game for 4-8 hours a day, and a few regular subscription players will dominate an individual game in terms of support, access etc. Traffic management is one of the keys to profitability in this model, ensuring that the hardware and bandwidth and port connections can be provided cost-effectively.

However *Lineage*, *Ultima Online*, and *Everquest* have shown that this model can work. If traffic can be managed efficiently 10 000 players generate USD 1.2 million annually – revenues comparable to those for modestly successful retail products – and games such as *Ultima Online* have attracted and retained 125 000 players. But introducing new games is a challenging task as few players are likely to subscribe to more than one USD 13/month game at a time, and the intensive user market, which is the primary target, is largely saturated.

Table 10. Selected MMORPG prices, USD

Game	Developer	Publisher	Retail price	Monthly charge
Anarchy online	Funcom	Funcom	19.99	12.95
Asheron's Call (I&II)	Turbin	Microsoft	12.95	12.95
City of Heroes	Cryptic Studios	NCSOft	49.99	14.99
EverQuest	Sony Online Entertainment	Sony Online Entertain.	9.99	12.95
Lineage	NCSOft	NCSOft	Free	14.99
Lineage II	NCSOft	NCSOft	49.99	14.99
Star Wars Galaxies	Lucas Arts	Sony Online Entertain.	49.99	14.99
Ultima Online	Origin	Electronic Arts	9.99	12.99
The Sims Online	Maxis	Electronic Arts	39.99	9.99

Pay-per-play – prepaid and micro-payment

In this model players pay a small fee to play either by buying pre-paid cards or by playing at Internet cafés. The latter option is particularly popular in Korea where the Internet café acts as a reseller/distributor for the game publishers. It has a number of advantages: players are less likely to withdraw in the middle of a game as they have already paid their money. The cost of a game is controllable and attractive to the moderate market segment. However prepaid pay-per-play is not suitable for long complex games, which require a system of micro-payments¹² for larger-scale implementation. The idea is that a player could pay 50 cents to play a game online for a few minutes/hours, similarly to arcade games. However, infrastructure for micro-payments is still developing. The charges of credit card companies (minimum transaction charges even for micro-payments) remain a barrier to low cost micro-payment mechanisms, and alternative micro-payment systems to exploit the potential of pay-per-play, *e.g.* via mobile phones, are still some way off in terms of coverage and cross-border usability (OECD, 2004a).

Advertising

Advertising and sponsorships are alternatives to support game play. Mass-market free game services, such as MSN Gaming Zone and Yahoo, as well as pogo.com, use primarily this model. Although it is hard to see how an advertising-supported website could support a MMORPG-type game, advertisers have started to recognise that online games reach a specific demographic group of consumers. The interactive nature of online games offers advertising companies flexibility as well as wide reach, targeting and monitoring (Olhava, 2003). In addition to banner advertising, developers are integrating advertisements, and Intel and McDonalds have already bought product placements – similar to in films – within Electronic Arts *The Sims Online* (Mantion, 2003). Advertising revenue generated by video games is projected to reach USD 260 million by 2008, with USD 92 million for in-game advertisements and USD 168 million from advertising support (Yankee Group). This is a significant change as the video game market has been largely ignored as a platform for advertising.

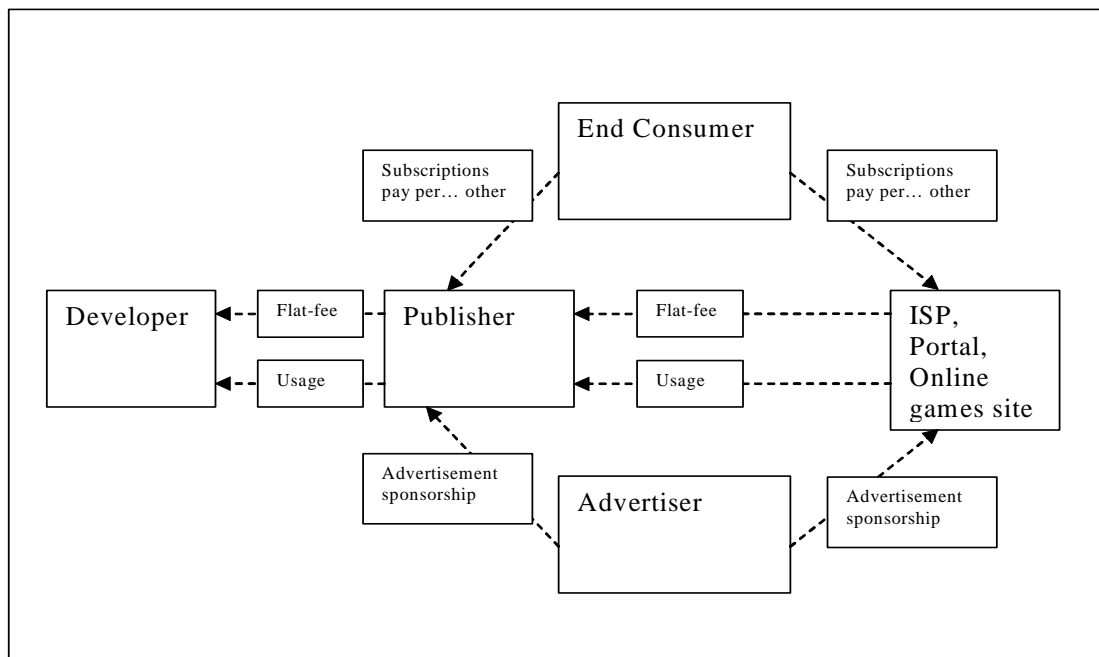
In some cases, games themselves have been used as an advertising medium. For example, the US military spent over USD 7 million to make America's Army, a PC multiplayer game that was free for download. The purpose of the game was to serve as a marketing and recruitment tool.

Premium services – pay for components and/or services

In this model additional online revenues come from selling in-game virtual items. This approach was tested by *ChronX* and *Sanctum* without success, and selling extra-game options does not seem a viable business model when there is no physical collection to drive up the value of items over time (as with baseball cards for example). Although some players are ready to buy virtual objects on sites such as eBay¹³ there are still complex legal problems regarding property rights (such as whether items belong to the companies or the players) and appeal to any except the intensive user is unlikely. This business model could be viable if instead of selling virtual goods it sells services such as customer and technical support, but it is unlikely that this could be more than support for a main revenue stream.

Emerging online revenue streams between the consumer, advertiser, online sites, ISPs, publishers and developers are depicted in Figure 9. The most successful emerging model is the “pay monthly” subscription model, but it is expected that most computer game companies will have to rely on a mix of business models including advertising, premium services, and customers support services to increase revenue. However, significant changes could occur if and when micro-payment options are more widely available for mass-market customers.

Figure 9. Revenue streams in online computer games



Source: IGDA Online Games Committee, 2003.

Changing distribution models

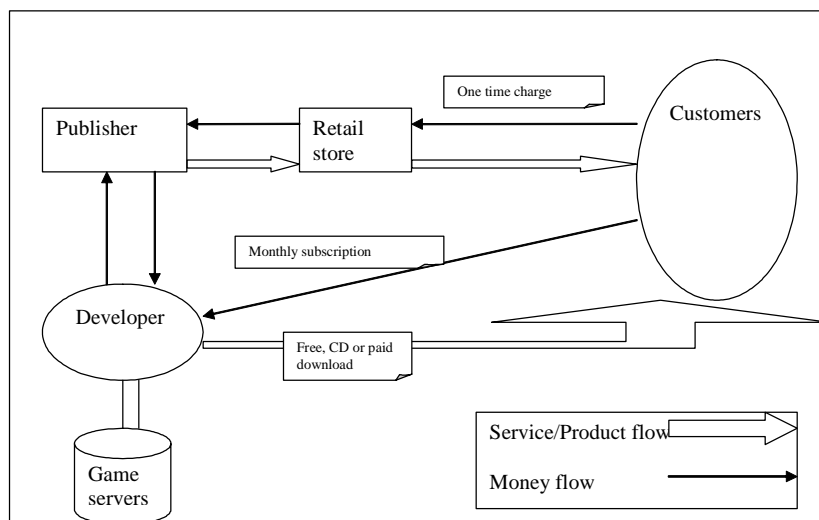
The emergence of the Internet promised to eliminate barriers to entry for distribution – in games software it opened up the possibility of setting up a Web site and selling games online. However, the challenges of reaching large numbers of customers, and the added costs of marketing, transactions, and providing customer support for the new distribution channel led to the understanding that there is not a simple one-for-one substitution among channels. The Internet distribution model is still less profitable and reliable than traditional distribution channels, although the gap between the two is shrinking.

Downloadable and Web-based game publishing is a valuable new strategy nonetheless. In this section three main distribution channels for online games are discussed: classic retail, download and free cover disks.

Retail

In the classic retail model customers buy “hard-copy” boxed software in a dedicated retail outlet, and it is probably still the most widespread distribution channel. In this model, there is no specific targeting of online customers and success of purely online games is low. Moreover, shelf space in this model constitutes a major barrier to entry for smaller independent developers or publishers and large established publishing companies have advantages in this distribution model.

Figure 10. Combined distribution and payment models



Download – selling direct to customers

Selling direct to consumers by enabling them to download the game on the Internet is an option offered by some publishers and developers. However, considering that newest realist boxed games are at least CD data size, 640 Mb, it is a viable distribution model only with widespread penetration of broadband. This distribution model has a number of advantages: it can cut out traditional distribution, increasing revenues for developers and/or publishers. In addition, they can control every aspect of distribution, allowing them to position and merchandise their games more efficiently. Moreover, they do not have to compete with any other products in the channel. Finally, direct distribution allows developers to build a close relationship with customers, who can be used for second time buying and direct marketing.

There are also large hurdles: maintenance and operation costs, hosting and bandwidth costs, uptime, payment transaction security, digital rights management, compression, installers, protecting personal information, customer acquisition and service, scaling traffic, and other issues that would otherwise be handled by distribution partners. The main problem is the cost of raising awareness of a game and/or Web site. With hundreds of new games released every year and millions of Web sites globally, a large fan base or blockbuster titles are needed to attract customers, as they rarely “stumble” onto a Web site. Developers need to spend resources on marketing and advertising to generate awareness or partner with large portals and ISPs to raise awareness for their games. Even more importantly, by adopting this channel the developer is directly competing with established distribution partners, and may begin to threaten their other sources of revenue. Overall, direct distribution can be valuable, especially for testing new games, building awareness of customer preferences, and as a safety net to insulate from fluctuations in external distribution, but it requires investments in marketing and brand creation.

Free cover discs and CD

In this delivery model, which is the inverse of buy at retail and play online for free model, the game software is distributed freely by ISPs, direct marketing, and computer stores (as promotion CDs) or downloaded for free from the company Web site. All earnings come from monthly subscriptions and advertising. With the sale price of a game at roughly USD 20-50 and a monthly subscription fee in the region of USD 13 it is easy to see why the importance of the initial sale is being replaced by the regular subscription cash flow. One shortcoming with this delivery system is that because the game is distributed for free it may not be seen as having any value.

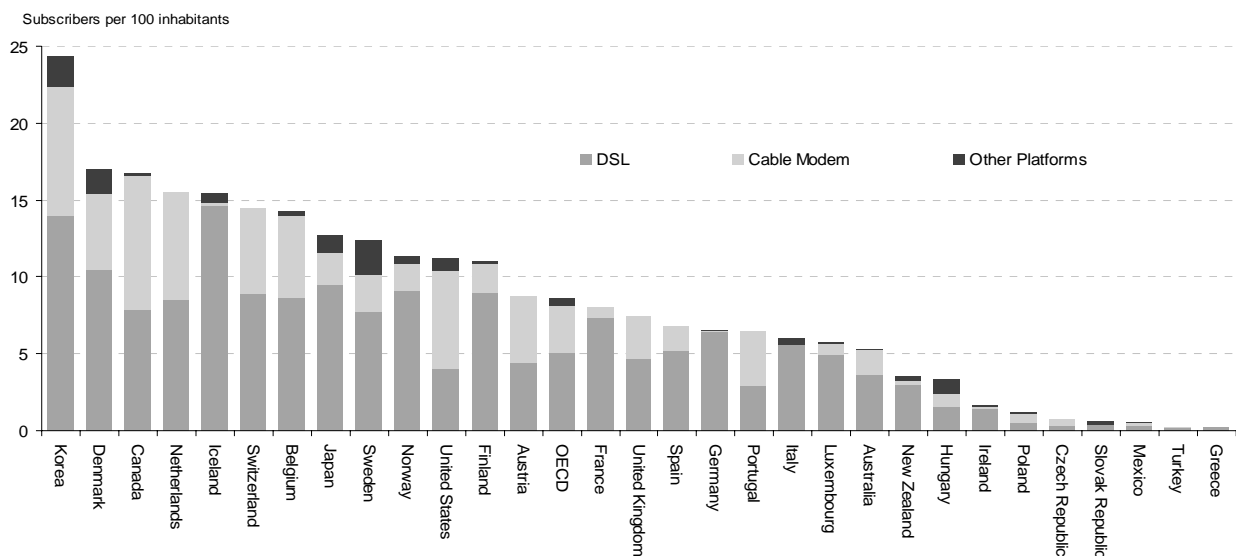
DRIVERS OF THE COMPUTER GAME INDUSTRY

The development of the game industry depends to an important extent upon technology. The spread of broadband provides increasing opportunities in terms of both new distribution mechanisms and potential for new business models, but low coverage and use also defines the limits of the market. R&D and technology developments are of key importance for the industry. Technologies to assure the diffusion of content and content products in general are increasingly R&D intensive (faster networks, multi-platform games, virtual reality animation, etc.). Further, demographics, income and preferences of computer game players will structure the growth and shape of the industry. These are dealt with in turn below.

