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Published Version

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Tsang, D. ORCID: <https://orcid.org/0000-0003-1671-5521> (2021) Innovation in the British video game industry since 1978. *Business History Review*, 95 (3). pp. 543-567. ISSN 2044-768X doi: 10.1017/S0007680521000398 Available at <https://centaur.reading.ac.uk/101839/>

It is advisable to refer to the publisher's version if you intend to cite from the work. See [Guidance on citing](#).

To link to this article DOI: <http://dx.doi.org/10.1017/S0007680521000398>

Publisher: Cambridge University Press

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Denise Tsang

Innovation in the British Video Game Industry since 1978

This article examines the evolution of the video game industry in Britain from its start in 1978. The industry originated with passionate hobbyists and amateurs who benefited from the national broadcaster's campaign to expand computer literacy. Unlike the regional clustering of the industry in the United States and Japan, the British industry was dispersed geographically, consisting of mini-clusters with porous boundaries. During the 2000s, the fragmented British industry was largely acquired by U.S. and Japanese multinational companies and became part of global value chains, but the development of mobile gaming and digital distribution provided opportunities for a new generation of start-ups to emerge in Britain.

Keywords: video game, knowledge & innovation, value chain evolution, game console, digital distribution, Britain

Beginning in the 1970s, video games ushered in a new phase in the long history of game playing, as they differed from traditional table games, board games, and children's games. Video games were the first type of game derived from information technology (IT). As such, the video game industry experienced major technological shifts as IT advanced over time, and its boundaries evolved rapidly with changes in platforms. For example, video game developers had to adapt to changes in hardware and IT infrastructure across arcade games, personal computer (PC) games, online games, console games, and smartphone/tablet games.

Although video games evolved alongside the IT industry, the challenges facing game developers differed from those facing other

I would like to thank the editors and two anonymous referees for guidance and insightful comments.

Business History Review 95 (Autumn 2021): 543–567. doi:10.1017/S0007680521000398
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companies in IT industries. Unlike other IT products and services, video games did not create value for consumers if they simply functioned; instead, they needed to entertain and to generate a sense of “fun.” Hence, companies that invested in video game development projects met with an inherently challenging form of business risk: how to forecast the continuously changing perception of what game players found entertaining.¹ The global video game industry grew exponentially in the decades following its origins and into the twenty-first century. By 2019, approximately one-third of the world’s population was reportedly playing video games. The combined spending on video game products and services in that year was estimated to be worth US\$152 billion.² The industry was also remarkably resilient and was only marginally impacted by the outbreak of the COVID-19 pandemic in 2020.³

A striking feature of the video game industry is that, despite the global interest in games, developers became concentrated in certain locations in a small number of countries. This level of concentration is hardly unusual in business history, and much has been written about historical clusters of innovation in information technology (Silicon Valley, Bangalore, and Shenzhen), finance (New York and London), and fashion (New York, Milan, and Paris). There is also well-established historical evidence on the economic significance of geographical clusters and their tendency to foster innovation, whether in manufacturing or the creative industries.⁴ In the case of the video game industry, the United States was the first mover and has remained the single largest market. In 2020, the overall U.S. market size as measured in revenue

¹ Casino games are not examined in this article as they are associated less with the pursuit of fun than with psychological addiction, caused by a combination of uncertainty, illusion of control, and random success. See J. Tobias-Webb, E. Limbrick-Oldfield, C. Gillan, J. Moore, M. R. F. Aitken, and L. Clark, “Let Me Take the Wheel: Illusory Control and Sense of Agency,” *Quarterly Journal of Experimental Psychology* 70, no. 8 (2009): 1732–46.

² Tom Wijman, “The Global Games Market Will Generate \$152.1 Billion in 2019 as the U.S. Overtakes China as the Biggest Market,” *NeuZoo*, 18 June 2019.

³ UKIE, *Playing On: How the UK Games Sector Reacted to the Challenges Presented by Covid 19* (London, 22 July 2020); Robert Hackett, “Forget Netflix: Gaming Companies are Winning the Pandemic,” *Fortune*, 12 Aug. 2020.

⁴ Enrico Moretti, “The Effect of High-Tech Clusters on the Productivity of Top Inventors” (NBER Working Paper No. 26270, Sept. 2019, rev. Feb. 2021); Stephen B. Adams, “Arc of Empire: The Federal Telegraph Company, the U.S. Navy, and the Beginnings of Silicon Valley,” *Business History Review* 91, no. 2 (2017): 329–59; Rik Wenting, “Spinoff Dynamics and the Spatial Formation of the Fashion Design Industry, 1858–2005,” *Journal of Economic Geography* 8, no. 5 (2008): 593–614; Youssef Cassis, *Capitals of Capital: A History of International Financial Centres, 1780–2005* (Cambridge, U.K., 2006); John F. Wilson and Andrew Popp, eds., *Industrial Clusters and Regional Business Networks in England, 1750–1970* (London, 2003); Tamara Hareven, *The Silk Weavers of Kyoto: Family and Work in a Changing Traditional Industry* (Berkeley, CA, 2002); Ronny Bianchi, Aldo Enrietti, and Renato Lanzetti, “The Technological Car District in Piedmont: Definitions, Dynamic, Policy,” *International Journal of Automotive Technology and Management* 1, no. 4 (2001): 397–415.

was US\$42 billion.⁵ There is an extensive historical literature on the American industry.⁶ It began in the 1970s in Silicon Valley, California. Nolan Bushnell and Ted Dabney founded Atari in 1972 and launched the popular table tennis arcade game *Pong* the following year.⁷ Around this time, Magnavox introduced an early video game console, the *Odyssey*, though it was short lived. As the industry grew, many other pioneering firms were based in California.⁸ The American video game industry has been responsible for some of the most popular franchises, including *The Sims*, *Halo*, *Madden NFL*, *Call of Duty*, *Half-Life*, and *Fortnite*. Additionally, U.S. companies such as Atari, Apple, Valve, and Roblox have been instrumental in redefining the way video games are played on rapidly changing, innovative technology.

Starting in the 1980s, Japan also became a major center of the video game industry. The Japanese market was worth US\$21 billion in 2020.⁹ In addition to the early launch of gaming consoles, the industry in Japan became associated with highly successful franchised characters such as Mario, Sonic, Pokémon, and Zelda. Japanese companies Nintendo, Sony, Square Enix, Sega, Bandai Namco, Capcom, and Konami have maintained unrivaled positions in their home market, and the industry has remained heavily clustered in Tokyo.

Britain long held third place in the world industry, with innovative game design and cutting-edge skill sets in game production. The British market was estimated at US\$6 billion in 2020.¹⁰ Over the years, British-based companies produced such noteworthy games as *Lemmings*, *Elite*, *Grand Theft Auto*, *Tomb Raider*, *Football Manager*, *Grid*, *Monument Valley*, and *Fall Guys*. As this article will show, the British video game industry was in its development more fluid and geographically dispersed than its American and Japanese counterparts. It can be considered as a “dispersed cluster,” or rather, as multiple mini-clusters with porous boundaries. The small size of the country and efficient communications

⁵ “Top 10 Countries/Markets by Game Revenues,” Newzoo, accessed 10 June 2021, <https://newzoo.com/insights/rankings/top-10-countries-by-game-revenues/>.

⁶ See, for instance, Martin Campbell-Kelly, William Aspray, Nathan Ensmenger, and Jeffrey R. Yost, *Computer: A History of the Information Age*, 3rd ed. (New York, 2018), 321; Scott Cohen, *ZAP! The Rise and Fall of Atari* (New York, 1984); Leonard Herman, *Phoenix IV: The History of the Videogame Industry*, 4th ed. (Springfield, NJ, 2016); and Nick Montfort and Ian Bogost, *Racing the Beam: The Atari Video Computer System* (Cambridge, MA, 2009).

⁷ Steven Kent, *The Ultimate History of Video Games* (Rocklin, CA, 2001), 37.

⁸ The presence of video games companies in Austin, Texas—including subsidiaries of Electronic Arts, Blizzard, and Zynga, as well as start-ups—has grown since the late 1990s. “The Best Cities for Aspiring Game Designers,” *Game Designing*, 1 Feb. 2021.

