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Innovation and Intellectual Property Use in the Global Video Game Industry

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ABSTRACT

This paper is an analysis of the evolution of the global video game industry, a sector characterized by rapid technological innovation and changing business models. It builds on the work of Özalp (2024) and delves into how innovation in hardware, software, digital transformation and business models have redefined the boundaries of game development and player experiences. The paper also explores the important job roles in the industry, the role of intellectual property and end with predictions for the future of the industry. It aims to provide an accessible understanding of the industry's evolution, its current state, and its potential future directions.

THE GLOBAL VIDEO GAME INDUSTRY

The video game industry encompasses all economic activity related to developing, marketing and monetizing video games, and its stakeholders include developers, publishers, (digital and physical) distributors, retailers, hardware manufacturers, game development tool providers and consumers. The industry today spans consoles, PCs, mobile devices, and browser and cloud services. Key components of the industry include game development; publishing (both physical and digital); hardware (including consoles, headsets and other accessories); esports and competitive gaming; and community and support services.

Within the video game industry two main players are key to bringing a game to market: the publisher and the game developer. Publishers finance and promote the game, while developers, who can be either independent individuals or large companies, are tasked with

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the actual game creation. Many publishers also have in-house or vertically integrated developer operations (Thomes, 2015).

Producing a video game involves significant risk, primarily due to the unpredictability of a game's popularity (De Vaan et al., 2013). This uncertainty is heightened by the increasing costs associated with game development, which have escalated in recent years. This change is evident in the growth of development teams. For example, in 1995 an average development team comprised about 26 people (see figure 1). By 2015, this figure had risen to approximately 94 people, illustrating a substantial increase in staffing and, consequently, development costs. Role types have similarly grown, increasing the cost and complexity of managing these larger teams as seen in figure 2.

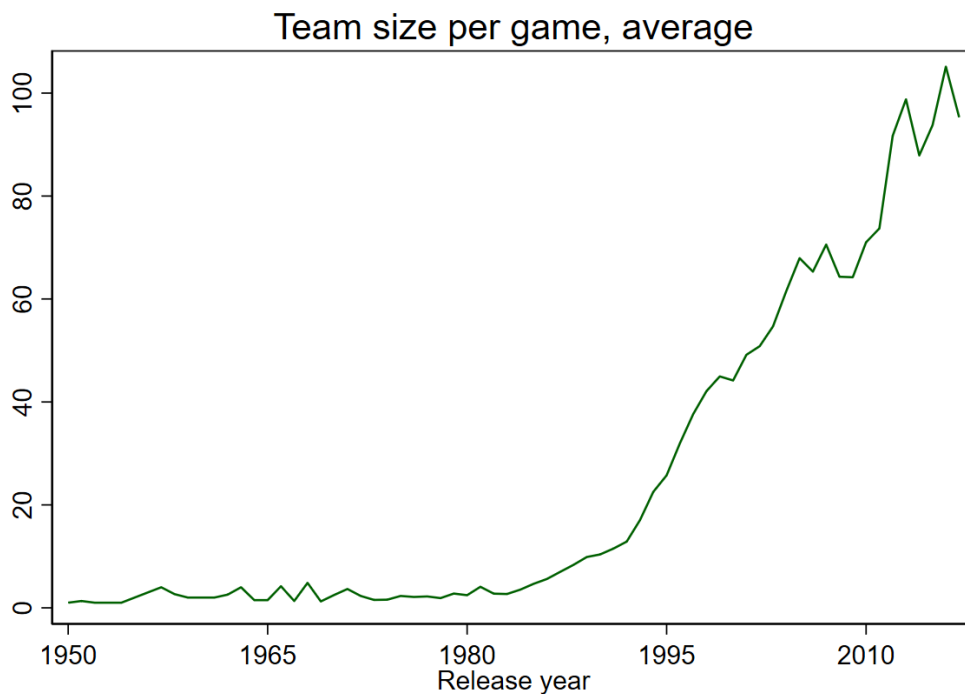


Figure 1: Video game development teams have grown larger. Data: Mobygames.

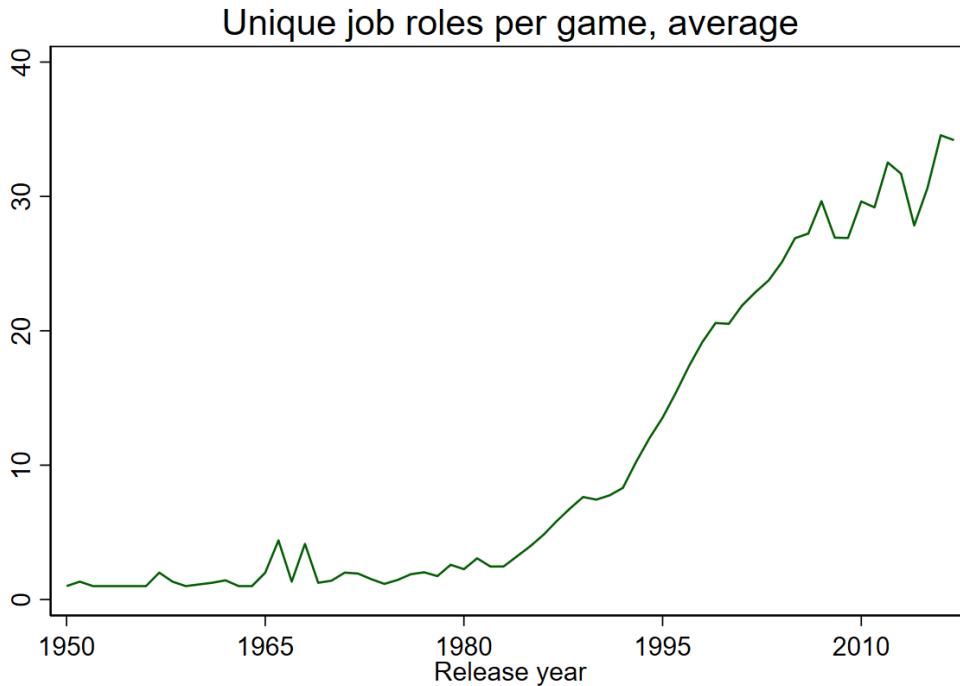
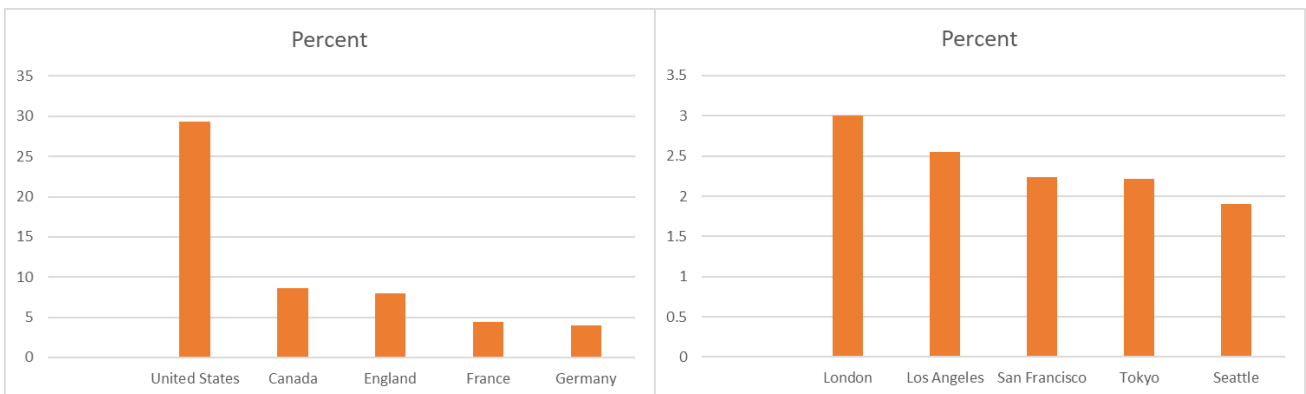


Figure 2. Video game production has grown more complex and requires more specialized know-how. Data: Mobygames.