Technology

Broadband

Broadband¹⁴ is diffusing rapidly. OECD estimates that the global number of broadband subscribers is growing rapidly: there were just over 127 million in June 2004, and over 150 million estimated end-2004, with high growth for example in China. However despite rapid diffusion of broadband infrastructure that will support the development, distribution and use of computer games, penetration varies very widely across countries with broadband penetration (subscribers per 100 inhabitants) high in some countries (15 or more in Korea, Canada and Northern Europe) and lower in some other OECD countries (see Figure 11). However this does not take into account differences in average speed of broadband connections across countries which range from a base of 512 kbps to 20 Mbps (as in Korea). Thus, comparisons across countries need to also take average connection speed into account when analysing potential applications and actual use. Overall, the potential for computer games and online games in particular is growing rapidly everywhere, but broadband density in terms of numbers of subscribers per 100 inhabitants will have important effects on building a critical mass of users, particularly of more advanced applications.

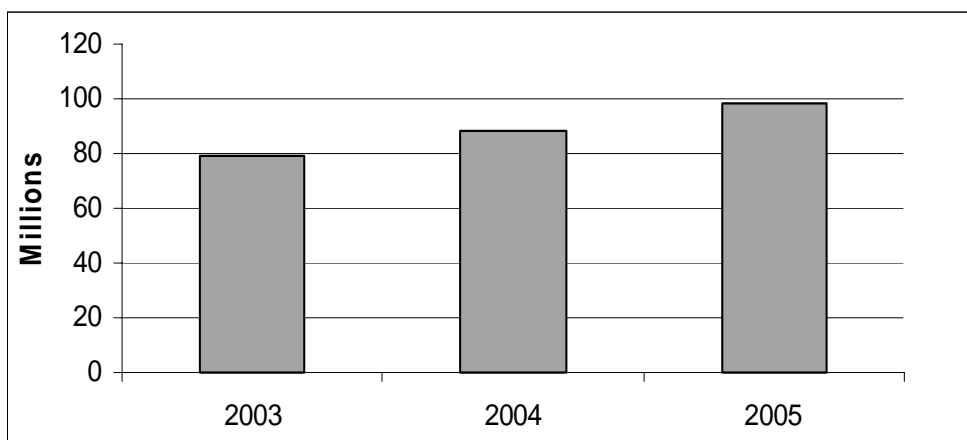
Figure 11. Broadband access in OECD countries per 100 inhabitants, June 2004

Japan, Korea and China all have very large numbers of broadband Internet users, and the online games industry has continued to penetrate the mass-market in 2003 and 2004 (*The Economist*, 2003). High broadband penetration and the spread of Internet cafés gives Korean providers a fertile market for online game development, and Korea has the fastest growing online market with the domestic online game sector profits exceeding USD 50 million in 2003 (IGDA, 2004). The Korean experience confirms the idea that the growth of broadband and the growth of online games go hand-in-hand.

Since 2003 a significant online game market has emerged in China. Driving this growth is a rapidly expanding broadband infrastructure, and additionally China now has at least 40 000 Internet cafés nationwide and appears to be at the development stage Korea attained in the 1990s. Prospects are good for online games – out of 14 hours per month spent online, the average Chinese Internet user spends 8 hours playing some kind of online game (IGDA, 2004).

After a slow start, broadband use is spreading in the United States and total numbers of occasional online players is relatively high. As a result, the online game industry is growing and there were more than 2 million paying online players in 2003 (IDC, 2003). Online games revenues are expected to become 24% of all game revenues in 2006, reaching USD 10 billion (Hong, 2002). The number of European households with broadband more than doubled in 2003 over 2002 (OECD, 2004d) and the number of online game users also doubled in 2003 (Nielsen/NetRatings, 2003). In European countries major online game destinations are portals such as Yahoo, MSN, Wanadoo, T-online and Tiscali. Previously, most sites featured free Web-based games but there has been a significant shift towards paid downloadable content.

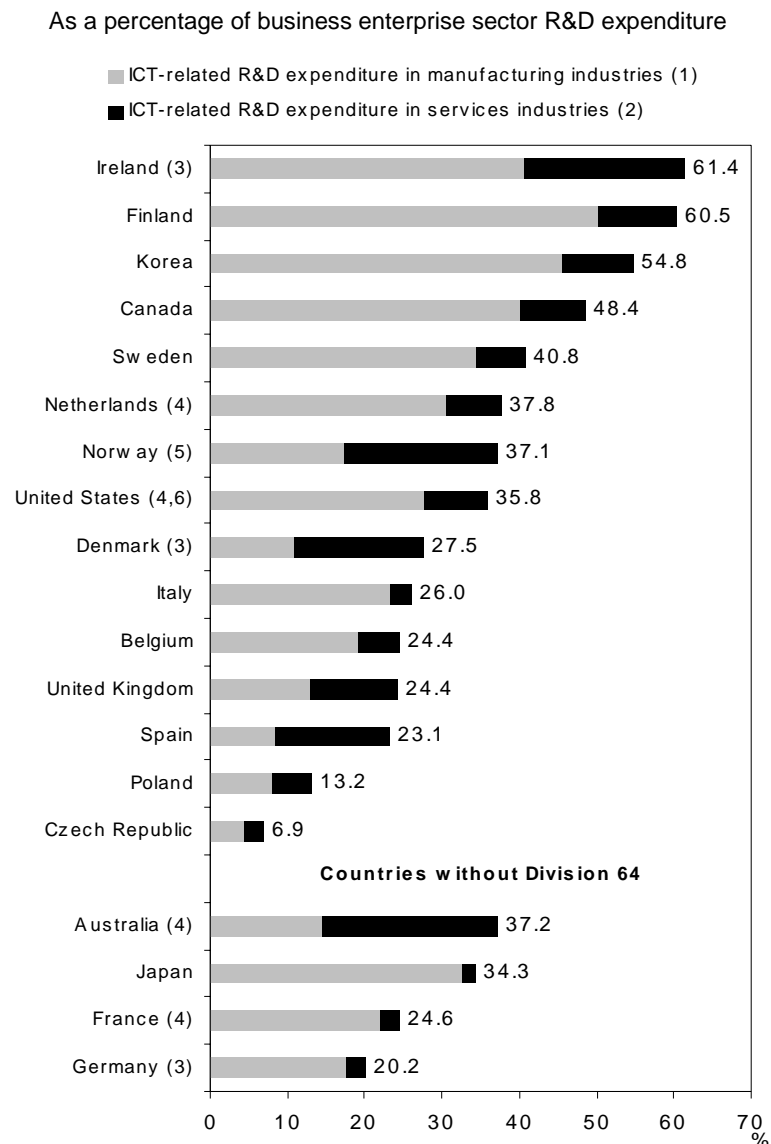
**Figure 12. Number of US online players
Including free and one-time players**



Source: IDC, 2003.

Investments in R&D

Investments in software and related development are important in the online games industry to develop advanced games features building on advances in infrastructure, hardware and software. The ICT industries generally invest heavily in R&D to create increasingly complex and efficient goods and services (Figure 13). Countries with a high concentration of ICT R&D, particularly in software, may be at an advantage in providing the conditions for computer games development. However, there is not an automatic spillover from the relative national focus of R&D on ICT to game development. The most important developer countries (the United States, Japan and the United Kingdom) are not those which are most specialised in ICT R&D. Market size, finance, skills, industry and market structure are important factors. Large software firms in particular invest significantly in R&D; in the period 2000-2002 they were among the leaders in terms of R&D intensity, spending the equivalent of around 15% of total sales on R&D (OECD, 2004d), and games software development firms probably spend a similar proportion of turnover on R&D. This contributes to the industry's dynamism, bringing new developers, improved technology, and new types of games. Computer games are technologically innovative and drive demand for better software, design tools and hardware performance (Mantion, 2003). There are also contrasting trends to both specialise in middleware software production and to use common software tools across different developments (see sections above).

Figure 13. Business ICT R&D expenditure in selected countries, 2001 or latest available year

1. ISIC, Rev. 3 divisions: 30; 32; and 33. 2. ISIC, Rev. 3 divisions: 64, 72. 3. 1999 instead of 2001. 4. 2000 instead of 2001. 5. 1997 instead of 2001. 6. Due to unavailability of data for division 64, class 642 (telecommunication) is included in services ICT R&D as a proxy.

Source: OECD, ANBERD database, January 2004, in OECD 2004d.

Hardware performance and community management

Better processor performance adds game qualities and drives the advance in game design and technology. In their turn, every new generation of games drives the demand for high-end processors and computer power in this chicken and egg computer hardware industry cycle, keeping demand for high-performance computers high. By 2007, Moore's Law predicts that the high-end CPUs will be running at about 20 GHz, that is, six times faster than now. And while some applications, such as truly proficient voice recognition could benefit from such high-speed chips, it will likely be games, and the distribution of game technology to other disciplines, that will benefit most from ultra high-speed chips (Mantion, 2003). Furthermore, improved tools for server and data management will drive computer game efficiency and use.

Demographic factors

This section focuses on demographic characteristics of game users and some of their impacts on the industry.

Who are the online players?

Familiarity and use of computer and video games is widespread. In the European Union one in four individuals play video games regularly. Most frequent players are aged 20 to 30 and play around six hours a week. General knowledge of video- and computer games seems to be relatively widespread. Survey data for Spain in 2000 is typical, showing that more than two thirds of consumers knew at least one videogame, and they tend to be more popular with men than with women (see Table 11).

Table 11. Familiarity with video games, Spain 2000
% surveyed knowing videogames personally

Gender	Many	Some	One or two	None
Male	23	42	15	20
Female	5	36	20	38
Total	12	39	18	30

Source: aDeSe (2000).

The online market can be divided into three segments: intensive, moderate and mass-market.¹⁵

Intensive users

Intensive PC game users are relatively few in number, about 15 million worldwide. They are characterised as typical technology "early adopters", usually male, aged 15-28. They are willing to play any games but prefer more complicated, challenging games. They tend to experiment with new products, at least in the Beta-tests free promotion stage, and are generally more tolerant of technical instability and bugs than the moderate or mass-market consumer. Intensive game users play frequently and regularly, and it is not unusual for them to play more than 20 hours per week. It is the intensive PC game players who have been behind the success of products such as *EQ*, *Diablo II*, and *Anarchy online*.

Moderate users

Moderate game players spend substantial amounts of time and money on games, but are often slow to adopt new technologies/products. It is difficult estimate their number, but some researchers have put them around 25-55 million world wide (Mulligan and Patrovsky, 2003). In some ways, moderate consumers are similar to intensive players: they spend approximately the same amount of money on video and computer games and tend to play as much on a weekly basis. The difference is that they are usually reluctant to get as involved as their intensive user counterparts, knowing that intensive online games use is resource-intensive. Some are concerned that they will spend more money than they think they should, others concerned about spending more time than they (or their parents, spouses, or others) think is psychologically healthy and/or generally prudent. They are often sensitive to monthly subscription price pressure and thus are less likely to stay with an online game unless it works extremely well at launch.

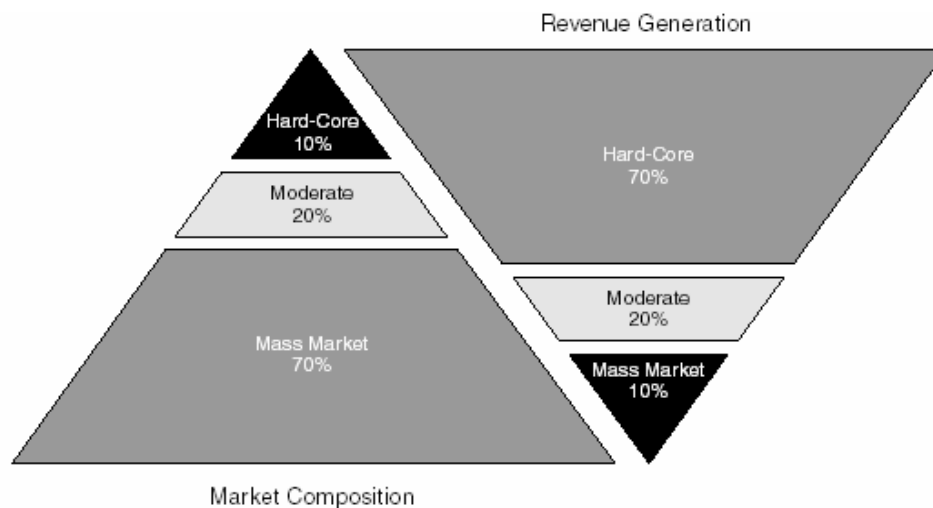
Mass market users

Mass-market consumers tend to prefer playing games that are easy to learn and of short duration such as familiar card, casino and word games. It is estimated that there are 80–170 million worldwide.¹⁶

Revenue streams from different user groups

Intensive players represent about 80% of revenue generation in online games, mainly through monthly or hourly fees. This is despite companies concentrating efforts on developing more accessible content and products that will have greater mass market appeal (see Figure 14).