⁹ “Top 10 Countries/Markets by Game Revenues,” Newzoo, accessed 10 June 2021, <https://newzoo.com/insights/rankings/top-10-countries-by-game-revenues/>.

¹⁰ “Top 10 Countries/Markets by Game Revenues,” Newzoo, accessed 10 June 2021, <https://newzoo.com/insights/rankings/top-10-countries-by-game-revenues/>.

links between its regions enabled an easy transfer of knowledge from, for example, Scotland to the English Midlands and South East. “Mini-clusters” of game development companies grew, over the decades, in London, Glasgow, Dundee, Newcastle, Leeds, Sheffield, Nottingham, Cambridge, Manchester, Birmingham, Coventry, Bristol, Oxford, and Brighton.¹¹ There was considerable mobility between these mini-clusters by game professionals, and the industry was characterized by a high level of labor mobility involving project-based work across all regions.

This article focuses on game development companies in Britain. The broad outlines of the evolution of this industry are known, although the literature remains less extensive than in the American case.¹² It is argued here that British companies benefited from a geographic proximity that facilitated knowledge sharing among talents, suppliers, and customers. In other words, British games developers formed a quasi-cluster, even though companies of various sizes were dispersed throughout the nation.¹³ The central argument is that between 1978 and 2020, game development companies benefited from the building of a nationwide talent pool and the transfer of knowledge via work, business, and institutional relationships across the United Kingdom.¹⁴

The article proceeds by analyzing the historical evolution of the British video gaming industry. It identifies three distinct historical periods and explores the relationship between prevailing technologies and industry evolutions. The first period, from 1982 to 1993, saw the emergence of a flourishing “bedroom coding” community that benefited in part from the institutional support of the British Broadcasting Corporation (BBC) through its Computer Literacy Program. In the second period, from 1994 to 2006, much of Britain’s fragmented industry was acquired by multinationals based in the United States and Japan,

¹¹ At least twenty-six game developers could be found in these locations. For details of the regional concentration of development companies, see <https://gamesmap.uk/#/map>.

¹² A lengthy narrative account of the growth of the British industry is provided by Magnus Anderson and Rebecca Levene, *Grand Thieves and Tomb Raiders* (London, 2012).

¹³ Mercedes Delgado, Michael Porter, and Scott Stern, “Defining Clusters of Related Industries,” *Journal of Economic Geography* 16, no. 1 (2016): 1–38; Rosa Caiizza, Aileen Richardson, and David Audretsch, “Knowledge Effects on Competitiveness: From Firms to Regional Advantage,” *Journal of Technology Transfer* 40, no. 6 (2015): 899–909; Jonathan Zeitlin, “Industrial Districts and Regional Clusters,” in *The Oxford Handbook of Business History*, ed. Geoffrey G. Jones and Jonathan Zeitlin (Oxford, 2008), 219–43; Michael Porter, “Clusters and the New Economics of Competition,” *Harvard Business Review*, Nov.–Dec. 1998, 77–90; Allen J. Scott, “The Cultural Economies of Cities,” *International Journal of Urban and Regional Research* 21, no. 2 (1997): 321–39; Michael Storper and Anthony Venables, “Buzz: Face-to-Face Contact and the Urban Economy,” *Journal of Economic Geography* 4, no. 4 (1994): 351–70; Alfred Marshall, *Principle of Economics* (London, 1890), 156.

¹⁴ Jason Kingsley, CEO of Rebellion Studio, stated that a large number of game development workers in British studios were European talents. “UK Video Games Sector Hits Record Size Despite Pandemic and Risks of Brexit,” *Sky News*, 19 Oct. 2020.

which had developed consoles for game playing. During the third period, from 2007 to 2020, independent domestic start-ups began to reappear with the rise of mobile gaming and digital distribution.

Because it was and remains populated by innovative organizations in constant flux, the video game industry is a challenging area to write about. There are few formal archives to consult. As a result, it was necessary to employ more unconventional sources and to build a picture of what was happening by triangulating different sources. Much of the raw data was found in gaming publications, which are a cross between fan magazines and trade journals. This article has relied heavily on end-user magazines (*Computer and Video Games* between 1981 and 2004, and *Retro Gamer* from 2004 onward) and trade magazines (*Develop* between 1996 and 2017, and *MCV* between 1998 and 2017). Company websites were consulted extensively and were a useful resource to track the creation, growth, closure, and acquisition of companies. As the magazine publication sector consolidated and moved online in the 1990s, data became available from new websites devoted to gaming, including *Eurogamer*. With the globalization of the video game industry over the past two decades, major developments in Britain were also reported in U.S.-based magazines such as *Fortune*, *Business Week*, *IGN*, and *GameSpot*. Industry publications from TIGA (The Independent Game Developers' Association), the nonprofit trade association representing Britain's game industry, and Nesta (formerly the National Endowment for Science, Technology, and the Arts [NESTA]), a British-based innovation foundation, were also helpful. Finally, the author conducted extensive interviews with practitioners in the industry in Britain and elsewhere.

The Origins of the British Video Game Industry

In a broad historical perspective, it might be argued that Britain was predestined to become an important location for the video game industry. The industry played into the strengths of British talent in forming large multi-character narratives, and in the country's history of computer research. The British mathematician Alan Turing, one of the earliest pioneers of computing technology, recognized the gaming potential of the computer as early as 1953, publishing a theoretical paper concerning the use of computers in playing chess.¹⁵ Yet there was certainly no straight line from Turing to the first video game developers nearly three decades later.

¹⁵ See B. V. Bowden, *Faster than Thought: A Symposium on Digital Computing Machine* (London, 1953), 272–81.

A great deal of serendipity can be found in the origins of the British industry. In the 1970s enthusiasts Richard Bartle and Roy Trubshaw, students at the University of Essex, were pioneers. In his teens, Bartle was a fan of the new role-playing board games epitomized by Dungeons & Dragons, launched in 1974. While still in secondary school, he developed his own similar games and sold them through the mail. As was typical of other play-by-mail games at the time, Bartle advertised his game in specialist magazines.¹⁶ Moreover, Bartle's school had a special arrangement with a local plant of British Petroleum that enabled him to learn computer programming at a time when few schools had computer facilities. He began to experiment with creating single-player computer games. When he entered university, Bartle met Trubshaw, a computer science major with excellent programming skills. Together they developed the game *Multi-User Dungeon (MUD)* using their university's computer network. Uniquely, it enabled multiple players to interact with one another. *MUD*, the first locally developed video game in Britain, was free to play and quickly gained popularity among a small group of gamers; however, without affordable network technology at the time, a mass market could not develop.¹⁷

Around the same time, Bruce Everiss entered the new video game sector in the city of Liverpool.¹⁸ His dedicated computer shop, Microdigital, began to sell the British-made computer Nascom 1 (developed by Chris Shelton) and the computer kit MK14 (developed by Clive Sinclair). In 1979, convinced of the potential of video games, Everiss traveled to California and returned to Liverpool with several Apple II computer games to sell to players. Microdigital emerged as an informal center of computing and gaming knowledge and attracted visitors from the rest of Britain and even western Europe.¹⁹ Everiss, who was an accountant by trade, inspired other nontechnical entrepreneurs to enter the industry.²⁰ In 1983, for instance, David Ward and Jon Woods founded Ocean Software, a game publisher in Manchester. Ward and Woods specialized in games based on Hollywood films. Later, in 1987, Michael

¹⁶ Game magazines in photocopy format included the strategy game Diplomacy's postal magazines *Albion* (1969–1975) and Ian Hetherington Games Workshop's *Owl and Weasel* (1975–1977).

¹⁷ Anderson and Levene, *Grand Thieves*, 1–17; Sarah Sloane, *Digital Fictions: Storytelling in a Material World* (New York, 2000), 168.

¹⁸ Microdigital was established in July 1978. See “Bruce Everiss,” *Retro Gamer*, 22 Aug. 2014.

¹⁹ Microdigital displayed a vast collection of games, books, home computer kits, and electronic components; Everiss sold his retail outlet to Laskys in 1981, and Laskys expanded Microdigital throughout the United Kingdom. See “Bruce Everiss”; and Tom Lean, *Electronic Dreams* (London, 2016), 175–77.