All-time top 5 countries of video game firms, in percent

All-time top 5 cities of video game firms, in percent

Figure 3: North America, Europe and Asia are top locations for video game firms. Data: gamedevmap. Video game firms include developers, publishers and ancillary organizations.

In this complex landscape, the role of publishers has evolved. Many have taken on development roles, integrating vertically to better control production, distribution and marketing. This vertical integration that started in the 2000s reflects a strategic response to the economic realities of the industry, aiming to streamline operations and leverage

synergies between development and distribution. During that time, major publishers such as Activision and Electronic Arts acquired several smaller development studios, a strategic move to create efficiencies and manage escalating costs. These consolidations reflect the increasing economic complexity of the global video game industry (Tschang, 2007).

Financially, the video game industry has outperformed traditional entertainment industries like film and music in terms of revenue, contributing substantially to the global economy (NewZoo, 2023). It's not just a commercial success story; the industry also fosters innovation in software development, graphics technology, and interactive storytelling. The rise of esports and digital distribution platforms has further expanded the industry's reach and influence.

Globally, the industry's market is broad, with significant contributions from regions such as North America, Asia, and Europe (see figure 3 and table 1). Each region contributes its own cultural nuances to game development and consumption patterns (Prato et al., 2014). The economic impact is also notable, with the industry supporting a vast ecosystem of jobs in game development, publishing, and related sectors.

| Company name | Gaming revenue 2022 (USD) | Main domestic country |
|---|---------------------------|--------------------------|
| Sony Group Corporation (Games and Networking Services Division) | 27 billion | Japan |
| Tencent Games | 24.4 billion | China |
| Microsoft Gaming | 16 billion | United States of America |
| Nintendo Co. Ltd. | 12 billion | Japan |
| NetEase Games | 10.9 billion | China |

Table 1: Top five video game companies by gaming revenue. Data: Orbis, author estimations.

One of the most significant disruptions to the industry recently is the lockdown measures that occurred during the COVID-19 pandemic. Lockdown proved to be a boon for the gaming industry as a housebound world population spent more time playing video games. Since lockdowns ended, some parts of the industry have seen a decrease from that peak, but many of the trends seem to have accelerated during the lockdowns and remain today such as the rise of “games as a service” (GaaS) in the console and PC markets and global consolidation in the industry.

INNOVATION IN THE GLOBAL VIDEO GAME INDUSTRY

Every new video game is a unique product, intricately combining advanced software engineering with creative artistic design. This uniqueness positions each game as an innovation, as it introduces something novel and different to the market. In this context, each game is not just a piece of entertainment but a complex, creative

invention. Nonetheless, the degree of innovativeness of video games may vary. See Özalp (2024) for a discussion on copycat games.

Drawing parallels, the video game industry resembles other highly innovation-driven sectors. For instance, in the biopharmaceutical industry, every new drug represents a breakthrough, combining complex scientific research with practical applications. Similarly, in the aviation industry, each new aircraft model embodies a culmination of cutting-edge engineering and design enhancements. These industries, much like video gaming, are characterized by a relentless pursuit of innovation.

The global video game industry has been significantly influenced by hardware innovation, software innovation (including developments in artificial intelligence) and digital transformation. These factors have not only redefined the nature of the industry but also profoundly impacted the way content is created, distributed, and consumed.

1. **Hardware Innovation:** Advancements in hardware, like faster processors, advanced GPUs, and XR devices, have pushed the boundaries of game development, enabling more immersive and complex gaming experiences.
2. **Software Innovation:** Software innovations, particularly in game engines and development tools, have lowered barriers to entry, allowing more creators to participate in the industry. In addition, AI is currently transforming various aspects of game development, from procedural content generation to enhancing player experiences through personalized game elements. AI-driven analytics are also being used to understand player behavior, which helps in designing more engaging and profitable games.
3. **Digital Transformation:** The shift towards digital distribution platforms (e.g., Steam, Epic Games Store) has revolutionized how games are sold and distributed, reducing costs, and increasing market reach. This transformation has also led to the rise of games which are continuously updated and monetized over time. The pandemic accelerated the adoption of digital technologies and remote working in the gaming industry. It also led to a significant increase in gaming audiences, as people sought entertainment during lockdowns. This surge in demand has spurred innovation in online multiplayer experiences and cloud gaming services.

INNOVATION IN VIDEO GAME HARDWARE

Hardware innovation is an important enabler of this industry since a game's technical possibilities are usually defined by the hardware limitations, functionalities (e.g., touch screen or motion sensor) and computing power. For example, virtual reality headsets are causing video game developers to imagine new ways to take advantage of their new

functionalities. Patent filing data shown in Figure 4 suggests that innovation in video game hardware and other technologies has grown rapidly in recent years, while Figure 5 shows how the dominance of various video gaming platforms have shifted over time.