Figure 14. Online games population and revenues



Source: Developing Online Games.

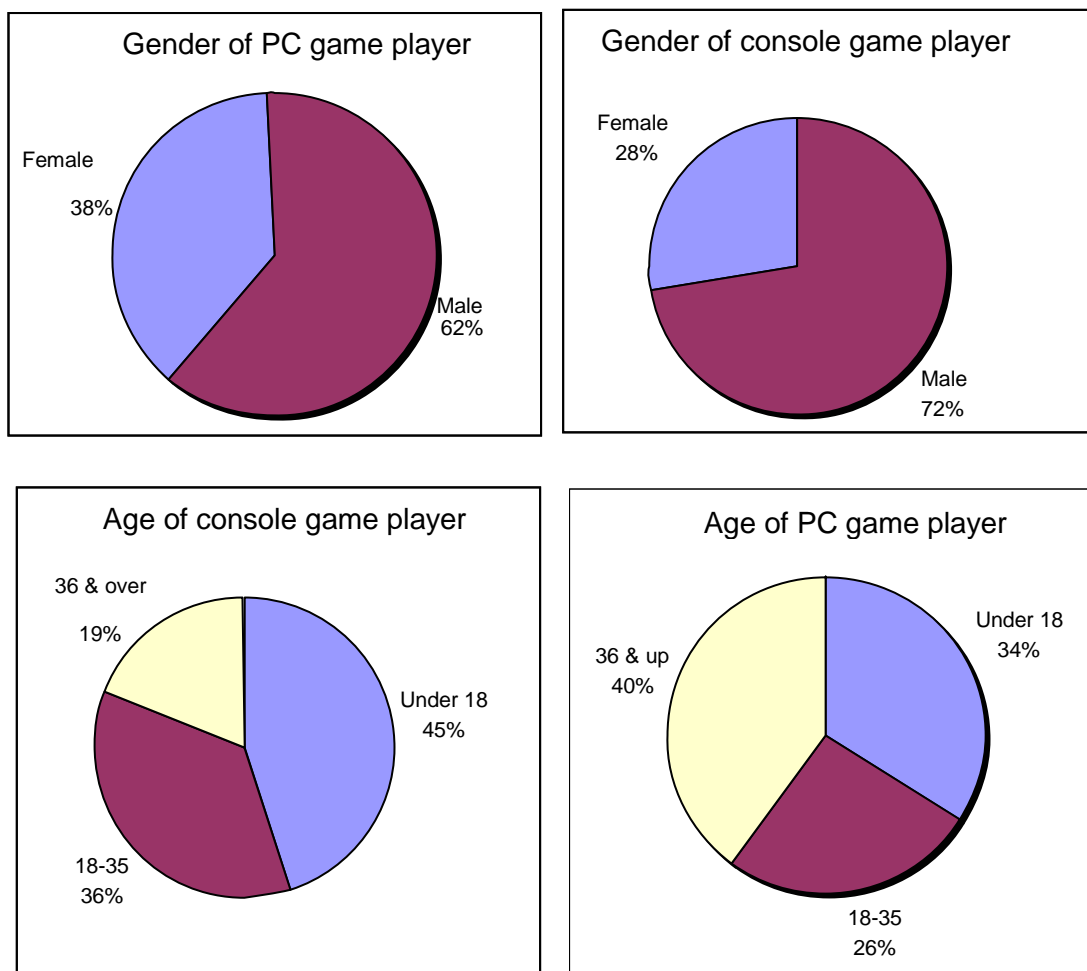
Demographic trends

There has only been about 10–12% movement between the groups, for example only about 10% of the moderate group has moved to the intensive group, either temporarily or permanently, or about 10% of the mass-market group has joined the moderate group. What is more likely is that a mass-market or moderate gamer will test the next higher niche, but remain in his/her market group. The game player market shares may remain the same, but the total overall size of the market continues to grow. There were 330 million Internet subscribers world wide end-2003 and projections suggest these will rise to over half billion by end-2007, and broadband subscribers world wide were over 150 million end-2004 with 133 million in OECD countries, suggesting there is likely to be very rapid growth in game market size (OECD, 2005). Additionally, with the moderate group being double the size of the intensive group and willing to spend approximately the same amount on games, it is becoming the key target of online game publishers. Publishers are beginning to plan their game designs and technology requirements around retaining the intensive group while trying to be more inclusive and to encourage moderate players to at least test-drive the upper-range products.

Two other major demographic trends influence the computer game market. First, players are getting older and richer. The first generation of computer players is now reaching 30 with higher incomes. Second, more women are using computer games (see Figure 15). According to recent ESA data, 17% of game players in the United States are older than 50, and a quarter are women aged 18 and over, although men aged 18 and over were still the largest group, and adolescent *online* players are significantly more likely to be male, with differences much less for adults (Griffiths *et al.*, 2004). The distribution is also strongly platform-dependent. Whereas console games are still more popular with men, women make up 30-45% of the market for mobile games (Haines, 2004a). ESA President Douglas Lowenstein suggested: "With half of all Americans playing computer and video games, the signs point to interactive entertainment as the entertainment choice of the 21st century" (ESA, 2003). Although data on socioeconomic characteristics is

scattered it tends to support the general trends summarised in this section (see Box 5 below). Work to provide better data in Europe is currently being undertaken by ISFE and should be available in 2005.

Figure 15. Computer and video games players by gender and age



Source: OECD based on IDSA 2002 Consumer Survey.

Box 5. Game player characteristics: Information for other countries

Scattered information for other markets corroborates and extends that for the United States presented above. In terms of gender, ELSPA data for the United Kingdom for 2003 suggest that: girls of all ages play less than boys; girls are more likely to play on PCs than consoles; intensive use (over 15 hours a week) is largely a male occupation.

There is some evidence that MMOPRGs increasingly attract women. The three major MMOPRGs (Asheron's Call, Ultima Online and EverQuest) count 20-30% of women players (quoted in Taylor, 2004). UK data suggest that one-half of online game players are women and women also use mobile games (18% of UK mobile players are estimated to be women) (Haines, 2004b).

Information for France also suggests that games are increasingly a leisure time activity across all segments of the population (quoted in IDATE, 2002).

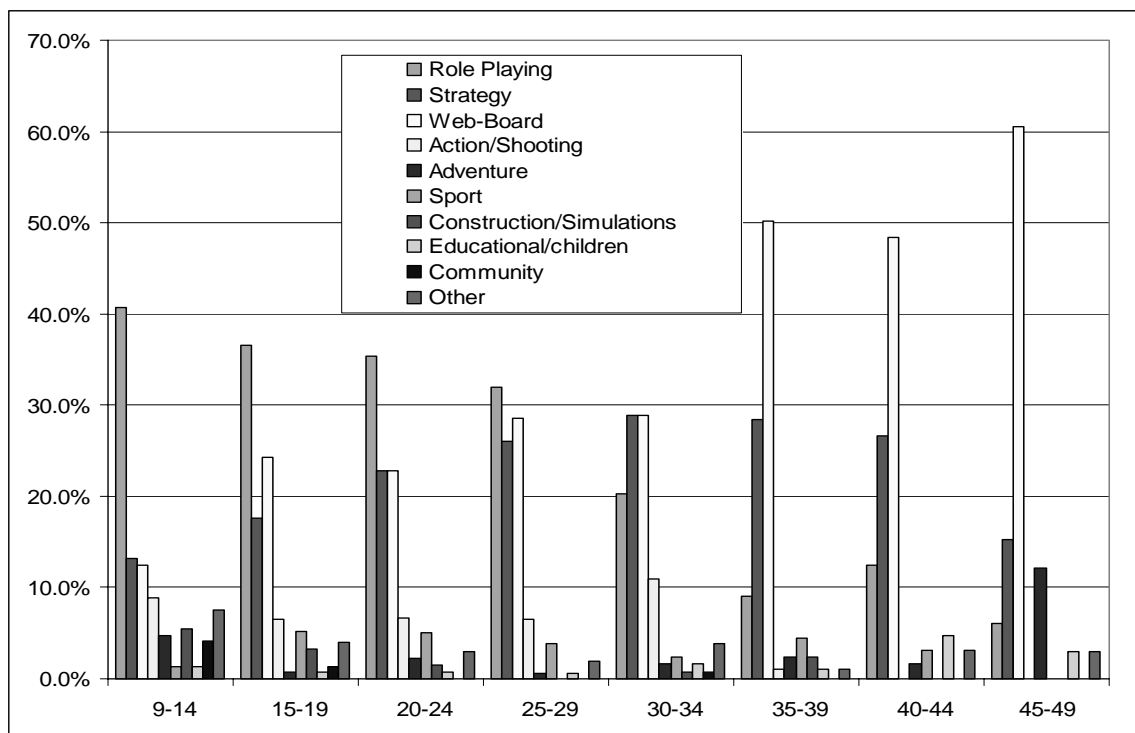
These characteristics have important implications for games development as they suggest that market development will spread to broader population groups, specifically including women and older people. In the search for new markets, the games industry is increasingly interested in increasing female use (quoted

in Krotoski, 2004). For example, the console games market has tended to be male-orientated, but new games have attracted a larger proportion of female players (see Haines, 2004a). A number of factors have contributed, and technological advances and increased broadband connectivity seem to have potential to allow gender-neutral games. These offer different options within one game and player interaction, a factor of importance to women players (Krotoski, 2004).

Mass market penetration: Lessons from Korea

A major challenge for the online game industry is to produce new content appealing to the mass market or at least the moderate market segment. Companies such as Electronic Arts have already released wider-appeal online games (notably *Sims Online*). Other companies have released titles such as *StarWars*, *ShrekII* and *The Matrix online* in an attempt to piggyback on Hollywood blockbusters. The lessons from Korea suggest that diversifying Internet content in conjunction with broadband Internet access increases market participation. For example, in Korea board-type games are over 50% of the computer games played by those over 35 while role-playing games are more popular with the under 35 group (see Figure 16). Moreover, short games that last 1-10 minutes appeal to older people. Most game developers and publishers are still trying to develop games for mass-market penetration building on some of these lessons. Mobile online games developers are also attempting to create mass market content of this sort (OECD, 2004c).

Figure 16. Computer games in Korea by type and age group of players, 2003



Source: OECD based on Korea Game Development & Promotion Institute (2004).

Box 6. Korea: social characteristics and online games

Apart from high levels of broadband penetration, rapid online computer game diffusion in Korea can in part be attributed to some characteristics of Korean culture. The strong emphasis on education and academic performance has prompted parents to turn to the Internet for educational goods and services and this has spilled over into Internet use for other purposes (Kyounglim, Y. *et al.* 2002). There may also be differences in online behaviour across cultures. In Asia, there is a preference for using the Internet for social communication, compared with the United States where the preference is for information search and, to a lesser degree, e-commerce (Chau *et al.*, 2002). These findings are in line with research into cultural differences, where Asians are found to have a high respect for social relationships and shared loyalty (Hofstede, 1994). The appeal of multi-player online computer games can be attributed to their community aspect, lacking in off-line games.

Venture capital

In recent years the largest share of venture capital has gone to the ICT sector in general, representing about 0.3% of GDP across OECD countries from 1999 to 2002. In terms of the distribution of total venture capital, more than half went to ICT in Ireland, Canada, and the United States in this period and the share going to ICT has remained high in 2003-2004 (OECD, 2004d). In Korea over 40% went to ICT, a higher share than in Japan for example (around 30%), and over one-quarter of venture capital in EU countries went to ICT (OECD, 2004d). Although these data can only be used as proxies for the availability of venture capital for the online game industry, they do suggest that important venture financing is potentially available for games software and hardware development.

Spillovers from computer games

Spillovers from the computer game industry include technological spillovers from games into other industries, impacts on education and impacts on learning and social interaction. It provides an ongoing example of the development of new business and payment models which may have applications in other content sectors and the industry is also generating original and copyrightable digital content that can be used in other formats such as movies, books and music, as well as for mobile platforms, home networks and other growth areas (MIC, 2004).