²⁰ “Interview with David Darling and Bruce Everiss part 1,” posted 20 Feb. 2012 by GTW, YouTube video, 18:21, <https://www.youtube.com/watch?v=2Ilyhg6IZ2o>.

Robinson established another computer retail store, called Microbyte, in West Yorkshire, which eventually grew into a popular chain. Indeed, the following year, Microbyte began its expansion by acquiring another popular video game retail shop in Nottingham.²¹

Soon, a growing cohort of game enthusiasts, almost all of whom were men, began to use personal computers to write programs and produce video games. Most of these early gamers were self-taught and spent hours playing and creating games with the new technology.²² Some of the more risk-taking individuals became involved in technology and software start-ups and joined the first wave of entrepreneurship within the British industry. For example, Tony Baden and Tony Milner, who had studied chemistry at Oxford University, established Bug-Byte in Liverpool in 1980.²³ That same year, Acornsoft was founded by a group of developmental psychologists from Cambridge.²⁴ Bug-Byte and Acornsoft published their own games and even some that were created by other innovative, local programmers. These included Acornsoft's space trading game *Elite*, which was created by two Cambridge undergraduate students, David Braben and Ian Bell, in 1984. *Elite* was not only the first PC game using wireframe three-dimensional graphics but also one of the longest-running game franchises.²⁵

Overall, these early pioneers left a lasting legacy, in part through the many start-ups that came and went in the 1980s. Though Bug-Byte lasted only five years, its employees went on to establish the high-budget game specialist Imagine Software in 1982. Imagine collapsed only two years later and was followed by a string of short-lived companies including Psygnosis, Denton Designs, and Rage Games.²⁶ In 1996, Rage became

²¹ "Making an Impact—Debbie Bestwick MBE, Founder, Team 17," LDC, 8 Dec. 2020, <https://ldc.co.uk/news/making-an-impact-debbie-bestwick-mbe-founder-team17/>; Simon Parkin, "Worms or Bust: The Story of Britain's Most Tenacious Indie Games Company," *Ars Technica*, 6 Dec. 2016, <https://arstechnica.com/gaming/2016/06/history-of-team17-and-worms/>.

²² The launch of Sinclair's ZX80 computer kit for under £80 in January 1980 enabled game enthusiasts to build their systems and then write game programs in Sinclair Basic. Subsequent improvisation, with ZX81 (March 1981) and ZX Spectrum (April 1982), enhanced the quality of the gameplay on these personal computers. The launch of BBC Micro in December 1981 and the use of BBC Basic language further promoted the learning of programming in Britain. See Tristan Donovan, *Replay: The History of Video Games* (Brighton, 2010), 112–14; "The BBC Microcomputer and Me, 30 Years down the Line," BBC News, 1 Dec. 2011, <https://www.bbc.com/news/technology-15969065>.

²³ "Bug-Byte Software Ltd 1980–1985," Science Museum Group, accessed 30 June 2020, <https://collection.science museum group.org.uk/people/ap7627/bug-byte-software-ltd>.

²⁴ Acornsoft was a subsidiary of the Cambridge-based Acorn Computers, which was founded by Chris Curry and Hermann Hauser in 1978.

²⁵ Alison Gazzard, *Now the Chips Are Down* (Cambridge, MA, 2016), 137.

²⁶ The BBC director Paul Anderson initially planned to make a documentary about the emergence of a new company; he and his crew noticed incidents of mismanagement during the filming and instead documented how Imagine filed for bankruptcy. *Commercial Breaks*:

the first publicly listed video game development company in Britain. Psygnosis, in turn, became one of the bedrocks of the sector and later, from 1993 to 2012, a subsidiary of Japanese multinational Sony.

The market for British video games also benefited from the work of the BBC. The British government had become alarmed about low levels of computer literacy in 1978, after a television program called *Now the Chips Are Down* questioned whether British industry was prepared for the new technology. In response, in 1980 the British government encouraged the launch of the ambitious BBC Computer Literacy Project. This included the development of the BBC Microcomputer System, or the BBC Micro, a new microcomputer system designed and built by Acorn Computers. These computers eventually found their way into 80 percent of British schools.²⁷ The project taught students how to program this computer, diffusing basic computer skills widely and, in doing so, helping to create a strong domestic demand for video game consumption.²⁸ The BBC project lasted for more than a decade. During that time, it delivered over 1.5 million BBC Micros, sponsored coding classes at state schools, and provided supplementary books and software.²⁹ The project ended in 1992 with the television broadcast of *The Trojan Mouse*, a program that reviewed a decade of achievement. Its title suggested that the literacy project had been a mouse hidden in the corner—somewhat underrated but nevertheless impactful. Subsequent research found that among 292 respondents employed in the digital sector, 87 percent had used the BBC Micro to play games and to learn computer programming.³⁰ On a more general level, one study concluded that the BBC project had resulted in “an extraordinary surge in computer literacy—one that would be the foundation of Britain’s skills base for a generation.”³¹

The Rise and Fall of Imagine Software, BBC Television, broadcast 1984. Firms created from Rage included Swordfish Studios in Birmingham, Juice Games in Warrington, and Venom Games in Newcastle.

²⁷ “Towards Computer Literacy—The BBC Computer Literacy Project 1979–83,” BBC Project Team, Aug. 1983. See National Archive of Educational Computing, <http://www.naec.org.uk/organisations/bbc-computer-literacy-project/towards-computer-literacy-the-bbc-computer-literacy-project-1979-1983>.

²⁸ BBC, Computer Literacy Project flyer, Jan. 1982, Centre for Computing History, <http://www.computinghistory.org.uk/det/7182/BBC-Computer-Literacy-Project/>; Anderson and Levene, *Grand Thieves*, 33–45.

²⁹ BBC Microcomputer and Me.”

³⁰ Nesta, *The Legacy of the BBC Micro: Effecting Change in the UK’s Cultures of Computing*, by Tilly Blyth (London, May 2012), 41.

³¹ Anderon and Levene, *Grand Thieves*, 70.

The Emergence of Bedroom Coding, 1982–1993

The launch of desktop computers in the United States in the late 1970s—with the Apple II, Commodore PET, and Tandy TRS-80—enabled a personalized gaming platform experience different from those of arcade games. These American-made desktop systems quickly found their way into other countries and immediately impacted the video game landscape. The British video game industry took shape with the influx of domestically designed games in various formats and soon saw the advent of competing British-made computer systems: the Sinclair ZX Spectrum, the Acorn Atom, the BBC Micro, and the Amstrad CPC. These computers were less expensive than the imported models and helped open up British markets rapidly.³²

In the early 1980s, with an increasing appetite among British consumers for computing technology as entertainment, the marketing channel for video games migrated from specialist magazines and independent retailers to high-volume, mainstream retailers such as W.H. Smith and Son, Woolworths, and Boots. While domestic demand grew steadily, it was the 1984 space trading game *Elite* that raised global awareness of the innovative British industry.³³ The developers, Braben and Bell, were creative coders. They rapidly solved several design problems that had stymied other developers. For instance, they reprogrammed the video controller in the BBC Micro, which had limited memory, so that it could successfully run *Elite*—a sci-fi, strategy, and shooter game in which players explored space. The ability to run such a game on the Micro had previously been considered impossible, even by the BBC design team that developed the computer, because of the trade-off required between memory, computing speed, and graphics.³⁴

Other self-taught, enthusiastic “bedroom coders” became external suppliers to game publishers. Some of them accumulated enough financial capital to set up video game publishing ventures themselves, resulting in the advent of such companies as Argonaut Games (1982), Rare (1985), Codemasters (1986), Climax (1987), DMA Design (1987), and Bullfrog (1987). Among these start-ups, Codemasters established itself as the most successful British game developer and publisher. Codemasters was cofounded in 1986 by two brothers, Richard and David Darling, in Warwickshire. They had acquired programming skills in Canada, where they attended junior high school, and used this knowledge to

³² Sinclair’s ZX80 was the first affordable British-made computer and was sold for under £100. Lean, *Electronic Dreams*, 69.