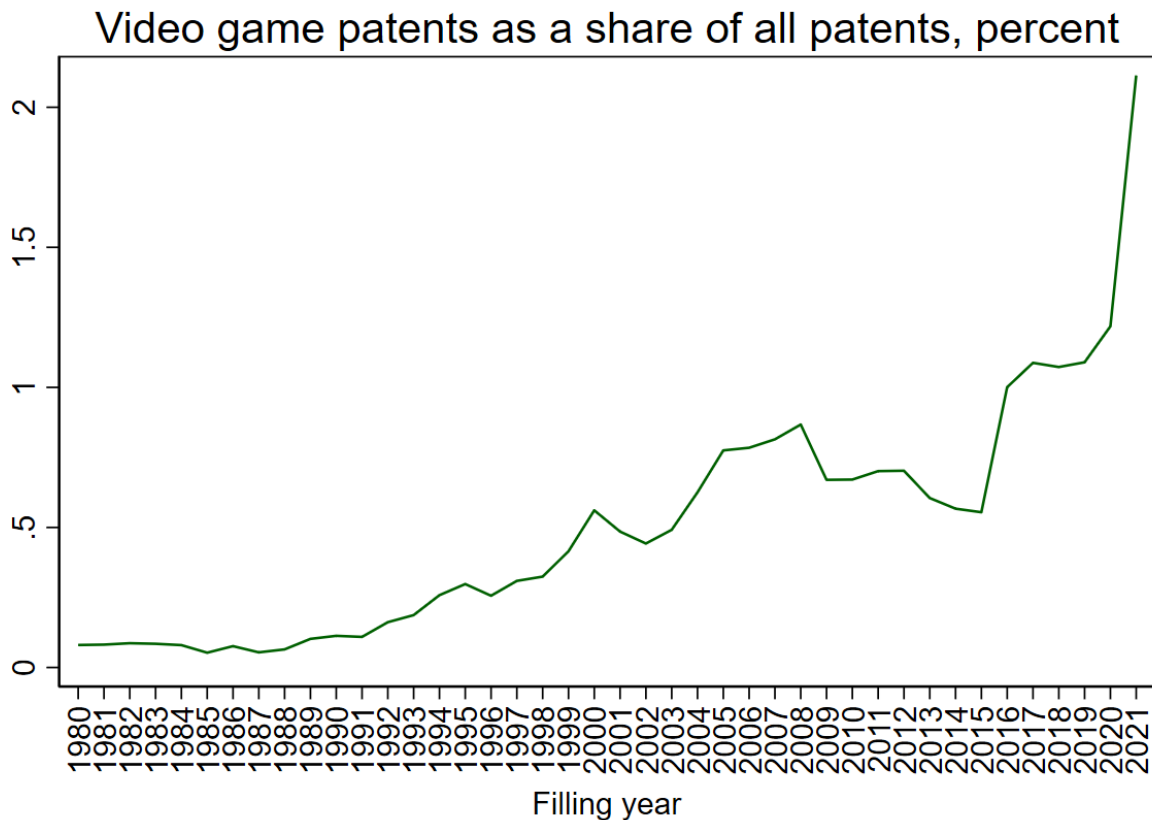


Figure 4. Innovation in video game technologies has grown rapidly. Data: Patstat; WIPO.

The Genesis and Decline of Arcades

The early days of video gaming were dominated by arcade machines, large apparatuses that offered experiences not replicable in the home environment. This era was characterized by simple yet addictive games like "Pac-Man" and "Space Invaders," which laid the groundwork for the gaming industry. Economically, arcades represented a direct transactional relationship between game performance and revenue, incentivizing developers to create challenging games that could maximize the duration of play thus increasing revenues. However, the rise of home console gaming, beginning with systems like the Atari 2600, initiated a decline in arcades. The ability to replicate or even surpass the arcade experience in the comfort of one's home marked a pivotal shift in consumer preference, leading to the gradual obsolescence of arcades.

The Console Wars and Innovation

The evolution of home consoles can be described as a series of generational leaps, each marked by significant technological advancements and fierce competition among manufacturers. The "console wars," initially between Nintendo and Sega, and later between current giants like Nintendo, Sony, and Microsoft, have been a driving force behind innovation in this space. Each new console generation brought with it improved graphics, processing power, and storage capabilities, enabling more complex and immersive gaming experiences. This competition also spurred differentiation in game development, with each platform fostering its unique ecosystem of games designed to leverage its hardware capabilities. From the cartridge-based systems of the 1980s to the high-definition, internet-connected consoles of today, the hardware evolution has expanded the scope and variety of video games, catering to a broad spectrum of genres and audiences.

The Rise of PC and Mobile Gaming

Parallel to the development of consoles, the personal computer emerged as a powerful platform for gaming, benefiting from the continuous advancement in computing technology and the openness of the platform. The PC gaming market thrived on the flexibility it offered to developers and gamers alike, including upgradable hardware, modifiable game content, and an increasingly digital distribution model. Games developed for PCs could harness the latest in graphics and processing power, pushing the boundaries of what was possible in gaming.

The advent of smartphones and tablets opened yet another chapter in the history of video game hardware. Mobile gaming, with its convenience and accessibility, has democratized gaming, making it a ubiquitous form of entertainment across demographics previously untapped by traditional gaming platforms. The touch screen interface led to the development of new game genres and play styles, tailored for brief, interactive sessions. This segment's exponential growth has significantly influenced the economics of the gaming industry (Yamaguchi et al., 2017), emphasizing micro-transactions and freemium models. In 2023, mobile games were the largest part of the video game market accounting for over 700,000 games in the App and Play stores combined and 49% of all video games (NewZoo, 2023).

Handheld Consoles: A Niche Market's Rise and Integration

Handheld gaming devices, epitomized by Nintendo's Game Boy and DS, Sony's PlayStation Portable (PSP), and later the Nintendo Switch, carved out a niche by blending mobility with the immersive experience of dedicated gaming hardware. These devices catered to a market segment seeking the quality and depth of console games with the portability of mobile devices. Over time, however, the distinction between mobile and handheld gaming has blurred, with smartphones increasingly capable of delivering complex gaming experiences. The Nintendo Switch represents a hybrid model that successfully merges the home console and handheld gaming markets, indicating a potential path forward for dedicated gaming devices in a predominantly mobile world.

XR: A New Frontier in Gaming

Extended Reality (XR)—an umbrella term that encompasses Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR)—is redefining the interface between the physical and digital realms, offering immersive experiences that challenge traditional notions of gameplay and interaction. XR technologies mark a significant departure from conventional video game hardware, focusing on immersion as their core value proposition. VR headsets, for instance, transport players into fully realized digital worlds, offering a level of immersion unattainable by traditional screens. This technology has given rise to new types of interactive experiences, from exploratory adventures in fantastical landscapes to intense, room-scale physical activities. AR, by contrast, overlays digital information onto the real world, enriching the user's environment with interactive digital elements. Games developed for AR devices, such as smartphones and AR glasses, blend physical and digital spaces, creating unique gameplay opportunities that leverage the user's surroundings. MR technology takes the concept even further by allowing digital and physical elements to interact in real-time. This creates a hybrid reality where game elements can react to changes in the physical environment, offering unparalleled dynamism and interactivity. The potential for MR in gaming is vast, promising experiences that seamlessly integrate the player's physical actions and environment into the game world.

The adoption of XR in gaming reflects broader economic and technological trends, including the demand for more immersive and interactive entertainment options, the advancement of sensor and display technologies, and the increasing computational power of consumer devices. The development of XR hardware and content requires substantial investment in research and development, suggesting a high barrier to entry for new market participants. However, the potential for groundbreaking applications of XR extends beyond gaming, into

fields such as education, healthcare, and social interaction, indicating a wide array of possible revenue streams and commercial applications. The XR gaming market also faces unique challenges, including the need for widespread consumer adoption of XR devices, the development of content that justifies the investment in such hardware, and the management of physical space requirements for certain XR experiences. Additionally, issues such as motion sickness in VR and the integration of AR into everyday environments present ongoing challenges for developers and manufacturers.