Business, revenue and payment models

Developments in computer games, particularly online games, can also provide important spillovers into other areas of digital content in terms of management and developing revenue streams in two ways. First, large-scale interactive games are difficult to copy (except through server-based piracy) as they are constantly evolving rather than static. Consumers pay to participate in an evolving and participative game, akin to being at a live sporting event or theatrical production and being able to influence the players or actors. These new online business models reduce, but do not eliminate, the piracy problem related to copyright infringement. This experience may be useful to other digital content industries developing new online business models. (See section on “The online model and IPRs” below.) Furthermore, the games industry is faced with considerable challenges in developing payment models, due to the small payments involved for occasional or short-time players and the youth of many players (they may not have credit cards or other conventional online payment instruments). Billing and payment methods developed for this industry will contribute to the wider development of payment systems for digital content, particularly in the challenging area of micro-payments.

Technology

Technology originally developed for games is increasingly used in other applications. Games developments in computer images, graphics resolution, high-speed interactivity, and touch feedback are used in other applications. Many of these technologies had their origins in defence (*e.g.* flight simulators, pilot helmets, etc.) and medical imaging where virtual modelling developed for training and computer

image construction led to developments in game creation. Until recently, this was mostly one-way, with applications developed in more established industries being used in simpler forms in the game industry. However, with advances in consumer hardware processing power this relationship is changing. Games imaging technology has potentially significant use for architecture, design and engineering applications, and games 3D-software in a range of training programmes and medical applications where interactivity is important. This trend is expected to intensify with advances in game software and hardware technology.

Education

There has been growing recognition that games, particularly because of their interactive nature, may provide useful tools for education (KPMG for the Danish Ministry of Culture, 2004). The benefits come from the use of games technologies and experience in devising educational tools, rather than coming from using games devised for non-educational purposes, as there is no strong empirical evidence that critical learning skills from games are “transferable”. In part limited direct effects of games on education may be due to few games so far being specifically developed for education, and commercial games have only limited educational aims (Kerr, 2004b).

However, research on the potential of games to serve as learning tools concluded that “video games have the potential to lead to active and critical learning.” (Gee, 2003). Pilot schemes by the British Educational Communications and Technology Agency (BECTA) have shown that there are benefits from using games technologies in education. Research initiatives on the potential for games to be used in education include: The Education Arcade (educationarcade.org) a consortium of international game designers, publishers, scholars, educators, and policy makers investigating the educational potential of video games (the US MIT’s Games to Teach); the NESTA Futurelab projects in the UK; and the EC-supported Kaleidoscope (Network of Excellence), and the EC mobile M-learning project (see also section in the Policy Framework below). Furthermore, public interest and non-profit groups dealing with public health and humanitarian issues (*e.g.* UNICEF) have developed interactive games to reach the new Internet generation. Web audience monitoring firms do not usually measure non-profit sites so it is hard to gauge the audience size and user impacts of these initiatives.

Social interaction

A number of studies suggest that games may develop particular skills outside of education. There is some evidence that games playing has positive impacts on for example visual and motor skills, with research showing that video games markedly improved a range of visual skills (Green and Bavelier, 2003). Scattered evidence suggests that strategic thinking and relationship building, social integration and some job-specific skills may be developed (Belo, 2004, Logan, 2004). Regarding social interaction, a Spanish consumer survey found that 71% of surveyed games consumers had a preference to play in groups and more than a third believed video- and computer games to be social (aDeSe, 2000). More recent studies found that up to three quarters of players prefer to play with friends and find the social component of games important (VUD, 2004b). Other studies do not confirm that video games contribute to diminishing children’s interest in reading. A study by the German Stiftung Lesen (Foundation for Reading) found no evidence suggesting that game players are less interested in reading (VUD, 2004b).

Finally, there is continuing discussion about the connection between violent games and the tendency to violence in reality. The evidence does not seem to support a definite direct causal connection although the effects of violent games may have their greatest short-term impacts during early adolescence particularly for males. However, it is generally agreed that well-controlled behavioural studies are lacking, particularly for different age groups and for impacts over time for all age groups (Bensley and Van Eenwyk, 2001, Wolock, 2002, Kirsh, 2003, Browne and Hamilton-Giachritsis, 2005). A 2001 report by the Surgeon General of the United States concluded that the impact of video games on violence was as yet

unproved (US Department of Health & Human Services, 2001). A recent review has suggested that the available quantitative literature was all from North America, that there is a small but significant association for younger male children, but that causality and long-term outcomes are unclear, and only weak evidence linking media violence with crime (Browne and Hamilton-Giachritsis, 2005). Further research is necessary, particularly with the rapid evolution of games and game playing and increasing realism and humanisation of games (Williams and Clippinger, 2002), and particularly in countries outside of North America (see for example Kuntsche, 2004 for research in Switzerland showing no direct impacts on violence but indirect impacts). There is insufficient understanding of how media consumption generally, and video games specifically, affect brain processing, learning, attitudes, and behaviour (Anderson and Bushman, 2001).

BARRIERS TO DEVELOPMENT OF THE COMPUTER GAME INDUSTRY

There are a number of barriers to development of the computer games industry including the availability of network infrastructure, particularly broadband, and the enabling legal and payments infrastructure to enable games software to be exploited by producers and used by consumers. There are also skills and management challenges and financing issues on the industry supply side. These are briefly discussed below.

Broadband coverage and latency

Connectivity. All parts of online games are affected by broadband availability, from the use of broadband-based applications for games development and testing, through simple software distribution, game playing, assistance and support, to large multi-player communications-based games. Broadband connectivity is a major factor for the download and/or use of online games and the lack of it is a major challenge. Although broadband is diffusing rapidly – an estimated 150 million subscribers worldwide end-2004 – many countries still have low penetration and high coverage (*e.g.* in rural and remote areas and for some socio-economic groups) is very far from being achieved. Diversity of broadband connection types, especially in Europe, where broadband suppliers and customers initially opted for slower connections and metered time and volume rates, has meant that online content products must be customised for the lowest common denominator; this in turn is a factor hindering development of online computer games. Moreover, low-speed Internet and/or pay-per-megabit connections limit direct-download distribution models.

Latency. Latency is defined as the time it takes for a block of data on a data track to rotate around to the read/write head. It is probably the most important network attribute for delivery of complex online games. Consistent and controlled low latency across the network is required especially for reaction-based, interactive multiplayer games, where network capabilities cannot be a significant factor determining outcomes. Bandwidth is crucial to avoid congestion, which results in high latency and data packets loss. However, bandwidth alone cannot enhance online game capabilities, although it provides the capacity and potential for improved performance. Most games introduced specifically for broadband may require little more than 100 Kbps of actual Internet performance in both directions. Faster connections to access POP servers are important, but provision of a perpetual complex game service also needs assured high performance across all network service elements: the game server, the IP backbone (network) and the network edge (client).

Game market factors

Legal framework. As is the case for all software-related and digital content-based industries, copyright and piracy are important issues for the computer games industry, and because of their impacts on innovation and innovation strategies and cash flow of firms, it is crucial that they are addressed. However, with online video games the industry is developing a business model which reduces the ease of copying as games evolve over time. A further problem may be caused by differences in cross-national legislation affecting software and digital content industries, with firms having to deal with a myriad of different legislative frameworks for copyright and media before they can enter or operate in different markets. This has been seen to be an important factor making it more difficult for European firms to reach critical size (KPMG for the Danish Ministry of Culture, 2002).

Micro-payment systems. The absence of reliable widespread low cost micro-payment systems is seen as a common problem for paying for access or download of small quantities of digital content. For games in particular where young players may not have credit cards and where conventional payment systems are not well-adapted to micro-payments this is seen as an ongoing challenge, for example for pay-per-play business models and consumers who do not wish to make regular subscriptions to a game (OECD, 2004a). Widely accepted flexible payment technologies for small payments are a key for developing the online games market and will facilitate the online games market to reach mass-market customers.

Industry development: Skills and business organisation

Availability of skilled personnel. In the past there have been considerable mismatches between skill demand and supply for ICT skills in general and for software skills in particular (OECD, 2002, 2004g). There may be shortages of designers and programmers specialising in particular areas of game design and development due to rapid growth in demand for such skills, to shortfalls in domestic supply (lack of educational courses, little training within the industry), restrictions on immigration of highly skilled personnel or difficulties in international sourcing of development tasks requiring large amounts of interaction among teams of developers. This can lead to delays in software and applications development, difficulties for small innovative businesses outside major industry centres, or relocation of activities to other countries. Demand for highly specialised skills is expected to intensify as the complexity of games grows and if the life cycle of game generations shortens and requires more sophisticated design capabilities. Demand for specialist games skills has continued despite the decline in demand for IT specialists after the 2000 boom and more universities and colleges adding courses on computer game design and technology to their curricula (Fries, 2003). Lack of skilled personnel due to inadequate training programmes is seen by the Spanish Software Entertainment Association as a major barrier to development, and analyses for the Irish industry have seen skills availability along with access to funding as key issues (Forfás, 2002, 2004).

The share of female employees in the industry is relatively low. For example, only 16% of the computer game industry's workforce in the United Kingdom is female, the lowest for media industries (Skillset, 2004). Additionally, most of women in the game industry do not work in game creation but are involved in administrative, marketing or managerial occupations. The low level of female participation in the industry may be a barrier to providing a broader focus on female concepts and content. Recognising the value of greater employee diversity, a number of firms have started to increase the share of female creative employees (see Haines, 2004a and 2004b for further details). With an increasing number of games of interest to women, this may also naturally result in a rise in interest among women to join the industry. Nevertheless, since the 1980s there has been a community of female developers some of whom have been particularly important in the design of games of female interest (Krotoski, 2004).

Management and organisation. Management skills, organisation and information flows have been seen as impediments to growth. The industry is fragmented in many countries with separation between different parts of the software development and hardware and infrastructure parts of the value chain. For example, the Spanish Entertainment Software Association has highlighted management and organisational challenges in the domestic industry, particularly poor co-operation between creative and industrial segments, which threatens an outflow of creative potential. Similar concerns were raised in a report for the Danish Ministry of Culture (KPMG, 2004) stressing the importance of co-operation in the industry. Forfás (Ireland) has also emphasised the need for further enhancing contacts between different industry participants in order to have better information exchange.

Financing issues

Financing issues are seen as important in the industry. Despite the important share of venture capital going to the ICT industry in general and the potential to benefit from R&D support finance (provided that games software development qualifies as R&D) is seen as an important barrier to development (see *e.g.* Forfás, 2004). This is in part due to the intangible nature of the product (games software and graphics), which means that the usual financial institutions may not wish to finance development. It is also due in part to the structure of the industry where games publishers and games portals may wish to have partly or fully developed products before signing contracts with developers, which places the financial burden on small firms with only one or a few products and a short track record. These challenges are even more acute for firms attempting to enter international markets. Concerns of these kinds have been raised by the Spanish Software Entertainment Association. The German Entertainment Association has also pointed out that the videogame industry has not yet been recognised as of similar economic potential as other entertainment sectors and does not benefit from the tax treatment accorded to those sectors (VUD, 2004).

POLICY FRAMEWORK

The game industry has received increasing attention from governments, industry associations and educational institutions. This section describes aspects of the policy framework affecting the industry. Industry support has aimed at R&D and technology development, and in some cases at more general business functions (information, market development) and skills development. IPRs and piracy issues are of continuing concern. Policies affecting online business conditions range from broadband quality and coverage, micro-payments, standards and taxation issues. Given the social dimension of this industry, issues such as culture and age ratings and the use of games developments in education also receive attention.

Industry development

The games industry is highly R&D and investment-intensive in areas such as software, platforms, and infrastructure, in areas such as 3D graphics and digital animation. Policies to support industry development have addressed R&D and innovation, and broader measures for example to encourage industry creativity and networking. However, in most countries it receives relatively little in the way of sector-specific development subsidies.

R&D and innovation

All OECD governments provide general tax incentives to R&D (current year write-offs, R&D tax credits, etc.) that could in principle apply to R&D for games hardware, software and infrastructure. Computer and video game development is R&D intensive with as much as 30-40% of game development costs being attributable to R&D and innovation, but in many countries it is unclear to what extent game development is considered as R&D to benefit from R&D incentives (Fries, 2003, Forfás, 2004). For example, in the United Kingdom, the R&D tax incentive scheme applies to game development but it is difficult to determine to which aspects, and one of the aims of The Independent Game Developers Association (TIGA) is to achieve clarification and expansion of definitions in the R&D tax scheme. There have also been moves in some countries (Japan and Korea for example) to encourage collaborative and cross-platform software development.

The French game industry received early recognition of games as artistic products, and since 2002 firms have been eligible for financial support through the *Fonds à l'aide économique du multimédia* (FAEM). A EUR 4 million fund goes to prototype funding, consisting of interest-free loans repayable only if a publisher buys the prototype. The government is contemplating moving to more general tax incentives and similar moves are contemplated in Germany (Kerr, 2004a, Behrmann, 2004). The UK Department of Trade and Industry provides smart funds to support innovation, but this support is not specific to the games industry (Kerr, 2004a).