³³ *Elite* also defined the space flight simulation genre in video games. Adam Lusher, “Elite: The Game That Changed the World,” *Telegraph*, 24 Aug. 2014.

³⁴ Anderson and Levene, *Grand Thieves*, 116.

design their own games for their father's Commodore PET computer.³⁵ In 1982, after they returned to Britain to complete their secondary education, they bought a Commodore VIC-20 and established Galactic Software, specializing in gaming.

In 1983, the new video game publisher Mastertronic noticed the talent of the Darling brothers and contracted them to supply games. One of the best-selling games written by the Darling brothers, *BMX Racers*, was released in 1984. The Darling brothers not only wrote games for Mastertronic but also recruited freelance gamers to develop further game titles. They subsequently became the key supplier of games to the company and eventually owned 50 percent of it. In 1986, Richard and David Darling sold their shares in Mastertronic for £100,000 and used the sum to establish their own venture, called Codemasters, with a vision to create "fantastic games."³⁶ Codemasters' first racing game—the successor of *BMX Racers*—was called *BMX Simulator*, and it became an instant hit. Thanks to this success, the company's revenue reached £2 million after only its second year. The Darling brothers were aware that their company's internal resources were not sufficient to produce enough games to meet the demand of the expanding market; as a result, they actively searched for games developed by enthusiasts to strengthen the publishing side of the business—just as Mastertronic had done with them only a decade earlier.³⁷ In 1985, for example, they recruited seventeen-year-old twins Andrew and Philip Oliver. The Oliver brothers had accumulated experience in game production since the age of thirteen and had worked with several publishers, including Players, Interceptor, Firebird, and Argos Press. They moved to Leamington Spa to be near the Codemasters headquarters and became the architects behind the popular *Dizzy* franchise in the late 1980s.³⁸

The British video game industry, therefore, originated with a generation of programmers who had substantial experience in playing and programming on their own personal computers. Reflecting the often informal training of the most successful developers, the business relationship between publishers and external developers also tended to be informal. For instance, Dave Jones, cofounder of DMA Design, agreed to a contract for his game, *Menace*, with the publisher Psygnosis

³⁵ Damien McFerran, "Video: Codemasters Co-founder David Darling Talks Game Genie, Micro Machines and More," *Nintendo Life*, 29 July 2013.

³⁶ Darran Jones, "Codemasters," *Retro Gamer*, 30 Dec. 2016, <https://www.retrogamer.net/profiles/company/codemasters/>.

³⁷ "At Home with Codemasters," *Breakfast Time*, BBC, originally broadcast 2 Aug. 1988, <https://www.bbc.co.uk/archive/codemasters/zkdfnrd>.

³⁸ Interactive Studios was created by the twenty-two-year-old founders in 1990 and was later renamed Blitz Studios. See "A Dizzying Interview with the Oliver Twins," *Retro Review*, 9 July 2018, <https://www.retrogamerreviews.co.uk/interview-oliver-twins/>.

during a video game convention in 1987 and was given a semiconductor chip as initial payment for the game.³⁹ Psygnosis not only was the nearest game publisher to DMA Design's Dundee office but also published games for the more powerful 32-bit computer, Commodore Amiga, which—as Jones astutely predicted—would quickly have a large market.⁴⁰ On the publisher's side, Psygnosis's David Lawson and Ian Hetherington had both acquired significant market experience while associated with Bug-Byte and Imagine, respectively, seeing both the successes and failures of hit titles.⁴¹ Consequently, they were able to recognize the potential of Jones's game and make a quick decision, offering a publishing contract for *Menace* on the spot. *Menace* yielded profits for both DMA and Psygnosis and sold fifteen thousand copies in 1988.⁴² In 1991, Psygnosis published DMA's game *Lemmings*, which had sold over two million copies by 1993 and over twenty million copies by 2011.

Other British publishers also made important, intuitive market decisions in the early years of the quickly growing industry. For example, David Darling of Codemasters steered the business's market segment toward high-priced games at a time when low-priced games had reached a peak of sales in Britain and Europe. He and his brother had established Codemasters as a quality British game company, and it quickly gained a good reputation among the growing segment of gamers who demanded sophisticated story lines and gameplay.⁴³ Codemasters was also receptive to innovative game ideas and used marketing knowledge gained in direct mail-order sales to forecast the trajectory of the games industry. Moreover, the Darling brothers maintained frequent communication with video game players, which allowed the business to gather and digest useful feedback from players and gain insight into the evolving market. Codemasters, in turn, shared this market intelligence with internal and external game development teams.⁴⁴

³⁹ Dave Jones obtained a 2 megabyte RAM computer memory as the initial payment for the game in a computer show from Psygnosis. Dean Takahashi, "Grand Theft Auto Creator Dave Jones: You Never Know When You've Got a Hit Idea," *Venture Beat*, 9 July 2018.

⁴⁰ After being made redundant at Timex, Jones spent his redundancy pay on Commodore's new imported model, Amiga, priced at US\$3,000. DMA Design used the Commodore Amiga as the tool to design the game *Menace*. Takahashi, "Grand Theft Auto Creator."

⁴¹ Ian Hetherington's background was in mainframe computer programming, at the British Oxygen Company; he was hired by Imagine to help out with the financial issue. Patrick Staford, "From Lemmings to Wipeout: How Ian Hetherington Incubated Gaming Success," *Polygon*, 12 July 2017.

⁴² "Grand Theft Auto V: Games Visionary behind Scotland's Biggest Cultural Export," *Daily Record*, 15 Sept. 2013.

⁴³ Approximately 5.5 million low-priced game titles were sold in 1987; since then, the market for low-priced games went into decline, as U.K. and European gamers were willing to pay at least double for high-quality games. See Anthony Guter, "A History of Mastertronic," last revised June 2016, http://www.guter.org/mastertronic/mastertronic_history.htm.

⁴⁴ Jones, "Codemasters."

Early participants also succeeded in building networks that supported creativity across all segments of the video game industry, from marketing to game design. For example, the cofounders of Codemasters recruited Everiss from Imagine Software to help manage their company's early branding strategy.⁴⁵ Everiss arranged for the youthful Codemasters cofounders to appear in public media campaigns to raise awareness of the company.⁴⁶ Similarly, Hetherington, the former finance director for Imagine who went on to cofound Psygnosis, had acquired experience in game production at a time of great change in the industry, and he played a significant role in identifying talent in video game development. His approach to nurturing creativity among independent game developers facilitated the success of companies including Traveller's Tales, Bizarre Creations, and Reflective Interactive. Hetherington identified the importance of collaboration with talented developers that focused on players' experience. He provided developers with challenging goals and supported them in terms of time and technology during the production process. In 1993, as managing director of Sony Computer Entertainment Europe, Hetherington again leveraged his industry experience to help Sony launch the first PlayStation, along with a strong lineup of games including *Wipeout*.⁴⁷

Another two leading companies, Eidos and SCi, made use of the networks that were part of the British video game industry. Eidos was founded by Stephen Streater in 1990 and began as a video compression technology company for Acorn Computers. Streater began to expand Eidos in 1995, purchasing struggling video game companies, including Domark, which was renowned for the football simulation game *Championship Manager*. Ian Livingstone from Domark joined Eidos and helped transform it into a game company. Even though he was not part of the original team, Livingstone came to be regarded as Eidos's cofounder. He had many years of valuable experience in the industry, beginning with his first venture: a London-based board game company called the Games Workshop. Soon, however, Livingstone had pivoted toward the video game industry, leading him to the company Domark, where

⁴⁵ Everiss brought American video games such as Space Invaders and Galaxian written for Apple II to one of the earliest retail outlets in Britain. See "Bruce Everiss," *Retro Gamer*, 22 Aug. 2014.

⁴⁶ Jones, "Codemasters."