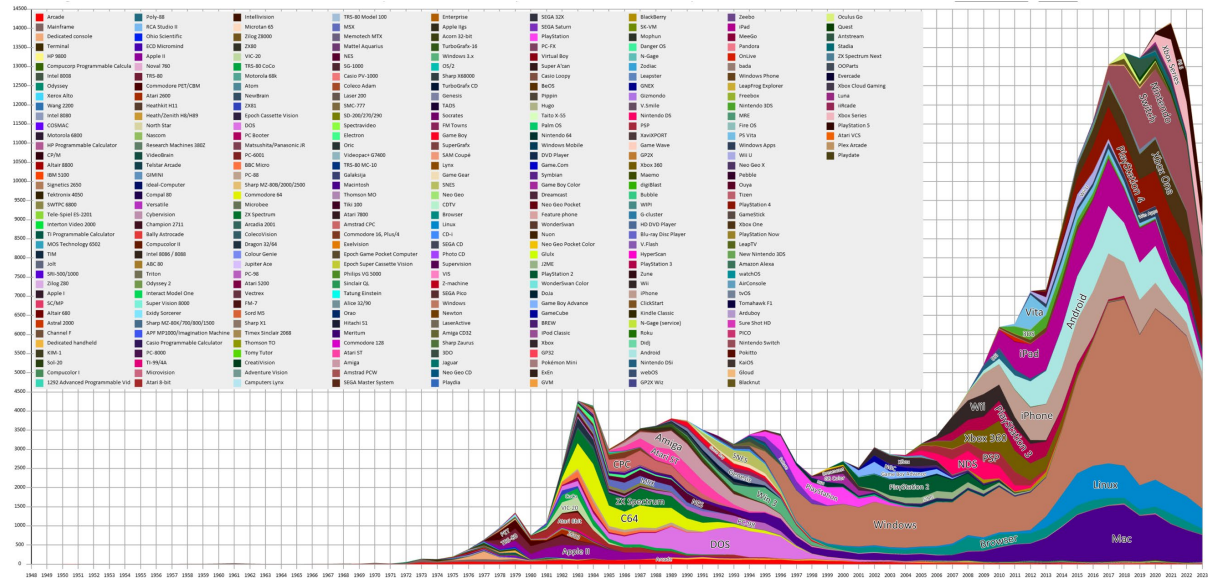


Figure 5. Video game platform market shares have changed greatly over time. Source: Paul van Eekelen; Mobygames. View the full resolution image here: <https://cdn.mobygames.com/user/18166618-image.png>

SOFTWARE AND IN-GAME INNOVATION

It is also possible to define innovation by considering components that make up a game (and its genre): gameplay, audiovisual presentation, story and context (Özalp 2024). From this perspective, an innovation – often a disruptive one – is usually represented by the novel combination of these components. In the past, such innovations have resulted in games that spun off whole new genres in the industry. For example, by introducing new gameplay and audiovisual presentation, *Wolfenstein 3D* is credited as the ‘grandfather’ of a genre called “first-person shooter”.

In-game innovation also extends beyond gameplay, audiovisual presentation, and storytelling. A significant part of this innovation is rooted in the software components that form the backbone of video games. This includes advancements in AI, game engines, and real-world physics simulations. These innovations, while integral to the gaming experience, are somewhat distinct because they often originate from industry suppliers and are subsequently licensed to various game developers.

AI in Games

The role of AI in video games has evolved dramatically. Initially used to control non-playable characters (NPCs) and create more dynamic environments, AI now enables more sophisticated game behaviors. This includes adaptive difficulty levels, more realistic NPC interactions, and even procedural content generation, where game elements are created in real-time, offering a unique experience each time a game is played. Investors have taken note, pouring millions of dollars into AI-powered video game startups (Dealessandri, 2023).

Game Engines

Game engines are powerful software frameworks used for the creation and development of games. They provide a suite of development tools that allow for the integration of graphics, sound, physics, and AI into a cohesive gaming experience. Modern game engines such as Unreal Engine and Unity have revolutionized the industry by offering more realistic graphics, efficient rendering techniques, and cross-platform compatibility. They enable developers to create more immersive and visually stunning games while also streamlining the development process. Popular examples of game engines include Unity, Unreal Engine, and Godot.

Physics Engines

The simulation of real-world physics is another area of significant innovation. Physics engines allow for the realistic portrayal of movements and interactions within the game world. This includes everything from the way objects fall or collide to the simulation of weather and environmental effects. The advancement in physics engines has led to more believable and engaging game worlds, enhancing the overall immersion for players. Physics engines can be standalone tools that game engines integrate to handle physical simulations. Examples include Havok, Bullet, and PhysX. While some game engines come with their own built-in physics modules, developers can also incorporate external physics engines depending on their specific requirements and the capabilities of the chosen game engine.

These software component innovations thus serve as foundational technologies that push the entire industry forward. Game developers can license these technologies to enhance their game designs, ensuring that even smaller studios have access to cutting-edge developments. Additionally, these innovations contribute to the industry's broader ecosystem, supporting a range of applications beyond traditional gaming. For instance, game engines are increasingly used in fields like architectural visualization, film production, and VR experiences, demonstrating the far-reaching implications of these technological advancements. This cross-pollination of technologies across different industries further accelerates innovation, creating a feedback loop that benefits both the gaming industry and other sectors.

DIGITAL TRANSFORMATION OF THE VIDEO GAME INDUSTRY

The video game industry, like others, has experienced a surge in innovation fueled by digitization in five areas:

Enhanced global collaboration

Digitization has vastly improved communication and knowledge sharing among developers and innovators worldwide. Online platforms, such as virtual game jams and conferences, have facilitated the exchange of ideas and best practices across borders. Additionally, resources such as GitHub and Stack Overflow have streamlined the process of sharing code and programming expertise.

Accessibility of engines

The widespread availability of game and physics engines has democratized game development. These engines, which are the foundational technology of video games, typically require substantial effort and time to develop from scratch. Now, they are accessible through various licensing models, including percentage-based royalties, free usage, or free until a sales threshold is met. This accessibility has empowered smaller firms, teams and individual creators, who might lack the resources or expertise to develop their own engines, to create games.

Digital distribution platforms

The rise of digital distribution has opened the industry up to smaller developers, helping keep the share of first-time developers stable as the industry has grown and consolidated (see Figure 6). In the past, gaining access to distribution networks for physical game formats in the PC and console markets was a major barrier for developers not linked with major publishers. Digital distribution channels have lowered this barrier, allowing more developers to enter the market and reach audiences directly.

Data-driven development

The ability to collect and analyze large amounts of data has enabled developers to understand player behavior better, leading to more personalized and engaging gaming experiences. Data analytics is used for everything from optimizing user experience to guiding content updates and balancing game mechanics.

Cloud gaming and streaming services

Cloud gaming is revolutionizing the video game industry by reducing hardware limitations and expanding accessibility. This technology allows games to be processed on powerful servers and streamed to various devices, enabling developers to create more graphically advanced and complex games, previously limited to high-end hardware. This shift also opens gaming to a wider audience, including those who don't own gaming consoles or high-performance PCs, potentially leading to games that cater to a more diverse range of players. Additionally, cloud gaming simplifies game updates and patches, leading to more dynamic and continuously evolving game worlds. Cloud gaming also facilitates the creation of expansive, persistent game worlds and supporting massively multiplayer experiences. It also allows for experimentation with new genres and formats, particularly those requiring

significant computational power. The ease of cross-platform playability is another benefit, as games can be played seamlessly across devices, broadening the potential audience.