The Korean government has given priority in the games area to development of online multi-platform game engines as well as other core technologies such as 3D computer graphics (Ministry of Information and Communication, 2004). Other policies have included the opening of a "Game Institute" in 2000, which serves as a distributor of core technologies, and plans to facilitate development of next generation game technologies and improved co-operation among research facilities and institutes. Technological

development in Europe is funded by general European technology research and development programmes as part of the various EC Framework programmes.

Some governments have set up awards to encourage creativity (*e.g.* the Korean game contests “Best Games of the Month”, “Korea Game Grand Awards”, etc.). These may also encourage development of games with educational or other objectives. The industry has been active in creating awards and other events, and there are plans to introduce game quality certification. Other countries are developing similar approaches including for example the Edinburgh International Games Festival ‘Edge’ awards.

Business support policies

The Korean government has identified the game industry as of strategic importance since the reform of the Sound, Records, Video, and Game Products Act in 1996. The objective in the IT839 Strategy is to transform Korea into one of the five major providers of online games and mobile content by 2007, notably also by creating a global brand “Game Korea” (MIC, 2004b).

Other governments have also adopted policies to support the online games industry as part of support for digital content industries. Ireland adopted the 2002 Digital Content Strategy, which supports the industry particularly through R&D programmes, establishment of a specialist venture capital fund, and IP protection. The games sector was identified as a key sub-sector and a number of critical issues specific to the games industry were identified, notably access to funding and skills (Forfás, 2002, 2004). The UK government adopted the Digital Content Sector Action Plan for Growth in January 2000 to outline possible strategies to support these industries, using for example competitiveness analysis of the UK games software industry (Spectrum for DTI, 2002). It also launched the Digital Content Forum (see below). New Zealand’s government has taken steps towards supporting the industry with the creation of a Design and Screen Production Taskforce following the Growth for Innovation Framework.

In Canada the CAD 30 million Multimedia Fund ran from 1998-2003 with funding for different parts of the multimedia value chain, including development, production and marketing assistance.¹⁷ Although industry associations such as the regional LyonGame or the UK’s TIGA do not generally provide financial support themselves, they have an important role in advising companies on existing specific or general support programmes and other sources of funding for games developers. In the context of regional development the European Union has also taken a role in encouraging the development of the game industry. It has for example partly funded Game Republic, an independent trade alliance supporting the computer game industry in the Yorkshire and Humber region.¹⁸ The aim of this association is to offset difficulties encountered by small game development companies (Kerr, 2004a).

Networking and information exchange

Governments and industry associations have initiated programmes covering technology and wider business development networking. Finland’s Tekes’ Fenix Interactive Computing National Technology Programme 2003-2007 is designed to contribute to long-run competitiveness and know-how of the interactive computing industry. In November 2003 the programme established a working group specifically on game and entertainment applications. A particularly interesting aspect of the project is that it covers a broad group including research institutes, private firms and organisations, recognising the importance of the combination of artistic, technical and social inputs.

The UK Department of Trade and Industry (DTI) has also sought to promote networking through the Digital Content Forum, bringing together trade associations and membership bodies from across the digital content industries, to work together with government on industry issues.¹⁹ Further, the DTI supports the

UK Games Forum and TIGA to actively encourage information exchange. Ireland also identified the importance of encouraging networking in games industry development (Forfás, 2004).

Market research and assistance

Industry associations have an important role in conducting market research activities and providing a broad range of information and training to assist member firms. The US Entertainment Software Association (ESA) for example is acknowledged for supplying industry data and market trend information. The association also conducts surveys on consumer usage, preference and other relevant fields. The Japanese Computer Entertainment Supplier's Association (CESA) conducts research on the industry. Governments, *e.g.* the UK Department of Trade and Industry have also played a role in providing market analysis to identify policy action (Spectrum for DTI, 2002). Industry associations are increasingly involved in assisting member firms. For example TIGA provides information on specific game company insurance schemes and provides a best practice handbook on a number of industry issues, and the ELSPA and Screen Digest reports are further examples of industry information services.

Some countries have policies to promote their games industry internationally. Korea has been particularly active, for example, via policies that facilitate developing foreign language versions of games and establishing a co-operative network of foreign game distribution and production companies (Korean Ministry of Culture & Tourism, 2004).

Trade fairs have a general importance for interchange of information and meeting industry participants as well as their export-promotion function, and governments can take a supportive role in specific game fairs. For example, in order to promote exports of its computer industry the UK Department of Trade and Industry supports UK representation at E3 (see below), and Multimedia Victoria, a State Government agency, is the main supporter of the Australian Game Developers Conference.

Industry organisations actively promote the industry via trade fairs. The US ESA organises the Electronic Entertainment Expo (E3), which is the most important fair of the interactive entertainment industry, and is a place for information exchange through workshops and seminars.²⁰ The Japanese Computer Supplier's Association (CESA) is involved in organising the Tokyo Game Show, an important trade fair, and the German Entertainment Industry Association (VUD) organises the annual GC – Games Convention designed to promote sales and interchange between different industry participants with an online game developer conference, the GCDC.

Skills and training

ICT skills have received continuing attention in all OECD countries and are among the top priorities in ICT policy, both at specialist level and at general user level. A pool of qualified personnel is a key element for the game industry, and although software and related ICT-skills are widespread, games skills are to some extent specific to the industry requiring a mix of advanced technological skills, creativity and specific knowledge of online games.

Most specialist games ICT skills are not obtained from formal university or tertiary institution degree courses. This is in part due to the difficulties involved in implementing change in educational systems and in part due to the rapid changes in specialist skills requirements compared with very long lead-times to change formal tertiary courses. Furthermore, in the domain of high-skilled software most skills are not acquired in formal education but usually on the job or in firm- or sector-specific training programmes (OECD, 2004g). Large firms often have training programmes to address current skills needs and to improve their internal software development processes. They recruit experienced programmers or new computer science graduates and provide their own practical training courses. The Electronic Arts

University is a good example, providing software engineering courses and programmes in their various studios.²¹

This does not, however, mean that the industry will solve all skill development requirements. Smaller firms may find extensive in-house training too costly if it covers a wide range of specialist skills. Also there may be insufficient training for the industry because employees can leave individual companies after training. To tackle these issues the Korean government has developed a formal game industry education programme. The “Game Academy” provides two-year educational courses as well as short-term improvement courses in game design, programming and related areas and produces 250 game specialists annually. This strategy was further strengthened in 2002 with the introduction of a certification system to evaluate qualifications of game industry technicians (Korean Ministry of Culture & Tourism, 2004). Korea further seeks to attract top educators in foreign countries, and plans international exchange programmes.

Other countries have also started to provide tertiary programmes or have identified skills and job training as key issues for industry development (Forfás, 2004). For example in the United Kingdom there are approximately 22 universities offering 72 degrees/courses in games. This proliferation of courses of various qualities has prompted the UK Department of Education and Skills, Skillset, the sector council for UK audiovisual industries, and bodies such as TIGA to call for industry accreditation of university games courses (Kerr, 2004a). To support the game industry in France, the *Ecole nationale de jeux vidéo et des médias interactifs* has been created at higher education degree level in Angoulême, with first enrolments in September 2004 (Kerr, 2004a). In France as in other countries there are numerous media and multimedia courses which may provide raw graduates for the industry, along with specialised computer engineers.

Issues related to gender inequality in the game industry reflect a more general issue of womens’ professional training (OECD, 2004g). An important prior step will be to raise interest in technologies and the use of ICTs. A number of policies have been implemented, e.g. the e-skills UK initiative to offer Computer Clubs for Girls (CC4G) or its ITBeat scheme designed to encourage girls to rethink their attitudes to careers in information technology. Another local example was the competition by Wired Sussex, first run in 2003, to encourage teams of girls to produce a game design outline (Haines, 2004a).

Intellectual property rights

A challenge for the games software industry is developing effective intellectual property rights protection which does not stifle new business models and diffusion of information. New technology and Internet access open new markets and support development of these markets, but they also permit unauthorised copying of material. Developers and publishers incur significant development costs for new products and it is important to be able to recoup these costs through sales.

With respect to quantitative losses due to piracy, ESA estimated worldwide costs to the United States entertainment software industry at over USD 3 billion in 2001, not including Internet piracy. A 2004 pan-European survey showed that one half of video game players reported that they had obtained a copied or pirated video game, and copied games for PCs and PlayStation2 are the most common (ISFE, 2004b). The German Entertainment Industry Association (VUD) emphasises that piracy is a significant problem for the industry in general and in terms of potential job creation.²² The Spanish Entertainment Association also highlights piracy as a priority for its 2004 policy projects (aDeSe, 2004). However, not all consumers see copying as an illegal activity. For instance, an early consumer survey in Spain found that more than half of those surveyed do not believe that purchasing illegal copies is an illegal activity, and a similar number were of the opinion that the game industry was not significantly hit by piracy (aDeSe, 2000). A more recent pan-European European survey of video game players and purchasers showed that over half (57%) of respondents agreed buying pirated video games is a crime, and two-thirds that pirated games damage the industry, but just over one-half (53%) nevertheless thought them good value for money (ISFE, 2004b).

Legislative action

Copyrights are protected and enforceable in over 100 countries that have signed the Berne Convention, other WIPO Agreements and the TRIPs Agreement. For those countries, the game publisher should enjoy protection as stipulated under national copyright law. According to industry associations, ratification and enforcement of the WIPO Internet Treaties is a necessary part of protecting games-related copyrights. OECD countries have been particularly active in their quest to raise and to meet higher international standards for copyright legislation.²³ Also, many countries have started to review their legislation on IPRs as part of their general IPR strategies. As part of the Korean supportive strategy there is also a focus on intellectual property rights.

Given their concern for property protection, industry associations are particularly active in seeking co-operation with governments to implement and enforce IPRs. The US ESA is active in collecting piracy, economic impact and enforcement information and statistics from member industries to support policies. Part of this also consists in identifying countries where IPRs are not adequately protected. The ESA also stresses the importance of effective co-operation with ISPs for the removal of unauthorised material.

Measures adopted by producers

The first response of the industry was to have security features built into game software and hardware as *keys* that required the physical existence of the original CD to play the game. Until recently this was a frequently used device (ISFE, 2002). However, technologically literate consumers have found ways around such protection and it is difficult to envision these solutions as truly long-term without strong legal protections against their circumvention. Such legal protection, required by the WIPO Internet treaties, is just coming into force in many countries. Other steps taken by industry associations have been to support IPR enforcement. For example the ESA has worked together with government agencies for enforcement and has included training and educating personnel responsible for implementation. In Spain the industry has set up the *Federación para la protección de la propiedad intelectual de la obra audiovisual* (FAP) to focus on enforcement, and to raise social awareness of problems raised by piracy (FAP, 2003). There may also be issues regarding collection of fees due to author's rights in this new and rapidly evolving area, similar to challenges facing collecting societies in the music industry.

The online model and IPRs

There is a marked contrast in the significance of piracy between online computer games and other entertainment industries, for example the music and movie industries where products are "static" and will not change from when they are downloaded. Online computer games are evolving games with game conditions and players' positions changing over time. In major online games two-thirds of the necessary programming remains on the server, and making a full identical copy is impossible due to the constant evolution of the game. It has thus been argued that piracy is less of an issue in online games. However, according to the ESA, server-based piracy – unauthorised access or copying of content located on servers and in some cases hosting by another entity that delivers the game – is an emerging challenge. In the absence of server-based piracy, in some ways the online computer and video game industry has found an effective way to overcome traditional problems presented by piracy of individual game copies. However, an important part of the online industry still relies on selling static downloadable games, which can potentially be copied, as does the traditional boxed game producers, and they do not benefit from the constant evolution of complex online games.

A further question with regard to IPRs arises for games where players can produce their own modifications using editing tools provided. This increasingly used feature raises questions as to how existing intellectual property laws will accommodate emerging issues of user production rights.

Online business conditions

Broadband policies

Broadband access for users is an important pre-condition for the growth of online games. All OECD countries have pursued or are pursuing active broadband development policies, mostly focusing on infrastructure development and promoting network competition, to ensure widespread broadband diffusion with particular focus on disadvantaged segments of society and regional equality. For online games it is increasingly important that broadband provides high capacity upstream as well as downstream, low traffic congestion and high reliability. The *OECD Recommendation of the Council on Broadband Development* (OECD, 2004h) recommends government action to encourage the wider diffusion and effective use of broadband services. The rollout of broadband has been largely driven by the business sector and by network operators, and this has provided major impetus for the development of increasingly complex online games and modifying established value chains and supporting new business models. These notably include the entry of ISPs and network operators into the value chain as new intermediaries replacing former distribution functions.