⁴⁷ Sony's PlayStation was launched in Japan in November 1994 and then in Britain and the United States in September 1995. Leonard Herman, *Pheonix: The Fall and Rise of Videogames* (Springfield, NJ, 2001), 188. *Wipeout* was developed by ex-Psygnosis employees at Sony Liverpool; the franchise has continued with a series of successful game titles. By March 1998, Sony had sold 9.64 million units of PlayStation in Europe. Reiji Asakura, *Revolutionaries at Sony* (New York, 2000), 208; "Ian Hetherington: Entrepreneur and Angel Investor," *Manchester Tech Trust*, accessed 1 May 2020, <http://www.manchestertechtrust.com/people/ian-hetherington/>.

he started as a game designer and eventually joined the management board in 1993.

SCi was founded by Jane Cavanagh, who had prior business development experience from working in British Telecom's internal game software division. Cavanagh traveled to Japan to identify opportunities within the video game industry and, returning home, in 1998 established The Sales Curve (renamed SCi in 1994) with 100 percent ownership.⁴⁸ Cavanagh's overseas experience allowed her to build extensive cooperation with foreign developers in SCi's early years, and as a result the company published a large number of Japanese and American games. SCi also pursued a backward integration strategy with a small internal development team, producing games such as *Double Dragon 3* (1991) and *Time Slip* (1993).⁴⁹ In 1997, SCi's first hit title, *Carmageddon*, developed by the independent company Stainless Games, was released.

Finally, as Britain's market expanded, foreign multinationals set up subsidiaries, marking an increase in global competition within the industry that would play out in the next stage of the British video game industry. Sega, a prominent Japanese video game maker, opened its European headquarters in London in 1982. The following year, another Japanese company, Konami, established a branch office staffed with expatriate executives in order to collaborate with local publishers in distributing games for the MSX computer.⁵⁰ American multinationals Activision and Electronic Arts entered the British market in 1983 and 1986, respectively. Nintendo entered Britain in 1993, as did Sony, which acquired Psygnosis in the same year.⁵¹ At the same time, Nintendo's London subsidiary made an equity investment in one of the most prolific British video game creators, Rare Games, which later developed a James Bond game called *GoldenEye*.

Consolidation and Selling Out, 1994–2006

The second period of the British gaming industry was shaped by the increasing presence of multinational companies, especially those from the United States and Japan. These foreign multinationals slowly began to acquire comparatively small British companies. DMA, a game design studio that had built up a strong portfolio of brands, was

⁴⁸ Jason Dobson, "SCi's Jane Cavanagh Receives OBE," *Gamasutra*, 2 Jan. 2007.

⁴⁹ See SCi game listing on MobyGames: <https://www.mobygames.com/browse/games/sci-games-ltd/offset,25/so,id/list-games/>.

⁵⁰ MSX was Konami's home computer standard released in 1983. Peter Stone (Konami general manager), interview by the author, London HQ, 12 Dec. 2006.

⁵¹ The founder of Psygnosis, Ian Hetherington, went on to create Evolution Studios in 1999, which was later sold to Sony. Andrew Bounds, "Games Industry: Underground Niche Is Now Mainstream," *Financial Times*, 16 June 2010.

bought and sold among publishers Gremlin and Infogrames before becoming a subsidiary of the U.S. multinational Take-Two Interactive in 1997. Core Design's ownership was transferred from CentreGold to Eidos and finally was integrated into Square Enix's European division in the next period of the industry. RuneScape maintained its independence but was eventually acquired by a Chinese industrial company, Hongda; the financially troubled Hongda then sold Jagex to a U.S. private equity company.

The launch of sophisticated video game consoles altered the dynamics of game production as this consolidation period progressed. The technological trajectory was marked by the launch of the Sony PlayStation in 1994, followed by the Microsoft Xbox in 2001 and the Nintendo Wii in 2006.⁵² With the subsequent generations of these systems, such as PlayStation 2, PlayStation 3, and Xbox 360, game consoles experienced an unrivaled popularity.⁵³ By developing platforms, Japanese and U.S. multinationals tightened control over the value chain as they actively pursued vertical integration by acquiring game development studios at home and abroad in order to provide an AAA, or blockbuster, gaming experience.⁵⁴

Indeed, along with the rise of consoles, the period was marked both by the creation of a handful of influential blockbuster British titles and by a rapid increase in the development cost for creating video games, which brought about work-for-hire strategies in British companies. Among the highlights of this era was Core Design's *Tomb Raider*, launched in 1996 and released for personal computers, PlayStation, and Sega Saturn consoles. This franchise garnered nine Guinness World Records, including the World's Best-Selling Videogame Heroine in 2019. Eidos's Ian Livingstone recalled that he was struck by the character and the story in the game when visiting Core Design in 1996 during a due-diligence visit prior to the merger of Eidos and CentreGold. He recognized the blockbuster potential of *Tomb Raider*; it was groundbreaking, with its female lead character accompanied by amazing graphics, music, and gameplay that were ahead of their time.

DMA Design's controversial *Grand Theft Auto*, developed in Scotland and released in 1997, went on to be a global video game icon and a highly profitable franchise under Rockstar Games. The game was the

⁵² "Video Games: A Serious Contest," *Economist*, 8 May 2004, <https://www.economist.com/business/2004/05/06/a-serious-contest>.

⁵³ *Grand Theft Auto V* was released in 2013. Luke Morgan Brittan, "'Grand Theft Auto V' Has Made More Money than Any Movie Ever," *NME News*, 11 Apr. 2018.

⁵⁴ Rod Cousens (CEO, Codemasters [2005–2015]), interview by the author, Leamington Spa, 20 Nov. 2006. AAA ("triple A") is a classification that designates games with blockbuster potential and high marketing and production budgets.

result of collegial teamwork by recent University of Dundee graduates, including Paul Farley and Keith Hamilton. Owing in part to the shortage of game professionals in the Scottish labor market, *Grand Theft Auto* also benefited from the experience of DMA veterans Steve Hammond, Mike Dailly, and Dave Jones, who had gained expertise during the making of the hit title *Lemmings*. Jones, for instance, was behind the idea to let players take on roles with criminal elements, while Dailly used his skills in designing high-speed car chases. With their resulting knowledge in game design, Farley and his colleague Jamie Bryan had the technical background to cofound the mobile game specialist company Tag Games in Dundee in 2006.

Jagex, a start-up founded in Cambridge Science Park in 2000, launched a free-to-play massively multiplayer online (MMO) role-playing game called *RuneScape*, which was inspired by a variant of the 1978 game *MUD*. Unlike prior games, *RuneScape* was stored on the server and one could play the game simply by opening a web browser window. Released in 2001, *RuneScape* quickly became a phenomenon. It was written by Jagex cofounder Andrew Gower, who completed the game while he was a computer science undergraduate at Cambridge University.⁵⁵ Gower's brother Paul, also one of the cofounders, assisted him with the creation of game content. Andrew Gower had been an early and avid consumer of video games and had started programming on his father's Sinclair ZX Spectrum computer at the age of seven.⁵⁶ As a gaming enthusiast, but lacking the budget to purchase video games, Gower wrote his own versions of popular games such as *Lemmings* and *Worms*. During his final year at Cambridge, he spent thousands of hours completing *RuneScape*. *RuneScape* has since won multiple Guinness World Records in the MMO video game category, including the most hours spent on a game by its players.⁵⁷ Jagex continually organized fan conventions and coordinated the *RuneScape* community that provided input to game development.

As console technology evolved, game developers encountered unexpected challenges. For example, during the transition to a new generation of game consoles, many game players began to delay making new purchases, waiting to buy new games to be played on the latest system. Most established British game developers attempted to defend their

⁵⁵ "Gower Brothers Q&A – Where It All Began," posted 6 Jan. 2016 by RuneScape, YouTube video, 51:22, <https://www.youtube.com/watch?v=KUvd6mqGCxw>.

⁵⁶ "Exclusive Andrew Gower Interview," *Bruce on Games* (blog), 18 Aug. 2009, <https://www.bruceongames.com/2009/08/18/exclusive-andrew-gower-interview/>.