However, cloud gaming's reliance on streaming necessitates a focus on network performance, such as minimizing latency and ensuring streaming quality. Moreover, cloud gaming is shifting economic models in the industry towards subscription-based services, influencing the types of games developed, especially those designed for long-term engagement. In summary, cloud gaming is influencing both the technological and creative aspects of the gaming industry, fostering innovation and potentially leading to new gaming experiences and genres.

In general, these shifts have not only expanded the range of game developers but have also transformed how games are shared, distributed, and consumed, contributing to the dynamic nature of the video game industry.

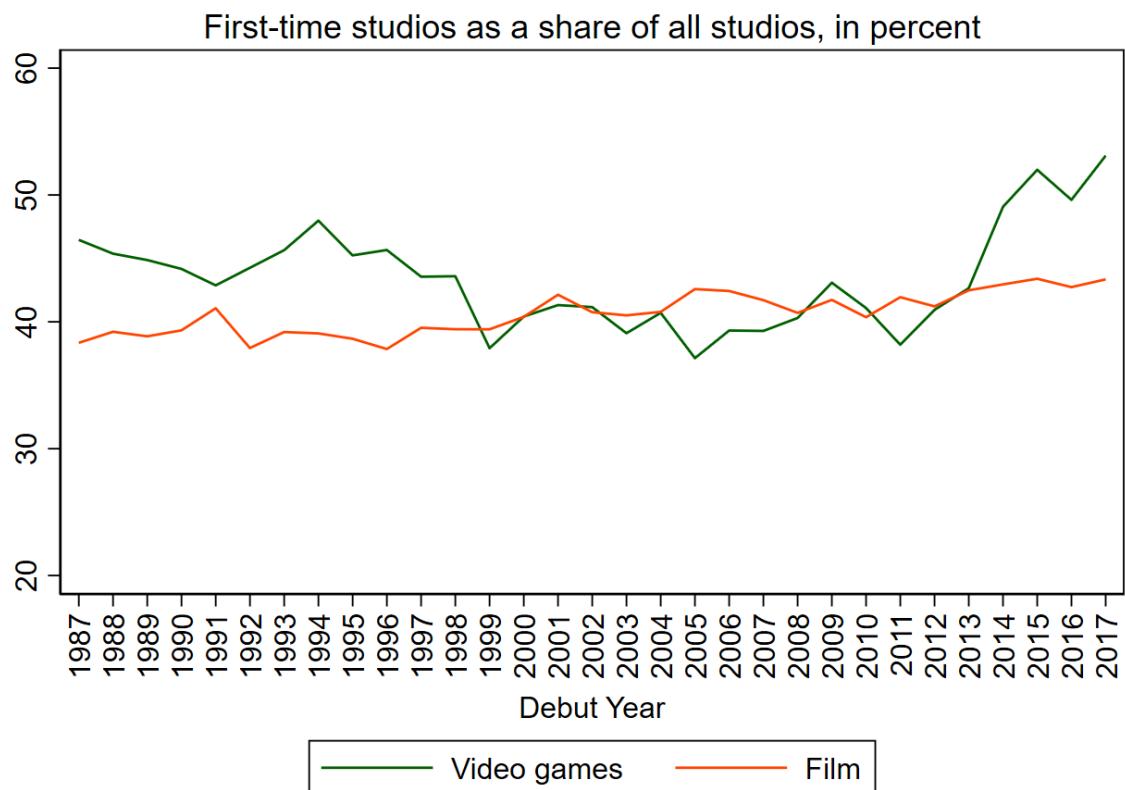


Figure 6: The rate of entrepreneurship is high in the video game industry. Data: Mobygames; TMdB.

BUSINESS MODELS IN THE VIDEO GAME INDUSTRY

The video game industry has undergone a significant transformation in its approach to generating revenue and maintaining market presence. This evolution is marked by a shift from traditional sales models to a variety of innovative strategies that align with changing technologies and consumer preferences.

Traditional Sales and Digital Distribution: Initially, revenue generation in the video game industry relied heavily on the direct sale of games, either as physical copies or digital downloads. Blockbuster titles such as "Call of Duty" and "FIFA" have traditionally driven their revenue through these methods, including the sale of both complete games and episodic content. Digital sales continue to be the primary source of revenue for many video game developers.

Subscription Models: The rise of digital platforms has given way to subscription-based models, as seen with Xbox Game Pass and PlayStation Now. These services offer access to a

vast library of games, along with regular updates and online multiplayer features, for a monthly fee.

Micro-transactions and In-Game Purchases: Micro-transactions represent a significant shift in revenue generation, particularly in free-to-play games like "Fortnite" and "Genshin Impact". These games capitalize on small, often cosmetic in-game purchases, creating a continuous revenue stream during the life of the game.

Advertising and Merchandising: Advertising has become a vital revenue source, especially in mobile gaming exemplified by games like "Candy Crush". Additionally, merchandising and licensing of game IPs, as seen in franchises like "Pokémon", contribute to revenue through products ranging from toys to clothing.

Esports and Live Events: Competitive gaming events, such as those in "League of Legends" and "Dota 2", generate revenue through sponsorships, media rights, and ticket sales.

This now diversified revenue model allows the industry to tap into various consumer segments and adapt to shifting market dynamics. As technology and player preferences evolve, it's anticipated that even more new and innovative business models will emerge, further shaping the future of gaming.

INTELLECTUAL PROPERTY RIGHTS IN VIDEO GAMES

Intellectual property right (IPR) enforcement is critical to the success of a video game hub. This is largely because video game development is a high-risk venture which requires high up-front development costs. However, once a video game is produced, the cost of every new unit – such as a CD or download – is low. In this sense, it is like the film industry, another creative sector. In such a context, strong IPR protection and enforcement raises infringement costs for a violator, which gives a video game developer a better chance of profiting from their work and investment.

Trademarks, copyright, patents and industrial designs are the most common types of IPR within the video game industry. Trademarks protect the brand names associated with a game. Copyright protects the artistic and creative elements of a video game – such as graphics, music, storylines, characters and dialogue, as well as the game's software code. Patents protect technical in-game mechanisms, game development technologies and software, as well as aspects of gaming hardware such as consoles. Industrial designs protect the visual design, the aesthetic and ergonomic aspects of video game user interfaces and hardware. Trademark filings related to video games have grown as shown in

Figure 7, and diversified considerably as seen in Figure 8, suggesting that video game developers and publishers are finding new ways to monetize their products.