Micro-payments

The development of practical micro-payment infrastructure is an important factor for the development of the online game sector. Rather than relying upon subscriptions, a pay-as-you-play option based on micro-payments may well increase the number of players. Various online payments options are currently available, but systems for very small (less than USD 5) international payments require development (see OECD, 2004a). A European Commission study by the Institute for Prospective Technological Studies concludes that “Further European action needs to be taken here, and the financial infrastructure must be developed in such a way as to support growth, innovation, competition and new entrants (guarding against anti-competitive effects)” (Bohlin *et al.*, 2003). With the E-Money Directive in 2000, the European Union had already taken a step in this direction, as the Directive sought to provide lighter regulatory provisions for “Electronic Money Providers” in contrast to the provisions banks faced. This sought to encourage new entrants that may become important in micro-payments such as PayPal and telecommunication service providers. The latter, in particular, with their experience in micro-payments (phone calls) may be able to develop further options for micro-payments. With the growing complexity of mobile games, service providers will have to rely upon third party content producers, who may further develop their position as micro-payment providers. But much will depend upon the value chain positioning of service providers and other factors such as the legal context in which they operate.

Taxation issues

Tax policies can significantly influence the development and uptake of content, including games content. As content developers and distributors look to global markets, managing the variety of taxation regimes can become costly. In the EU electronic services downloads are subject to Value-Added-Tax (VAT), regardless of where the selling company resides. The European Union implemented the VAT Directive in July 2003 removing tax on exports of electronic services and, at the same time, requiring collection of VAT on electronic services imported into the EU by consumers from suppliers outside. In order to facilitate collection of VAT on these imports the EU followed a recommendation in a 2001 OECD report by allowing overseas suppliers to use a simplified online system of registration, reporting and payment. Non-EU companies can register in the EU country of their choice for purposes of collecting the VAT. In the United States, the Federal government has not determined whether similar downloads are taxable.

At international level, the OECD has addressed issues arising with regards to consumption taxation of cross-border electronic commerce. The 1998 Ottawa Taxation Framework Conditions provide that consumption taxation of cross-border electronic commerce should result in taxation in the jurisdiction where the consumption takes place. Whilst preserving tax neutrality, this raises practical difficulties in ensuring collection of consumption taxes on cross-border business-to-consumer transactions of electronic services and intangible products (OECD, 2001b and 2003f). Collecting consumption taxes directly from the consumer is not efficient given the administrative difficulties. For cross-border supplies of goods (a far greater trade than for services and intangibles) the problems are much reduced, as Customs administrations are able to ensure collection of any consumption tax due before releasing the goods to the customer. Unaccounted (*i.e.* untraceable/ anonymous) payment systems could pose even greater problems for tax administrations.

At a different level, German developers have proposed a plan for a "separate surcharge" on sales of computer games in Germany to "promote the production of computer games at the national level". Designed as an amendment to the film law, this plan is inspired by the support system for the French film industry. The VUD trade association is currently examining the political and legal dimensions.

Standards

The lack of standards across PC and mobile platforms is seen by games developers to present significant challenges, particularly regarding interoperability, testing and international expansion. There are also considerable lock-in effects due to the development of *de facto* standards, developed *e.g.* by console manufacturers. Under competitive conditions they have large market incentives to have developers to develop unique games for their particular hardware (which is expensive for the developer) and not to spread the game to other systems, thereby locking-in developers to particular hardware. There are also important standards and interoperability issues which are not specific to the game industry including in the areas of broadband and payments (see sections above).

Competition

In general it is important to create contestable markets to permit consumers to purchase products at competitive prices, and that control over parts of the value chain does not unduly restrict new entrants, or reasonable and non-discriminatory access to distribution channels or technology. Areas of concern have been the functioning of the game console market and its domination by three hardware suppliers, and the growing power of large publishing houses and technology owners associated with the rising cost of producing off- and online computer games. This has been identified as potentially affecting independent content developers that are one of the weakest parts of the value chain (Fries, 2003). In addition, the growing importance of brand names and game titles combined with vertical integration suggests that market leaders may use bundling or cross-platform subsidy strategies to pre-empt competition (see also Kerr and Flynn, 2003, and Williams 2002).

Social issues

Given their increasing importance as a leisure activity, social issues related to games are of increasing importance, including cultural and language issues, education and age rating issues.

Culture and language

Culture and language issues are seen as important in the development of digital content including games content, particularly for small countries and cultural minorities, and there is significant government support for local content development. Many European countries financially support content development that is relevant to the games industry. Government support ranges from sponsorship for local content providers at industry events, sponsorship of local or regional forums and fact-finding missions to raise local firm competitiveness, to government support to develop local content. There are EC-funded support programs for audio-visual content, with Media Plus supporting production of European content. The EC's eContent programme for the period 2001-2004 aimed to support the production and use of European digital content as well as promote linguistic and cultural diversity on networks, followed by the eContentplus programme 2005-2008 to tackle the fragmentation of the European digital content market and improve the accessibility and usability of geographical information, cultural content and educational material. The first had a budget of EUR 100 million and was an application of the eEurope Action Plan contributing to "stimulate the use of the Internet", and the second a budget of EUR 149 million. In Japan, CG-Arts and the government funded *Toward a Culturally-Oriented Nation*, and the Japan Arts Fund and Arts Plan 21 provide financial support for performance expenses. The Canadian government provides funding to cultural institutions to hire new media graduates to produce digital content.

Games technology in education

There is increasing recognition of the potential of games software and technologies in education because of their interactivity, advanced graphics and visual features. For instance, there is positive evidence in support of games in education provided by BECTA. However, so far there have been few specifically developed advanced game applications for educational purposes and the lack of multiple-station licensing hinders development. The German *Kinderhilfswerk* has stressed the potential and lack of progress in the education system of use of computer software generally, including game software.

A number of public agencies have initiated programmes investigating games for education. The British Educational Communications and Technology Agency (BECTA) is conducting research into potential learning opportunities of games technology,²⁴ and the Institute of Education at London University is investigating how games can be integrated into media education and related areas. Some of the projects have been actively supported by the UK Department of Trade and Industry, and in some educational projects computer games are already used in class alongside traditional material (BBC News, 2004b). Korea has created awards and competitions specifically for educational games and awareness programmes that highlight the educational potential of games to increase demand and thus their creation.

Content issues and age ratings

There is an ongoing debate on the impacts of violent games on behaviour, and as with other forms of published content the question of the limits to freedom of expression arise in areas where games are used to promote racist and other defamatory content.²⁵ Laws in a number of countries including Australia, New Zealand, Germany and Brazil outlaw some games, and the game industry is taking increasing steps to reduce the circulation of violent games, introduce self regulation age rating systems, and promote culture- and arts-based content (Interactive Digital Software Association, 2001). Furthermore, with platform and media convergence, concerns for example with TV advertising and associated regulation are extending to other media, including games (de Cockborne, 2004).

Age rating: National systems. Rating systems are important to ensure protection of minors from content judged unsuitable for their age, and particularly in the light of increasing evidence that parental selection and monitoring is significantly associated with games impacts on behaviour (Gentile *et al.*, 2004).

Recognised clear rating systems allow protection of minors without raising post-production costs to producers. A number of countries have focused on providing age rating systems. In Korea there is a rating classification system for online and mobile games. The Korea Media Rating Board officially began rating online games in April 2000 and without such a rating, a particular game cannot be sold in Korea. In the United States the Entertainment Software Rating Board (ESRB) is the applied rating system for computer and video games in terms of age appropriateness and content. Since its establishment in 1994, games by more than 400 software publishers have been rated under this system.

International co-operation. There are efforts to develop trans-national rating systems and such efforts are particularly important for online games that can be accessed from any country. Apart from age and content considerations, different rating systems may incur substantial costs to companies operating internationally or coming from or attempting to enter small national markets.

The cross-national European age rating system PEGI (Pan European Game Information) is an entertainment sector classification system built on different cultural requirements in 16 European member states. The standard has been developed by the Interactive Software Federation of Europe (ISFE) since May 2001 (see Box 8), and since 2003 it has been possible for videogame developers to implement the standard on a voluntary basis. By end-2004 over 2 400 games had been rated with almost 1 100 being PC games, and a labelling system for dedicated Web sites was being developed (ISFE, 2005). The ISFE works with national industry associations to increase adoption of the standard. For example, a major objective of the Spanish Entertainment Association is to promote adoption of PEGI. The association has worked with the National Consumer Institute (*Instituto Nacional de Consumo*) for broad diffusion of the new rating system and via agreements with specific videogame industry journals and principal games retailers to increase the level of adoption (aDeSe, 2004b).

Box 7. The role of industry associations: The Interactive Software Federation of Europe (ISFE)

ISFE was established in 1998 by national interactive software trade associations in the UK, France, Germany and the Netherlands to represent the interests of the interactive software sector. Subsequently ISFE extended its membership to any group representing the industry, based in the 15 EU member states plus Norway, Iceland and Liechtenstein. Most major interactive software publishers have joined ISFE, and the remaining interactive software trade associations in Europe are expected to follow. Its role is: *i*) creating industry awareness - highlighting the economic and cultural value of the sector; *ii*) protecting minors/information to consumers – providing EU consumers with consistent information on the content of games and their suitability for different age categories; *iii*) anti-piracy – informing and educating EU consumers about piracy, and promoting anti-piracy measures within the European industry; *iv*) research/market data – gathering, processing and communicating market data about the industry. Most countries have one or more national associations with similar aims, and there are also regional support organisations such as Game Republic, an independent trade alliance for video game development in the UK's Yorkshire and Humber region, and France's LyonGame, supporting the industry in Lyons.

ANNEX 1. ABBREVIATIONS

aDeSe – Asociación Española de Distribuidores y Editores de Software de Entretenimiento

BECTA –British Educational Communications and Technology Agency

DTI – Department of Trade and Industry of the UK

ESA – Entertainment Software Association

FAEM – Fonds à l'aide économique du multimédia

FAP – Federación para la protección de la propiedad intelectual de la obra audiovisual

IDSA – Interactive Digital Software Association

IGDA – International Game Developers Association

ISFE – Interactive Software Federation of Europe

KGDI – Korea Game Development and Promotion Institute

MIC – Ministry of Information and Communication Republic of Korea

MMORPG – Massively Multiplayer Online Role Playing Game

PEGI – Pan European Game Information

TIGA – The Independent Game Developers Association

VUD – Verband der Unterhaltungssoftware Deutschland

ANNEX 2. STATISTICAL DEFINITION OF THE COMPUTER GAME INDUSTRY

The computer game industry, and especially the online computer game industry, has received little statistical attention. Computer games are both software and entertainment, making them difficult to classify mutually exclusively, and the software and entertainment industries are evolving rapidly and are complex to classify. As computer games go online they will be included in communications services (for access services and if subscriptions are paid to services operators) and in online retail sales.

In current international definitions, the software industry produces a homogenous product with no distinction between different types of software, apart from *e.g.* the System of National Accounts distinguishing between packaged (standard), custom, and own-account software. In activity classifications (ISIC, NAICS, see Table 12) software (presumably including games software) is classified as being produced by computer and related activities, it is separately identified in software publishing, and it also appears in games and toys retail activities (*e.g.* games consoles hardware and pre-recorded software). Online games activities are not separately identified. This potentially leads to overlaps in some sub categories and exclusion in others. In private sector classifications account is usually only taken of the product's place in the value chain (*e.g.* publisher, consultancies, etc.).

Table 12. International definitions of software and computer games

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

Thus there is no official statistical separate identification of the computer games industry or the online computer game industry, and a paucity of data from both official and private sources. Data in this report are drawn from different entertainment or software industry sources. Harmonised national and if possible international statistics will help future analysis (Eivind, 2004, Kerr, 2004a).

ANNEX 3. SELECTED COMPUTER AND VIDEO GAME M&As: 2000-2003

Target	Acquirer	Date	Value million
TDK Mediactive Publisher of interactive entertainment software	Take-two interactive	Sep-03	USD 22.7
Sega.com Online multiplayer game technology platform	Nokia Corp	Aug-03	n/a
Hachette Digital Presse	Future Network plc	Mar-03	USD 4
ValuSoft, Inc Interactive entertainment	THQ, Inc	May-02	n/a
Z-AXIS Game developer for console platforms	Activision	May-02	USD 23.5
Remand Entertainment & Apogee Software Acquired all the rights to "Max Payne" from developers	Take-two interactive	May-02	n/a
Interplay Entertainment Divested Shiny Entertainment	Infogrames Entertainment	Apr-02	USD 47
Outrage Entertainment Game developer	THQ Inc	Apr-02	n/a
Shaba Games Game developer	Activision	Apr-02	USD 9.3
42-Bit AB Game developer	Warthog	Apr-02	USD 1.7
Particle Systems UK science fiction game developer	Argonaut Games	Jan-02	GBP 13
The Galleon Group Game development, 3D graphics and design, website design	Andaman Resources plc	Nov-01	GBP 13
Scoregames France's second largest retailer of computer software and video games	The Game Group	Oct-01	GBP 19
Vision Park Entertainment AB Swedish computer game company.	KF Media AB	Sep-01	GBP 7
The Arxel Guild French developer and publisher of games software	CTO SpA	Apr-01	GBP 5
Hasbro Interactive Inc Online computer games	Infogrames Entertainment	Dec-00	GBP 69
Pixel Broadband Studios Israel publisher of video and computer games	Gameplay	Oct-00	GBP 34
Jungle.com Computer and games retailer	Great Universal Stores	Sep-00	GBP 37
Paradigm Entertainment Game developer for consoles	Infogrames Entertainment	Jun-00	GBP 11
Software Warehouse Holdings Retail chain selling software	Jungle.com	Mar-00	GBP 102
Computec AG Online games division and retailing businesses	Gameplay	Feb-00	GBP 48

Source: OECD compiled from Corum Group Ltd. (2003, 2002a, 2002b) and industry sources.