⁵⁷ See "Greatest Aggregate Time Playing an MMO or MMORPG Videogame (All Players)," Guinness World Records, accessed 11 June 2021, <https://www.guinnessworldrecords.com/world-records/most-popular-free-mmorpg>.

market positions in the face of this sudden and major drop in demand, but without success. Leading publicly listed companies Rage Software and Argonaut Games went bankrupt in 2003 and 2005, respectively. Eidos—which had gone on an acquisition spree in the mid-1990s to become the fifteenth-largest multinational in the global industry by sales revenues in 2000—accrued losses of over £50 million in 2001, and its problems worsened when the 32-bit PC games market in Britain went into decline.⁵⁸ The publicly listed SCi acquired Eidos in 2005.⁵⁹ SCi itself stumbled after missing the rise of Nintendo Wii, and it was acquired by Japanese video game maker Square Enix in 2009.⁶⁰ Many other high-profile, independent development studios, including Bullfrog Productions, DMA, Criterion, and Sports Interactive, were acquired by U.S. and Japanese multinationals.⁶¹

The presence of foreign multinationals also facilitated the spread of the work-for-hire model among participants throughout this period. This typically involved multinational publishers contracting game development companies with a specific requirement. The developers would then receive a negotiated fee either as a fixed sum or as a percentage of total sales of the final game deducting the expenses as compensation. The use of external game development was formalized with contractual obligations, which specified milestones and payment schedules.⁶² The intellectual property rights of the games in most cases, however, belonged to the publishers. The development process was monitored as the publishers aligned the production with their marketing plan. To a great extent, independent British game studios integrated themselves into the global value chain of multinationals through work-for-hire contracts.

⁵⁸ Andy Chalk, “Ten Deals That Shook the Industry,” Escapist, 25 July 2018, <https://www.escapistmagazine.com/v2/ten-deals-that-shook-the-industry/>; “Eidos Cash Call Hits Share Prices,” BBC News, 29 May 2001, <http://news.bbc.co.uk/2/hi/business/1357873.stm>; Jonathan Green, *You Are the Hero* (Haddenham, 2014).

⁵⁹ Tim Bradshaw and Maija Palmer, “Eidos Approves Takeover by Square Enix,” *Financial Times*, 27 Mar. 2009.

⁶⁰ Simon Bowers, “SCi Shares Flourish after Founder Is Forced Out,” *Guardian*, 19 Jan. 2008.

⁶¹ Electronic Arts acquired Bullfrog and Criterion in 1996 and 2004, respectively. Sega purchased Sports Interactive in 2006. France’s Infogrames acquired the Sheffield-based Gremlin Interactive (which bought DMA in 1997) for US\$40 million in early 1999; Infogrames then sold DMA and its intellectual property associated with Grand Theft Auto to Take-Two in September 1999 for US\$11 million. Infogrames closed the Sheffield operation in 2003, and most of Gremlin’s employees stayed in the city and joined the new venture Sumo Digital. London-born Sam Houser, who was instrumental in the ingenious promotion of Grand Theft Auto, relocated to New York and led Take-Two’s newly founded Rockstar Games.

⁶² Jason Avant (studio manager), interview by the author, Buena Vista Games, Brighton, 8 Nov. 2006.

This model was essential because of the expenses associated with game production. It was not uncommon for a developer to spend a year on the production of an original game. During the twelve months of production, the developer had to cover the fixed costs of, for example, salaries and rent; however, the game generated a stream of income only after its release. Consequently, it was essential for game developers to obtain revenues in the interim through other means, whether by working on publishers' projects or as subcontractors for larger developers, to sustain their operations. Most small- and medium-sized companies therefore focused on fulfilling external game development contracts, while aspiring to engage in original work that could be lucrative in the market. For example, Frontier Developments produced ten game titles during the period from 1994 to 2006 (twelve on behalf of publishers and one internally developed game, *Darxide EMP*), whereas the new Dundee-based 4J Studios secured work-to-hire projects from Bethesda and Codemasters. Frontier worked mainly with U.S. multinationals and, to a lesser extent, with Japanese and French multinationals. This provided the companies with healthy cash flow to maintain daily operations.

There were collective efforts to support creativity in the industry in this period. For example, industry participants in Scotland worked with local institutions to improve the supply of human capital. The University of Dundee and Abertay University began offering courses in game design in 1997. Universities in Sheffield (for example, Sheffield Hallam), London (City and Brunel), and South East of England (Bournemouth) developed similar programs. Furthermore, industry participants came together to establish TIGA in 2001. The major aim of the newly formed body was twofold: to lobby Parliament to provide greater financial incentives to gaming companies and to improve the competitiveness of the British video game market compared with that of other countries, like Canada. It also tried to bolster video games against other sectors of the entertainment industry, such as film and music, in terms of public recognition.

The emerging digital distribution model also offered new opportunities. Experienced programmers, including Mark Healey, were able to maintain intellectual property and sell original games on the digital distribution platform Steam, owned by the Washington State-based Valve Corporation. Healey's game *Rag Doll Kung Fu*, released in 2005, was the first third-party game listed by Valve. Healey went on to cofound Media Molecule in 2006 and to launch the franchise *Little Big Planet* with the character Sackboy in 2008. Other new entrants from universities, such as Mediatonic and Introversion Software in London, also began selling through new channels to a dedicated group of players in 2005.

Table 1
 Games Developed by Frontier for Multinational Publishers,
 1995–2020

Year	Revenue (£ millions)	Games
1995	14	<i>Frontier: First Encounters, Darxide</i>
1996	3	
1997	2	
1998	178	<i>V2000</i>
1999	137	
2000	56	<i>Infestation</i>
2001	117	
2002	206	
2003	694	<i>Roller Coaster Tycoon, Roller Coaster Tycoon 2: Wacky Worlds & Time Twister, Wallace & Gromit in Project Zoo, Dog's Life</i>
2004	503	* <i>Darxide EMP, Roller Coaster Tycoon 3</i>
2005	621	<i>Wallace & Gromit: The Curse of the Were-Rabbit</i>
2006	2,119	<i>Thrillville</i>
2007	1,283	<i>Thrillville: Off the Rails</i>
2008	9,461	* <i>LostWinds</i>
2009	6,767	* <i>LostWinds 2: Winter of the Meoldias</i>
2010	9,604	<i>Kinectimals</i>
2011	11,196	<i>Kinect: Disneyland Adventure</i>
2012	14,157	<i>Kinect Star Wars, *Coaster Crazy</i>
2013	12,072	<i>Zoo Tycoon, *Coaster Crazy Deluxe</i>
2014	9,541	<i>Tales from Deep Space, *Elite Dangerous</i> [various editions through 2020]
2015	22,763	<i>Screamride</i>
2016	21,363	* <i>Planet Coaster</i> [various editions through 2020]
2017	34,200	
2018	37,400	<i>Zoo Tycoon: Ultimate Animal Collection, *Jurassic World Evolution</i> [various editions through 2020]
2019	89,689	* <i>Planet Zoo</i> [various editions through 2020]
2020	76,089	[various editions through 2019]

Source: "Frontier Developments plc," MobyGames, accessed 26 May 2021, <https://www.mobygames.com/company/frontier-developments-plc>; Frontier Developments annual reports.

Notes: Roller Coaster Tycoon and Kinect Star Wars represented Frontier's work for game developers Chris Sawyer Productions and Terminal Reality, respectively. Frontier's other work for publishers included the following: Frontier: First Encounters (Game Tek, U.S.), V2000 (Grolier Interactive, U.S.), Infestation (Ubisoft, France), Roller Coaster Tycoon 2: Wacky Worlds and Soaked (Infogrames/Atari, France), Wallace & Gromit in Project Zoo (BAM! Entertainment, U.S.), Dog's Life (Sony, Japan), Roller Coaster Tycoon 3 (Infogrames/Atari, France), Wallace & Gromit: The Curse of the Were-Rabbit (Konami, Japan), Thrillville (LucasArt, U.S. & Infogrames/Atari, France), Thrillville: Off the Rails (LucasArt, U.S.), Kinectimals (Microsoft, U.S.), Zoo Tycoon (Microsoft, U.S.), Tales from Deep Space (Amazon, U.S.), Screamride (Microsoft, U.S.), and Zoo Tycoon: Ultimate Animal Collection (Microsoft, U.S.).