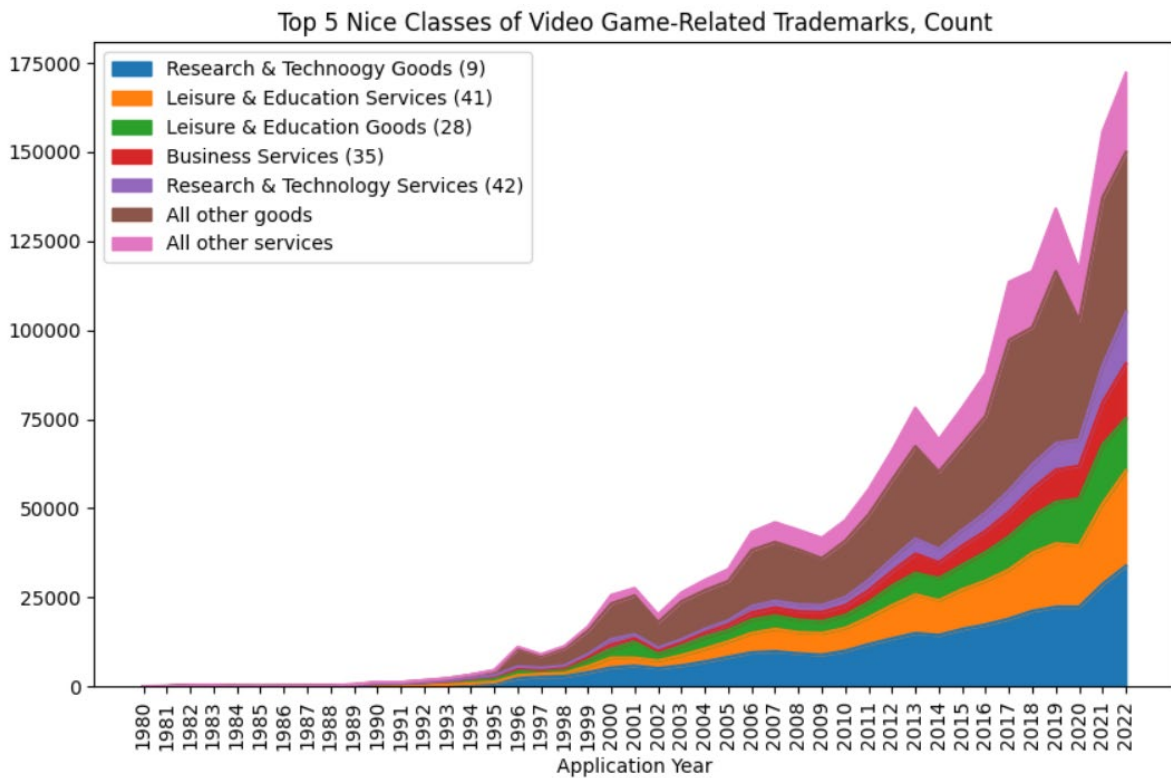


Figure 7. Global trademark filings related to video games have grown. Data: WIPO Global Brands Database.

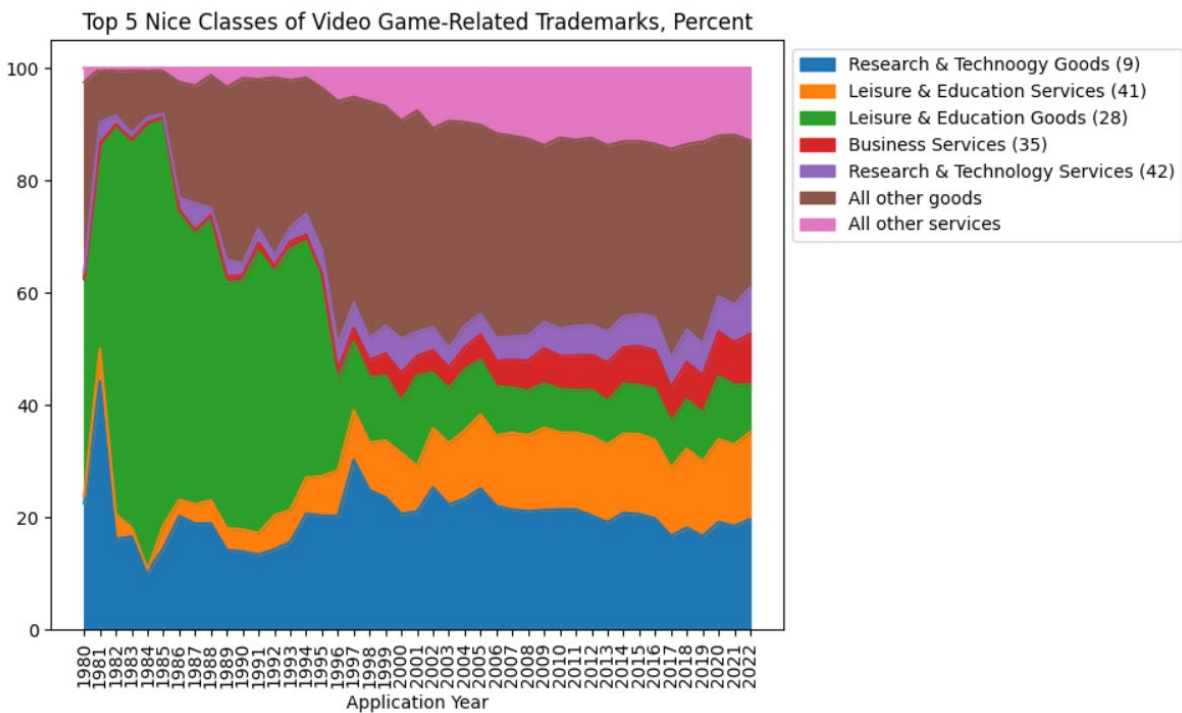


Figure 8. Video game-related trademarks are increasingly filed for uses outside of video games. Data: WIPO Global Brands Database.

CORE JOBS IN TODAY'S VIDEO GAME HUBS

The regions that are most successful at fostering local video game industries are those that already possess certain know-how and leverage it. This know-how has grown more complex over time as shown in Figure 2. Figure 9 presents the evolution of video game industry roles based on Mobygames data. However, many skills are transferable from one video game hardware platform to another. For the video game contributors that switch platforms Figure 9 shows how they move from working on one video game platform to another (see Casper & Storz, 2017 and Izushi & Aoyama, 2006).