BIBLIOGRAPHY

- Alliance Numeric (2003), International Interactive Games Industry: Some Facts and Figures, Montréal, Québec, Canada.
- Anderson, C. and B. Bushman (2001), Effects of Violent Video Games on Aggressive Behaviour, Aggressive Cognition, Aggressive Affect, Physiological Arousal and Prosocial Behaviour: a Meta-Analytic Review of the Scientific Literature, *Psychol Sci.* 2001, 12, pp. 353-359.
- Antikainen, H., S. Kangas and S. Vainikainen (2004), Three Views on Mobile Cross Media Entertainment, MGAİN Research Report, March 22, 2004.
- Asociación Española de Distribuidores y Editores de Software de Entretenimiento (aDeSe) (2000), Los Videojuegos en los hogares españoles, October 2000.
- Asociación Española de Distribuidores y Editores de Software de Entretenimiento (aDeSe) (2004a), *La industria española de videojuegos facturó 800 millones de euros el año pasado*, Nota de Prensa, 25/02/2004.
- Asociación Española de Distribuidores y Editores de Software de Entretenimiento (aDeSe) (2004b), *aDeSe firma un convenio con el Instituto Nacional del Consumo para la promoción del código PEGI*, 07/01/2004.
- Associated Press. (2004), Violent Video Games Under Attack, Forbes, at: <http://www.forbes.com/work/feeds/ap/2004/07/06/ap1444124.html>.
- Associated Press (2005), La. Trying to Lure Video Game Industry, ABC News.
- d'Attenhoven, S. (2002), Management of Networked Virtual Environments, Free University of Brussels, Belgium.
- Battisti, D. (2004), Italian eContent Policies, Strategy and Policy Office, Minister for Innovation and Technologies, OECD WPIE Digital Broadband Content Panel Paris, 3 June 2004. at: www.oecd.org/document/59/0,2340,en_2649_33757_32159227_1_1_1_37451,00.html
- BBC News. (2004a), Broadband Divide on the Horizon, 16 July 2004, at: <http://news.bbc.co.uk/go/pr/fr/-/1/hi/technology/3894225.stm>
- BBC News (2004b), Games "Deserve a Place in Class", accessed 26 October 2004, at: <http://news.bbc.co.uk/1/hi/technology/3956241.stm>.
- BBC News (2004c), Gamer buys \$26,500 virtual island, 17 December 2004.
- Becker, D. (2002), Online Game Makers Seek Key to Profits, 25 January 2002, Available at: <http://www.cnet.com>.
- Behrmann, M. (2004), Öffentliche Förderung für die Entwicklung und Produktion von Computerspielen in Frankreich. Starnberg/Berlin, Eine Übersicht zur Vorlage bei der Beauftragten der Bundesregierung für Kultur und Medien (BKM).

- Belo, R. (2004), Games Help Street Urchins Learn, BBC News, accessed 12 October 2004.
- Bensley, L. and J. Van Eenwyk (2001), Video games and real life aggression: Review of the literature, *Journal of Adolescent Health*, 2001, 29, 244-257.
- Bishop, M. (2003), *Game Plan: Game On: A Blueprint for Growing the Victorian Computer Game Industry*, State of Victoria, Australia.
- Bohlin, E. *et al.* (2003), *Prospects for Third Generation Mobile Systems*, an ESTO Project Report, IPTS Technical Report prepared for the European Commission Joint Research Centre, June.
- Browne, K. D. and C. Hamilton-Giachritsis (2005), The influence of violent media on children and adolescents: a public health approach, *Lancet*, 365, 702-710.
- Canoë (2004), Les Canadiens préfèrent les jeux vidéo en ligne, at : <http://www2.canoe.com/techno/nouvelles/archives/2004/08/20040804-105246.html>
- Consumer Electronic Association (2004), *CEA Market Research: U.S. Consumer Electronics Sales & Forecasts 2000-2005*, CEA.
- Chau, P., M. Cole, A. Massey, M. Montoya-Weiss and R. O'Keefe (2002), Cultural Differences in Consumers' Online Behavior, *Communications of the ACM* 45(10):138-143.
- Communication Committee (2004), *Broadband Access in the EU: Situation of 1 January 2004*, working document, European Commission Directorate-General for the Information Society. Brussels, Belgium.
- Corum Group Ltd. (2002a), *Corum M&A Briefing Software & IT Service M&A Transactions in Q1 2003*, Corum Group Ltd.
- Corum Group Ltd. (2002b), *Corum M&A Briefing Software & IT Service M&A Transactions in Q2 2002*, Corum Group Ltd.
- Corum Group Ltd. (2003), *Corum M&A Briefing Software & IT Mergers & Acquisitions 2003 Year End Review and 2004 Analysis*, Corum Group Ltd.
- Corum Group Ltd. (2004), *Corum M&A Briefing Software & IT Service M&A Transactions in Q1 2004*, Corum Group Ltd.
- Costikyan, G. (1999), *The Future of Online Games Good Reports*, Good Publishing New York.
- Daglow, D. (2004), *Building Big Licensed Games with Big Teams*, Stormfront Studios, Game Developers Conference San Jose, CA, 22-23/03/2004, at http://www.gdconf.com/archives/2004/daglow_don.doc
- Deloitte (2004), *Moore's Law and Electronic Games: How Technology Advances Will Take Electronic Games Everywhere*, Deloitte-Technology, Media & Telecommunication, May.
- Department of Health and Human Services of the United States (2001), "Youth Violence: A Report of the Surgeon General", at: <http://www.surgeongeneral.gov/library/youthviolence/youthvioreport.htm>
- DFC Intelligence (2003), *Challenges and Opportunities in the Online Game Market*, 25 June at: http://www.dfcint.com/game_article/june03article.html

DFC Intelligence (2004a), Review: Themis Report on Online Gaming 2004, at:
http://www.dfcint.com/game_article/jan04article.html

DFC Intelligence (2004b), The Business of Computer and Video Games 2004, at:
http://www.dfcint.com/game_article/feb04article.html.

Egenfeldt-Nielsen, S. (2002), Brave New Entertainment Business Grows Up, Game Research, at:
http://www.game-research.com/brave_new.asp

Entertainment and Leisure Software Publishers Association (ELSPA) (2003a), White Paper: The Cultural life of computer and video games: A cross industry study, London, August.

ELSPA (2003b), White Paper: Computer and video games: a British phenomenon around the world, London, August.

ELSPA (2004a), Video Games Market demonstrates over 100% growth in six years. Press release 1st September at <http://www.elspa.com/about/pr/pr.asp?mode=view&t=1&id=478>

EPPA (2004b), Compelling Content Interactive software: Extending the digital entertainment revolution to broadband users.

Entertainment Software Association (ESA) (2003), *Game Players Are A More Diverse Gender, Age and Socio-Economic Group Than Ever, According To New Poll*, News Releases, at:
<http://www.theesa.com/pressroom.html>

European Audiovisual Observatory. (2003), Multimedia and New Technology: 2003 Yearbook.

Eurostat. (2003), Cinema, TV and Radio in the EU Statistics on Audiovisual Services 1980–2002, European Communities, Luxembourg.

Evans, D. S., A. Hagiu and R. Schmalensee (2004), A survey of the economic role of software platforms in computer-based industries, RIETE Discussion Paper Series, 04-E-032.

Federación Para La Protección de la Propiedad Intelectual (2003), Memoria de Actividad 2003.

FIAM-International Federation of Multimedia Associations. (2003), Industry Classification: The Multimedia and Interactive Digital Content Industry; Draft Discussion Paper, November.

Financial Times (2004), The perfect portable PC for the job, 27 October, p. 8.

Forfás (2002), A Strategy for the Digital Content Industry in Ireland.

Forfás (2004), Electronic Games Study.

Fries, F. (2003), Propositions pour développer l'industrie du jeu vidéo en France, Agence Française pour le Jeu Vidéo.

Gee, J. (2003), What Video Games Have to Teach Us About Learning and Literacy, Palgrave Macmillan, New York.

Gentile, D. A., P. J. Lynch, J. R. Linder and D. A. Walsh (2004), The effect of violent video game habits on adolescent hostility, aggressive behaviors, and school performance, *Journal of Adolescence*, 27,

- 5-22. Germain, J. (2004), Global Piracy: Illegal Software Markets Endure, April 6, Linux News & Information from Around the World.
- Godager, G. (2004), Funcom, OECD WPIE Digital Broadband Content Panel Paris, 3 June 2004, at: http://www.oecd.org/document/62/0,2340,en_2649_33757_32160190_1_1_1_1,00.html
- Green, T. and B. Keen (2002), Wireless, Interactive TV and Online Gaming: Market Assessment and Forecasts, Screen Digest and European Leisure Software Publisher Association, London.
- Green, C. S. and D. Bavelier (2003), Action video game modifies visual selective attention, *Nature*, 423, 29 May, 534-537.
- Griffiths, M. D., M. N. O. Davies and D. Chappell (2004), Online computer gaming: a comparison of adolescent and adult gamers, *Journal of adolescence*, 27, 87-96.
- Haines, L. (2004a), Why Are There So Few Women in Games?, Media Training North West, September.
- Haines, L. (2004b), Women and Girls in the Games Industry, Media Training North West, April.
- Hermida, A. (2004a), Next Gen Games Prove a Challenge, BBC News Online, 6 September, at: <http://news.bbc.co.uk/2/hi/technology/3630726.stm>
- Hermida, A. (2004b), Long-Awaited Doom 3 Leaked Online, BBC News Online, 2 August, at: <http://news.bbc.co.uk/2/hi/technology/3527332.stm>
- Hofstede, G. (1994), Cultures and Organisations: Intercultural Cooperation and Its Importance for Survival, Harper Collins, London.
- Hong, J. (2002), BCD Forum: The State of the Online Game Industry, 18 September, Halifax, Canada.
- Hsieh, D. (2002), China's Internet Users Second Only to US, *Straits Times*, 24/ April.
- Hyman, P. (2004), 'Middleware' Puts Focus on Content, not Code, *The Hollywood Reporter*.
- IDATE (2004), Jeux vidéo : vers les consoles nouvelle génération – Synthèse de l'étude réalisée par l'IDATE, 2004.
- IDC (2003), U.S. Online PC Gaming Forecast and Analysis 2003-2007: Not Just Playing Around Anymore, September.
- IGDA, International Game Developers Association- Online Games Committee. (2003), Online Games White Paper. 2nd Edition, Informa Media Group 2001.
- IGDA (2004a), Web and Downloadable Games White Paper, Game Developers Conference, San Jose, CA.
- IGDA (2004b), Developer Business Summit: An IGDA Think-Tank., 22-23 March Game Developers Conference San Jose, CA.
- Interactive Digital Software Association (IDSA) (2001a), Video Games & Youth Violence: Examining the Facts.

- Interactive Digital Software Association (IDSA) (2001b), Economic Impact of the Demand for Playing Interactive Entertainment Software.
- Interactive Digital Software Association (IDSA) (2002), Essential Facts About the Computer and Video Game Industry.
- Interactive Software Federation of Europe (ISFE) (2002), Computer and Video Games – An Industry Coming of Age.
- Interactive Software Federation of Europe (ISFE) (2004a), ISFE Yearbook 2003-2004.
- Interactive Software Federation of Europe (ISFE) / Nielsen Interactive Entertainment (2004b), Video games piracy in Europe, September.
- Interactive Software Federation of Europe (ISFE) (2005), Position paper on the Communication from the Commission “Challenges for the European Information Society beyond 2005”.
- International Telecommunication Union (ITU) (2004), Asia-Pacific Telecommunication Indicators 2004, Geneva, Switzerland, September.
- Ismail, S. and I. Wu (2003), Broadband Internet Access in OECD Countries: A Comparative Analysis, Office of Strategic Planning and Policy Analysis and International Bureau, FCC, October.
- JETRO, San Francisco (2004), Online & Mobile Gaming Market: United States, Japan.
- Kane, S (2004), The Whole World is Playing. The Outlook for Video Games, 2003-2007: A Global Overview, PwC.
- Kaydara (2004), Kaydara Announces Middleware Solutions for Game Developers, Press Release 26 March.
- Kerr, A. (2002), Loading... Please Wait. Ireland and the Global Games Industry, Dublin City University, STeM Working Paper, No 1.
- Kerr, A. and R. Flynn (2003), "Revisiting Globalisation through the Movie and Digital Games Industries." *Convergence: The Journal of Research into New Media Technologies*, Vol.8 (2).
- Kerr, A. (2004a), Policies for the games industry in Europe: Competitive culture(s)?, presentation at the Korea Games Conference, Seoul, 15 October. Available from the author at the Centre for Media Research, University of Ulster, Northern Ireland, UK.
- Kerr, A. (2004b), Digital Games Go Online, presentation given at the OECD Workshop on Broadband Digital Content, 1 December 2004, available at: <http://www.oecd.org/dataoecd/18/29/34078416.pdf>
- Kessler, S. (2004), Hot Players in Online Gaming, *Business Week*, 24 May at: http://www.businessweek.com/investor/content/may2004/pi20040524_2927_pi044.htm
- Kirsch, S. J. (2003), The effects of violent video games on adolescents. The overlooked influence of development, Aggression and violent behavior, 8, 377-389.