*Games developed and published by Frontier

The Rise of Indie Games, 2007–2020

The advent of digital distribution, which began around 2007 and started to take off in earnest after 2010, brought new opportunities to both established multinational players and a new generation of start-ups. In 2007, about 600 companies comprised the British video game industry.⁶³ By 2018, there were 2,261 video game developers in Britain, and over three-fifths were established after 2010, seeking to exploit the new market opportunity that digital distribution offered. Importantly, the vast majority of these new game developers were small; more than 2,000 of these companies had fewer than 250 employees.⁶⁴ Using the prevailing game engine technology, they were able to make sophisticated games with small teams.⁶⁵

Digital distribution became feasible with the advent of online delivery and online payment for video games during this period. The launch of the Valve Corporation's Steam, an online game shop as well as a hub where users could store and play their purchased games, spurred other industry players to develop their own digital distribution models, including Xbox Stores (2005), PlayStation Store (2006), the App Store (2008), Google Play (2008), and Nintendo eShop (2011). As video games were increasingly played on mobile platforms, casual players became a new and important segment in the industry.

With gamers becoming more familiar with the concept of the online marketplace, Eidos and Codemasters entered into an agreement with Steam to deliver some of their new game titles in 2007.⁶⁶ Soon, the release of new games via Steam coordinated with the delivery schedule of the titles in brick-and-mortar stores. Other game developers raised funds virtually for game projects. Frontier Developments successfully raised funds to develop a new *Elite* game through the Kickstarter fund-raising service, banking on the popularity of the franchise among fans to generate financial support among would-be players. The move allowed Frontier to refocus its strategy toward development of original games. Overall, Frontier undertook eight publisher-commissioned game projects and produced fifty new games within its six franchises between

⁶³ Nesta, *A Map of the UK Games Industry*, by Juan Mateos-Garcia, Hasan Bakhshi, and Mark Lenel (London, Sept. 2014), 20.

⁶⁴ "Centre Stage: Keeping the UK's Creative Industries in the Spotlight," CBI, Oct. 2019, 22.

⁶⁵ The game engine is the core software of a video game and is labour intensive to write. The arrival of inexpensive, off-the-shelf game engine software such as Unity lowered the barrier to entry in making games during this period.

⁶⁶ "Eidos Launching with Steam," *Game Zone*, 15 Mar. 2007, https://www.gamezone.com/news/eidos_launching_with_steam; Maarten Goldstein, "Codemasters Latest Publisher to Join Steam," *Shack News*, 24 Oct. 2019. Despite its online initiative, Eidos was acquired by Square Enix in 2009.

2007 and 2020.⁶⁷ *Elite Dangerous*, released in 2014, sold over 4.3 million units by the end of 2018.⁶⁸

The British industry also repositioned itself for mobile gaming. Leading mobile game developers included Team17, Revolution Software, Ustwo Games, Playdemic, and Space Ape. Between 2014 and 2019, Ustwo's popular *Monument Valley* franchise was downloaded over 200 million times, and the character Princess Ida was contracted to appear in a Paramount Pictures adapted animated film. Many of the companies that focused on the mobile games market were small; in turn, the proliferation of mobile gaming spurred the growth of micro- and small-sized companies and the expansion of the British cluster.

Digital distribution offered tremendous opportunities to established companies and allowed them the freedom to create. They monetized intellectual property through sales of games in the digital distribution channels of Steam, Microsoft, Apple, and other companies; they sold in-game items and thus generated income even through free-to-play games.⁶⁹ The trend of direct digital channels was popularized by Epic Games in 2011; Epic's *Infinity Blade*, which retailed at US\$5.99, achieved US\$1.6 million in sales in its first four days in the App Store.⁷⁰ Within the British industry, Ustwo, Team17, and Frontier also adopted digital distribution after 2011.⁷¹

Also taking advantage of high-speed broadband internet was London's Mind Candy, founded by the dot-com entrepreneur Michael Acton-Smith in 2004. Mind Candy enjoyed global success with the 2008 launch of the MMO game *Moshi Monsters*, a subscription-based game for children aged six to twelve. The company used the multimedia franchise to generate income from toys, magazines, books, albums, trading cards, a membership service, and an animated musical-comedy film with Universal Pictures. It reached its peak in 2012, attaining sales revenues of £47 million.⁷² Mind Candy's sales revenues then declined as a result of its slow response to the popularity of mobile phone and the tablet platforms among children.⁷³

⁶⁷ For example, the Planet Zoo franchise launched three new titles in 2020: *Planet Zoo: Aquatic Pack*, *Planet Zoo: Australia Pack*, and *Planet Zoo: South America Pack*. These titles allowed players to expand Planet Zoo's gameplay.

⁶⁸ "Notice of Results and Trading Update: Frontier Developments plc," London Stock Exchange, 15 Jan. 2019.

⁶⁹ The Korean online game *Maple Story* invented the free-to-play business model. "Guess Who's Rewriting the Rules of Gaming?" *Fortune*, 28 Apr. 2008.

⁷⁰ Simon Parkin, "Infinity Blade Becomes Fastest-Grossing iOS App," *Gamasutra*, 13 Dec. 2010.

⁷¹ Natasha Lomas, "Ustwo Spends to Keep Whale Trail Flying," *Tech Crunch*, 10 Oct. 2013.

⁷² Stuart Dredge, "Moshi Monsters Revenues Grew in 2012 but Mind Candy Sees 'Untapped' Mobile Potential," *Guardian*, 3 Oct. 2013.

⁷³ Matthew Field, "Mind Candy on Track to Double Sales as It Signs Up Brian Blessed for Children's Story App," *Telegraph*, 14 Oct. 2019.

The accumulated project management expertise among multinational subsidiaries and British developers accelerated innovation during this period. Multinational subsidiaries made good decisions in the coordination of console games. Rockstar Games Edinburgh's *Grand Theft Auto V* sold twenty million units in 2020, while Sega's Sports Interactive franchise *Football Manager 2021* sold one million units within two months of its pre-Christmas 2020 launch.⁷⁴ Other established companies such as Frontier, Sumo Digital, 4J Studios, Rebellion, and Team17 continued to perfect the work-for-hire model to attain efficiency and effectiveness when developing AAA games for American and Japanese publishers. 4J was founded by industry veterans Chris van der Kuyl and Paddy Burns in 2005 and had created *Minecraft* titles for gaming consoles since 2012. The company coordinated game production in Britain and globally to deliver Mojang's *Minecraft* games to PlayStation users. Its founders' project management experience meant that 4J was able to maintain a lean core team of fewer than twenty for pre-production during its first twelve years, and relied on external teams during its production process.⁷⁵ Other new entrants, like Ustwo, acknowledged the importance of tacit knowledge in the success of game titles. With seven years of expertise and knowledge in designing commercial applications for clients and original nursery rhyme applications, Ustwo diversified into video games in 2008. The company believed that trial and error, or "perceived failures," ultimately shaped its successful *Monument Valley* franchise.⁷⁶

The larger British companies with decades of industry experience, such as Team17 and Frontier, transformed themselves into publishers to serve other developers in Britain and abroad. For example, Team17 published *My Time at Portia*, which was developed by the Chinese game developer Pathea Games. After the Microsoft Windows version of the game was released on Steam in January 2019, Team17 published the console version in April 2019.⁷⁷ In July 2020, Team17 signed a publishing contract with Tencent's NExT Studios to publish *Crown Trick*. The strength of Team17 as a game publisher was associated with its ability to provide advice regarding game production, marketing, and growth. Furthermore, with the rise of China as the largest video game

⁷⁴ Tyler Clifford, "'Grand Theft Auto V' Sold 20 Million Units in 2020, the Most since Its 2013 Release, Take-Two CEO Says," *Mad Money*, CNBC, 9 Feb. 2021; "'Football Manager 2021 Has Sold over 1 Million Copies in Record Time,'" *Gamasutra*, 5 Jan. 2021.

⁷⁵ Robert McLaren, "Profits Stack Up at Dundee Minecraft Company 4J Studios," *Courier* (U.K.), 2 Aug. 2019.

⁷⁶ Stuart Dredge, "From Mouthoff to Monument Valley: Ustwo's Path to Apps Fame," *Guardian*, 29 May 2015.