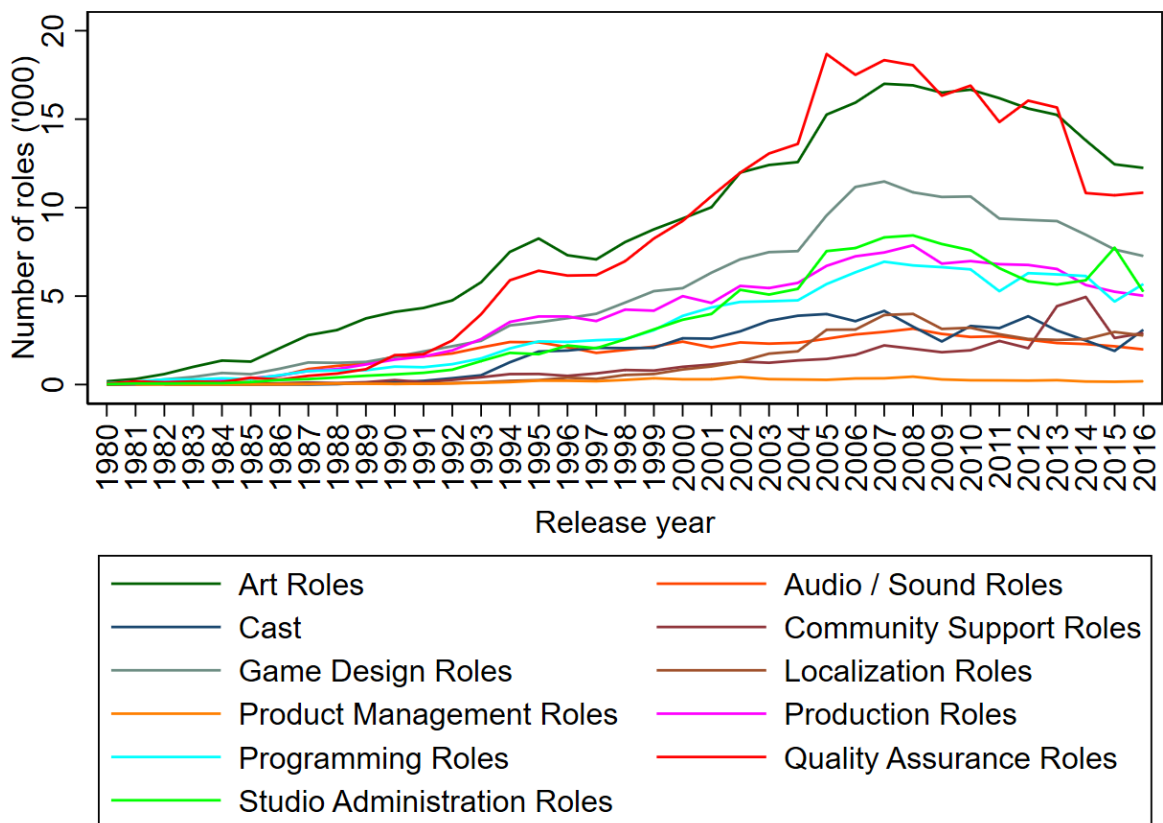


Figure 9: Video game industry roles a highly varied. Data: Mobygames.

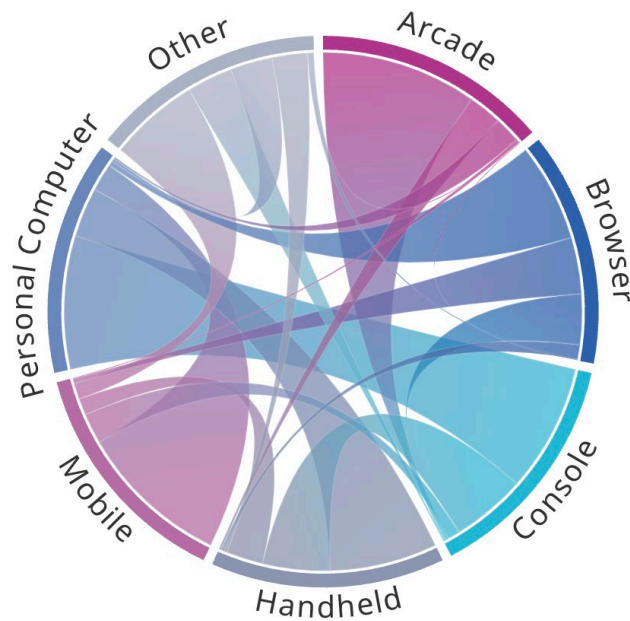


Figure 10. Video game know-how is related across platforms. For video game contributors between 1950 and 2017 who switch platforms, flows represent the share of these contributors that switch from working on one video game platform to another. Data: Mobygames.

COMPUTER PROGRAMMING AND ENGINEERING

Programming talent is central to the development of a local video game hub. Programmers produce software for video games. They do this by assembling the game engine and other pre-written software, and by writing custom code required for that game. Programmers typically have an education in computer science or a closely related field.

In Finland for example, the demoscene and the presence of Nokia provided the industry with an early pool of highly skilled programmers. In the U.S. and Japan, much of the programming talent came from the early computing and consumer electronics industries. Due to the slower diffusion of general-purpose microcomputers and PCs in Japan compared

to the U.S., Japanese computer hardware and operating systems were more focused on application-specific uses and designs (Özalp, 2024). These developers eventually brought their know-how from working on specialized computing for consumer electronics to the Japanese console industry where they built software architectures and games for consoles (Koyama, 2023).

Sometimes, local hubs turn to foreign workers to make up for skills gaps. For example, in 2020, 59% of video game developers in Poland had employed or were seeking to employ foreign workers - primarily from Ukraine, Belarus and the US (Gałuszka et al., 2020). Similarly, the video game industry in Finland has drawn extensively from talented foreign workers, with the overall share of non-Finns in the gaming industry being 30 percent in 2022 (Neogames, 2022).

ART AND GAME DESIGN

The ability to tell stories through visual art and animation is another capability that is central to the video game industry. Video game artists make preliminary sketches that help define the mood and unique feel of a video game. They then go on to make 2D or 3D renditions which are ultimately incorporated into the game.

Game designers however essentially write the script for the game. In Japan for example, the manga industry and animation industry provided strong foundations, human capital, and IP to build on/license for the video game industry (Aoyama & Izushi, 2004). Many hit games such as Attack on Titan 2 and Dragon Ball Z use IP from the manga and animation industries. Furthermore, these industries have provided the video game industry with much of its art and game design talent. Similarly, the local pool of animation and CGI talent that supported Hollywood productions, together with the licensed IP from movies and comic books, greatly helped to shape the U.S. video game industry.

LOCALISATION

Video game localization is the process by which a video game is (re)produced for a region other than the one for which it was originally created. It is a complex process requiring collaboration between various professionals. Translators handle the translation of text, including dialogues, instructions, and user interface elements, into the target language. Culturalization experts ensure the game's content is culturally appropriate, adjusting symbols, gestures and scenarios as needed. Voice actors and directors work on re-recording dialogues, while localization QA testers focus on identifying language-related errors and cultural issues in the localized version.

Localization engineers deal with the technical aspects, adapting the game's software for different languages and ensuring text fits within the interface. Localization project managers oversee the entire process, managing timelines and coordinating teams. Additional roles include audio engineers for adapting sound effects and voice tracks, graphic designers for adjusting visual elements, legal advisors for ensuring compliance with regional laws, and marketing and PR teams for tailoring promotional materials to the target audience. This multifaceted process is crucial for making games accessible and engaging to players in various regions, considering linguistic, cultural and legal differences.

The goal of localization is to convey as well as possible the intentions of the game designers, while minimizing disparities in the experiences of players in the original and subsequent

target regions. Localization is often outsourced to specialized localization companies (Gałuszka et al., 2020).

As an example, the success of Poland's video game industry can largely be traced back to the initial localization activities of local publishers, particularly CD Projekt (Özalp, 2024). Starting from the translation of video game manuals, CD Projekt eventually moved to localizing games, eventually generating enough income to allow CD Projekt to start developing its first original game, *The Witcher*. In turn, *The Witcher*, which became a global sensation, gave momentum to the industry, coinciding with, and perhaps encouraging, new players entering the industry.

ADMINISTRATION

Like every business, video game companies require certain non-technical, managerial skills to operate effectively. The range of responsibilities for administrative roles in this industry vary from fundraising and managing budgets and staffing, to office management and customer support. Two administrative roles that are unique to this industry are IP and production management.