- Kono, M. (2004), Promotion Policy for Content Business in Japan, OECD WPIE Digital Broadband Content Panel Paris, 3 June 2004 at:
http://www.oecd.org/document/59/0,2340,en_2649_33757_32159227_1_1_1_1,00.html
- Korea Game Development and Promotion Institute (KGDI) (2004), The Rise of Korea Games: Guide to Korean Game Industry and Culture, KDGI, Ministry of Culture & Tourism, Seoul.
- KPMG for the Danish Ministry of Culture. (2002), The Interactive Culture Industry: Background Paper, KPMG and the Danish Ministry of Culture, 4 June.
- Krotoski, A. (2004), Chicks and Joysticks – An Exploration of Women and Gaming, Entertainment and Leisure Software Publishers Association (ELSPA).
- Kuntsche, E. N. (2004), Hostility among adolescents in Switzerland? Multivariate relations between excessive media use and forms of violence, *Journal of adolescent health*, 43, 230-236.
- Kyounglim, Y., L. Heejin and So-Hye Lim (2002), The Growth of Broadband Internet Connections in South Korea: Contributing Factors, Asia/Pacific Research Center, Stanford, CA.
- Larta, (2003), The Electronics Games Industry, White Paper, Larta Research, available at:
<http://www.larta.org>
- Logan, T. (2004), Gaming Helps Traders Score Big-Time, BBC News, 10 October.
- Lorentzen, E. (2004), Norway's Strategy for Electronic Content, Ministry of Trade and Industry, OECD WPIE Digital Broadband Content Panel, Paris, 3 June 2004 at:
www.oecd.org/document/59/0,2340,en_2649_33757_32159227_1_1_1_1_37451,00.html
- Mantion, E. (2003), The Economics of Online Gaming, In-Stat/MDR, June.
- Michaud, L. and T. Mestaer (2002), Video Games: Terminal, Markets, Usage, IDATE, France.
- Michaud, L. (2004), *Growth of Digital Broadband Content: Stocktaking and Outlook*, IDATE, OECD WPIE Digital Broadband Content Panel Paris, 3 June 2004 at:
http://www.oecd.org/document/59/0,2340,en_2649_33757_32159227_1_1_1_1,00.html
- Microsoft (2004), Microsoft: Next Generation of Games Starts with XNA, 24 March 2004, Press Release.
- Ministry of Information and Communication (2004a), IT 839 Strategy, Korea.
- Ministry of Information and Communication (2004b), White Paper 2004 – Internet Korea, July, National Computerization Agency, Korea.
- Mulligan, J. and B. Patrovsky (2003), Developing Online Games: An Insider's Guide, New Riders.
- Nainan, S. (2004), Securing Your Place in the Future of Console Network Entertainment, Sony Entertainment, presentation at OECD Forum, 3 February, available at :
www.oecd.org/document/59/0,2340,en_2649_34223_32159227_1_1_1_1,00.html
- Nielsen and NetRatings (2003), Online Gaming Doubles in Europe in One Year, 19 February.
- Nokia (2003), Nokia Press Release, 19 August at: press.nokia.com/pressreleases.html

DSTI/ICCP/IE(2004)13/FINAL

OECD (2001a), *Taxation and Electronic Commerce – Implementing the Ottawa Taxation Framework Conditions* – 2001 Report, Paris.

OECD (2001b), *The Development of Broadband Access in OECD Countries*, DSTI/ICCP/TISP(2001)2/FINAL, Paris.

OECD (2002), *Information Technology Outlook: ICTs and the Information Economy*, Paris.

OECD (2003a), *The Sources of Economic Growth in OECD Countries*, Paris.

OECD (2003b), *Universal Service Obligation and Broadband*, available at: <http://www.oecd.org/dataoecd/4/23/2496799.pdf>.

OECD (2003c), Summary Record of the Sixth Meeting, Working Party on Indicators for the Information Society, Informal working document, Paris.

OECD (2003d), *Communications Outlook 2003*, Paris.

OECD (2003e), *The Implications of Convergence for Regulation of Electronic Communications*, DSTI/ICCP/TISP(2003)5/FINAL.

OECD, (2003f), *Taxation and Electronic Commerce – Implementing the Ottawa Taxation Framework Conditions – 2003 Report*, available at: <http://www.oecd.org/dataoecd/45/19/20499630.pdf>

OECD (2004a), *Online payments systems for e-commerce*, DSTI/ICCP/IE(2004)18/FINAL, forthcoming.

OECD (2004b), *Information Technology Outlook 2004*, Chapter 5, Paris.

OECD (2004c), *Mobile content: New content for new platforms*, DSTI/ICCP/IE(2004)14/FINAL.

OECD (2004d), *Information Technology Outlook 2004*, Chapter 1, Paris.

OECD (2004e), *Information Technology Outlook 2004*, Chapter 2, Paris.

OECD (2004f), *Information Technology Outlook 2004*, Chapter 4, Paris

OECD (2004g), *Information Technology Outlook 2004*, Chapter 6, Paris.

OECD (2004h), OECD Recommendation of the Council on Broadband Development, C(2003)259/FINAL.

OECD (2005), *Communications Outlook 2005*, Paris.

Olhava, S. (2003), White Paper: Marketing Through Games, IDC, August.

Passione, J. (2002), Not Just Playing Games, America's Network.

Pastore, M. (2000), Trends & Statistics: The Web's Richest, 23 March at: http://www.clickz.com/stats/big_picture/geographics/article.php/32618

Pattinson Group (2003), The Measurement of Creative Digital Content, Report for the Department of Communications, Information Technology and the Arts. Australia, June.

- Presidential Commission on Education Reform (PCER) (1997), *Education Reform for the 21st Century: To Ensure Leadership in the Information and Globalization Era*, Korea.
- Pelkonen, T., C. Melakoski and T. Rissanen (2003), *Challenges and Opportunities in the Emerging Mobile Games Markets*, ACTeN Business Roundtable 11, 12 November.
- PriceWaterhouseCoopers (2004), *Global Entertainment and Media Outlook 2004-2008: Video Games*, pp. 322-343.
- Reuters (2004), *Florida Video Law: Parents Decide*, 18 January.
- Rogers, D. (2004), *The End Game How Top Developers Sold Their Studios*, BizDev Inc., at: <http://www.gdconf.com/archives/2004/index.htm>
- Scheeres, J. (2002), *Games Elevate Hate to Next Level*, 20 February, *Wired News*, at: <http://www.wired.com/news/culture>
- Sieber, S. (2004), *Massive Online Gaming, Small Income*, E-Business Center, PwC & IESE, 24 May.
- Spectrum Strategy Consultants (2002), *From Exuberant Youth to Sustainable Maturity: Competitiveness Analysis of the UK Games Software Sector*, Department of Trade and Industry, at: www.dti.gov.uk/cii/services/contentindustry/computer_games_leisure_software.shtml
- Steinkuehler, C. (2004), *Learning in Massively Multiplayer Online Games*, in Kafai, Y., W. Sandoval, N. Enyedy, A. Nixon and F. Herrera (eds.), *Proceedings of the Sixth International Conference of the Learning Sciences*, pp.521–528, Mahwah, NJ, Erlbaum.
- Taylor, T.L. (2004), *Multiple Pleasures – Women and Online Games*, available at http://crossmedia.blogspot.com/2003_07_01_crossmedia_archive.html
- The Economist (2002), *Video games: Console Wars*, 20 June.
- The Economist (2003a), *Invaders from the Land of Broadband*, 11 December.
- The Economist (2003b), *Sony: The Complete Home Entertainer*, 27 February.
- The Economist (2004), *Gaming Goes to Hollywood*, 25 March.
- Topic Ltd. (2004), *World Broadband Statistics: Q4 2003*, March.
- Verband der Unterhaltungssoftware Deutschland (VUD) (2004a), *Computerspiele als Wirtschaftsfaktor*, accessed on 22/10/2004 at <http://www.vud.de>
- Verband der Unterhaltungssoftware Deutschland (VUD) (2004b), *Erst die Freunde, dann der Computer*, accessed 25/10/2004 at <http://www.vud.de>
- Williams, D. (2002), *Structure and Competition in the US Home Video Game Industry*, *The International Journal on Media Management*, 4(1), 41-54.
- Williams, R. B. and C. A. Clippinger (2002), *Aggression, competition and computer games: computer and human opponents*, *Computers in human behavior*, 18, 495-506.

Wolock, E. (2002), Is there a reasonable approach to handling violence in videogames? *Children's Software and New Media Revue*, July/August.

Xu, W., B. Knutsson, H. Lu and B.Hopkins. (2004), Peer-to-Peer Support for Massively Multiplayer Games, Department of Computer and Information Sciences, University of Pennsylvania.

Young (2004), IT Industry New Growth Engine, Digital Contents Industry Promotion, OECD WPIE Digital Broadband Content Panel, Paris, 3 June 2004.

NOTES

- 1 The June 2004 panel is summarised in OECD (2004), *Digital Broadband Content, Panel and government session*, DSTI/ICCP/IE(2004)15/FINAL, www.oecd.org/dataoecd/53/39/34579763.pdf.
- 2 Yahoo operates the second most popular US online game Web site following Electronic Arts' EA.com.
- 3 <http://secondlife.com/new.php>.
- 4 The first companies to manufacture game-ready computers such as Alienware and PCLaptops have been joined by Dell in producing high performance machines with very fast processors, high resolution screens and advanced video cards for games or top of the range business use, see *Financial Times* (2004).
- 5 For instance, the game Action Tennis was successful on the European mobile portal site Jamba! The mobile game Samguk is particularly successful in China.
- 6 Sony game software sales are estimated to be 60% of total game software and hardware revenues.
- 7 Microsoft's Home and entertainment branch includes MS Xbox, PC games, TV platform and Home Product Division.
- 8 Tables 6 and 7 include subsidiaries Blizzard Entertainment and Sierra Online, etc.
- 9 For a console game, if licensing fees are included, the amount is USD 4-7 million (Fries, 2003, p. 10).
- 10 See for example, Electronic Arts Web site at: <http://www.ea.com/home/home.jsp> accessed 15 April 2005.
- 11 To guide future development publishers can monitor play and see what players do and do not like. The direct link to customers can help shift from a retail model towards direct-to-consumer sales.
- 12 Micro-payments can be defined as transactions under USD 5 (OECD, 2004a).
- 13 A typical search on eBay for Anarchy online can find more than 100 different sellers selling virtual items some of which attain impressively high prices. For example, a player recently paid USD 26 500 for a virtual island in the MMORPG game Project Entropia (BBC, 2004c).
- 14 Broadband access is defined as an Internet connection with a downstream connection of at least 512 kbps. However the term has no single definition and ranges from 200 kbps to over 30 Mbps (see OECD, 2003b).
- 15 Data on player numbers and player demographics are drawn from a range of industry sources, using a variety of survey and interview methods, which are not necessarily published or comparable. Data details in this section need therefore to be treated with caution.
- 16 Authors' estimates are around 120 millions players based on various industry estimates.
- 17 For example the programme offered interest-free loans up to 50% of costs, maximum CAD 75 000.
- 18 For further information on Game Republic: <http://www.gamerepublic.co.uk/>
- 19 Working with the DTI, it recently produced "UK Digital Content: Exploiting the Opportunity", which identified core issues for the industry and set out a manifesto for growth.
- 20 For further information see: <http://www.e3expo.com>

- 21 See Electronic Arts Web site, sections on recruitment profiles and training.
- 22 Data from a study by the *Gesellschaft für Konsumforschung* (GfK).
- 23 Note that all OECD countries are TRIPS signatories and that most have acceded to the WIPO Internet Treaties, although ratification is a longer process.
- 24 For further information consult BECTA's Web site: <http://www.becta.org.uk>
- 25 The Anti-Defamation League has reported Racist and anti-Semitic computer games are being used to recruit young people. National Alliance chairman William Pierce claims that computer games are just another advertising vehicle for his group (Scheeres, 2002, also at Reuters, 2004).