⁷⁷ Grey Wright, "Yorkshire-Based Games Label Team17 Signs Deal to Grow Its Reputation in Asia," *Wakefield Express*, 16 July 2020.

market in the world, the British cluster sought to benefit from collaboration with Chinese companies, as it had with previous collaborations with U.S. and Japanese multinationals.⁷⁸

Established companies that expanded through acquisition during this period successfully preserved their cohesive teamwork. While foreign multinationals selectively closed their subsidiaries, Codemasters took the opportunity to expand its resources in the competitive sports genre. It acquired Sega Racing Studio, Vivendi's Swordfish Studios, and Sony's Evolution Studios. Codemasters did not acquire the intellectual property of the former multinational subsidiaries but simply focused on tapping into the knowledge base of their existing development teams. These new teams, which specialized in racing games, enhanced Codemasters' ownership advantages in terms of technical expertise in the racing game genre. Consequently, the former team dynamics among the multinational subsidiaries were sustained in the acquired studios. These teams joined Codemasters and worked at the same offices in order to maintain their original DNA, and Codemasters benefited from the collective knowledge the gaming professionals had accumulated during production of previous projects.⁷⁹ After 2008, Codemasters worked with the *Formula One World Championship* franchise; the first series, released in 2009, won several industry awards. Codemasters' *F1 2019* game was also regarded as the top global sports gaming franchise, with over twelve million players across different game platforms.⁸⁰ Codemasters acquired the London-based Slightly Mad Studios in 2019, further strengthening its racing franchises.⁸¹

TIGA managed to raise the profile of the British video game industry and lobbied for specific policies that targeted industrial growth. Its campaigns led to favorable policy in terms of the improvement of R&D tax credits in 2011, the expansion of the U.K. shortage occupation list in 2013, the introduction of the Video Games Tax Relief (VGTR) in 2014, and the creation of the UK Games Fund in 2015.⁸² In particular, its

⁷⁸ Tencent's global investment includes Activision Blizzard, Riot Games, Epic Games, Ubisoft, and Frontier Developments. Frontier's equity ties with Tencent enabled it to gain tacit knowledge of the game market in China. Aliya Ram, "Tencent takes 9% Stake in UK's Frontier Developments," *Financial Times*, 28 July 2017.

⁷⁹ Matt Martin, "Codemasters Acquires Sega Racing Studio," *Gamesindustry.biz*, 25 Apr. 2008; Dan Person, "Evolution Studios Joins Codemasters," *Gamesindustry.biz*, 11 Apr. 2016; James Batchelor, "Codemasters Moves F1 Team into New Birmingham Studio," *Gamesindustry.biz*, 25 Apr. 2019.

⁸⁰ Martin Gamble, "Codemasters Agrees Five Year Formula 1 Contract Extension," *Share News*, 1 Nov. 2019.

⁸¹ Matthew Handrahan, "Codemasters Buys Slightly Mad Studios for 30m," *Gamesindustry.biz*, 2 Nov. 2019.

⁸² See "Policy and Public Affairs," TIGA, accessed 2 June 2021, <https://tiga.org/policy-and-public-affairs>.

VGTR campaign lasted for seven years and provided incentives for multinationals to pursue development activities in their subsidiaries.⁸³

Conclusion

The British video gaming industry, then, emerged from highly informal beginnings to become the birthplace of such globally famous games as *Elite*, *Tomb Raider*, and *Grand Theft Auto*. The accumulated expertise of individual participants was a fundamental driving force in the industry. Most could have had alternative careers in a range of sectors; however, their passion for video games provided intrinsic motivation for continuous engagement, despite challenging times. Their knowledge, accumulated from experience in game design, programming, market trend forecasting, and project management, enabled the British industry to innovate continuously from its early days.

This article has identified three periods in the development of the British industry, which are intertwined with technological advances that led to major changes in the organization of video game projects. Initially, the small team size required for game development meant that individuals were able to use the knowledge they had gained from playing and programming games to solve technical issues when creating new titles. The marketing in this early period was intuitive and small scale, targeting hard-core players through a network of relationships built up between publishers and developers as well as with game players. The arrival of sophisticated game consoles increased budgets for and the amount of time invested in game development. Collegiality among experienced professionals willing to regroup and work together across Britain underpinned many successful projects. Additionally, knowledge sharing within teams during day-to-day personal interactions and across projects arising from job mobility resulted in greater efficiency and enabled the British cluster to prosper. Though exogenous shocks altered the competitive dynamics and led to new business models, the British industry's ability to manage relationships with multinational publishers and to solve problems inherent in game development within a collegial environment enabled its versatile participants to adapt to changes. Finally, the rise of digital distribution reversed the trend incentivizing participants to innovate in order to appropriate the monopoly rents concerning intellectual property. Independent start-ups, enabled by evolving game development technology, focused on creativity and aspired to create hit titles for a global market.

⁸³ “Revealed: Global Video Games Giants Avoiding Millions in UK Tax,” *Guardian*, 2 Oct. 2019.

Established companies with accumulated expertise in game design, project leadership, and management took advantage of this new opportunity and steered toward self-publishing games.

The British government had unintentionally sown the seeds of the video game industry in its quest for industrial renewal in the late 1970s. The early emergence of the British industry was helped by the BBC Computer Literacy Project; subsequently, the government's role was mainly reactive. The hit-title-driven nature of the industry created uncertain income streams and cash-flow issues coupled with inadequate finance and management expertise. As a result, early successful companies were either acquired or bankrupted. Industry participants, realizing the need to become more proactive, engaged at the local and national levels to improve the landscape of the British industry.

U.S. and Japanese multinationals entered the British market from the 1980s. As investment in game titles steadily escalated after the launch of the Nintendo Wii, Sony PlayStation, and Microsoft Xbox, these multinationals came to the rescue of troubled local companies, which encountered heightened financial pressure throughout the 1990s and the early 2000s. Indeed, many small British companies were absorbed into the larger multinational network as subsidiaries. Others collaborated with multinationals through work-for-hire projects. From the 2010s, British companies including Codemasters, Team17, Jagex, and Frontier extended their collaboration with counterparts in emerging economies. This, in turn, has enriched their market knowledge, helping them to expand into new markets that are structurally and culturally different from Britain and the United States.

The British industry also repositioned itself in line with the external environment and pursued new business models in pricing and distribution. With the rise of the Internet, innovative developers created intellectual property based on expertise and ideas, as well as practicing work-for-hire. They used existing distribution channels or their own websites to pursue a self-publishing strategy for original games. A considerable number of British independent developers also entered the surging mobile game segment. Given that less-established development companies were able to provide work-for-hire, the contribution of multinational subsidiaries became more significant.

Even though this article focuses only on the evolution of the British industry between 1978 and 2020, it has shown significant interaction with the United States and Japan. The arrival of arcade games and PC gaming in Britain aroused the imagination of entrepreneurs and enthusiastic players who were eager to be part of a new industry. Generations of British consumers of video games who became game professionals were able to pursue their life's passion while simultaneously fueling

the expansion of the industry. Their knowledge in game development was associated with the twin understanding of the mechanics of play and the psychology of fun, which was also the bedrock of the industry in both the United States and Japan.

In conclusion, technology has played a key role in the British video gaming industry. Foreign multinationals entered Britain with both market and efficiency motivations. The subsequent transfer of knowledge and expertise provided British video game participants with a global view of the industry from its inception, generating an enduring characteristic of innovation. This article has highlighted knowledge embedded in innovation, which played a key role in the creation and continuity of the cluster despite turbulence in the external environment. The British industry has not only witnessed the transformation of video game production from amateur project to professional project but also shared knowledge with foreign multinationals during times of uncertainty. The industry grabbed the digital distribution channel and controlled its destiny through the launch of innovative original games. It also successfully used its knowledge in AAA game development and contributed to the development of console game technology.⁸⁴ Overall, the ability to grasp existing opportunities served as a foundation on which the British industry could reinvent itself when changes were inevitable.

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⁸⁴ Jason Schreier, “PlayStation 5 Review: Video Games You Can Actually Fool,” *Bloomberg Business Week*, 6 Nov. 2020.