IP Management: The management of IP and IPR is a core capability to the video game industry for at least two reasons. First, IP management has enabled video game industries around the world to take advantage of the existence of fanbases from other sectors who can often be convinced to buy a game. Second, proper IP management enables video game developers and publishers to monetize their IP through other video game spinoffs as well as non-video game merchandise such as t-shirts, movies, and toys. Global trademark fillings suggest that video game related merchandising has grown rapidly, particularly with respect to non-video game related items, as shown in [Figure 6](#) and [Figure 7](#). This suggests that firms are finding new ways to monetize their video game-related IP outside the direct context of video games.

In Japan, a deep knowledge of protecting and managing IP already available in the adjacent industries such as in the manga industry laid the foundations of this capability for video game developers. Likewise, video game companies in the US and Canada benefited from local IP management expertise in technology and entertainment franchises developed by IP experts in the technology and film industries (Pilon & Tremblay, 2013).

Production Management: Video game production management is the management of video game talent, as well as the timeline, deliverables, budget and anything else necessary to produce a video game (Davidson, 2017). Production managers are typically called producers or project managers in the video game industry. Producers are often experienced game

development professionals, coming from technical fields such as game design. However, many of them also come from non-technical roles such as accounting.

THE FUTURE OF THE VIDEO GAME INDUSTRY

The video game industry in the post-COVID-19 world is poised for profound transformations driven by technological innovation and evolving business models.

TECHNOLOGY WILL CONTINUE TO DRIVE VIDEO GAME EVOLUTION

The future of the video game industry will be significantly influenced by advancements in hardware and software. In 2022, 6% of Japanese video game developers had invested in developing VR games, however 11% of these developers indicated that they would do so in 2023 (CESA, 2023). The release of Apple's Vision Pro AR headset in 2024 amongst other developments in the industry provides further impetus for development of XR technologies to provide more immersive gaming experiences. AI is expected to become more sophisticated, leading to dynamic game environments that can adapt in real-time to player actions and work better with alternative input such as voice.

Despite the discontinuation of Stadia, Google's cloud gaming service, in 2023, cloud gaming will continue to evolve, with emphasis on offering higher resolutions more seamless experiences, and minimizing latency issues. On the hardware front, video game devices will become more energy-efficient, yet more powerful. Wearable technologies could open new realms in gaming interaction.

GAAS AND ANTITRUST PRESSURE WILL CHANGE GAME ECONOMICS

Much like the broader software market, the video game industry is likely to witness a continued shift towards subscription-based services and micro-transactions. The popularity of games-as-a-service (GaaS) is expected to grow, emphasizing continuous engagement and community building. We may also see the rise of hybrid models, blending elements of free-to-play, subscriptions, and traditional sales.

In addition, recent antitrust rulings, investigations, and civil lawsuits involving Apple and Google's app marketplaces are having repercussions on payment options on mobile platforms, including those of mobile games. In recent years EU and US antitrust regulators, as well as Epic Games' civil lawsuit have mounted increased pressure on Apple and Google to relax their restrictions on their app marketplaces and the rest of iOS and Android respectively. By allowing developers to use outside payment systems and bypassing Apple and Google's in-app purchase system, game developers could retain a larger portion of their revenues by avoiding high commission fees. This move could lead to more competitive pricing for consumers and encourage innovation among developers seeking to offer value

outside the confines of these app marketplace restrictions. Overall, the increased antitrust scrutiny on big tech firms will lead to more developer-friendly practices, altering how games are distributed, monetized, and consumed globally.

WELLNESS AND EDUCATION WILL BECOME LEADING MARKET SEGMENTS IN THE VIDEO GAME INDUSTRY

Exergames are video games that require physical movement. Studies (Aladejana et al., 2016; Chao et al., 2015) have shown that exergames promote exercise and healthy living, combating sedentary lifestyles and contributing to physical well-being. In addition, video games can foster social interactions and offer a form of escapism which may help reduce anxiety and depression symptoms (Johannes et al., 2021). Similar to and perhaps riding the wave of growth experienced by health and fitness wearables, the market segment for video games that successfully cater to wellness needs will grow.

The industry has also developed numerous educational games, also called serious games, that teach a range of skills from basic arithmetic and language learning to complex problem-solving and critical thinking. Some of these educational games have been shown to improve math and science outcomes of students (Dele-Ajayi et al., 2019). In addition to this, the potential for video games to make learning more interactive and engaging, is on the brink of realization. In 2020 for example, the government of Poland added the video game *This War of Mine* to the official reading list of high school students, to help them learn about the sociology, ethics, philosophy and history of conflicts in the Balkans.

Video games will be increasingly used to help workers and students develop important digital literacy and technology skills, improve access to education in populations with limited access to qualified teachers, and advanced simulations built on game engines will find applications in more professional disciplines besides medicine, aviation and engineering where they are currently used. All these will create a demand-pull, encouraging video game developers to invest more in education.

VIDEO GAMES WILL INCREASINGLY INFLUENCE CULTURE

Video games currently draw considerable inspiration from culture and cultural works. Going forward, the video games will themselves increasingly define culture. As video games find increasing application in the lives of young people, including as tools for education and exercise, games will continue to serve as platforms for social interaction and community building, transcending entertainment to become integral parts of the social fabric of the next generation. We can expect a greater emphasis on inclusive and culturally diverse content, reflecting the global nature of gaming audiences. As seen in the historic success of games like Pokémon, and more recently, the successes of Billboard number one song - The

Scotts, a Fortnite partnership as well as The Witcher which inspired a spinoff TV series, video games will become a key source of the intellectual property to inspire other creative economy sectors in the next decade.

CHALLENGES AHEAD

Despite these exciting prospects, the industry faces challenges. Health advocates decry the contribution of video games and video gaming to sedentary lifestyles and social isolation. In addition, loot boxes, virtual items purchased either with real-world currency or in-game currency, can contain randomized rewards and have been criticized for their similarities to gambling, possibly fostering addiction in players, including children (Jayemanne et al., 2021). Balancing monetization with player satisfaction, data privacy, and digital wellbeing will be key. Additionally, ensuring equitable access to gaming technology across different regions remains a challenge that needs to be addressed.

The video game industry is not just about entertainment; it's a fusion of art, technology, and social interaction. It's a sector that not only reflects but also shapes global culture and technological advancement. The industry's journey thus far has been marked by remarkable innovation and adaptability, and its future promises to be even more dynamic and influential. The road ahead is filled with opportunities and challenges, but one thing is certain – the video game industry will continue to be a significant player in shaping our digital and societal landscapes.

METHODOLOGICAL NOTES

This paper is based on desk research, interviews, panel discussions with industry executives, and detailed quantitative analyses. This approach was designed to capture a broad view of innovation in the video game industry, leveraging both the qualitative insights from industry leaders and quantitative data from reliable sources.

QUALITATIVE INSIGHTS THROUGH INDUSTRY ENGAGEMENT

From February 2023 to February 2024, a series of interactions were conducted, encompassing both interviews, panel discussions and email exchanges. These were organized with industry executives from the Global Video Game Coalition, which plays a pivotal role in shaping industry standards and practices. The panel discussions featured a broad spectrum of representatives from leading game development powerhouses, including Sony Interactive Entertainment, Roblox Corporation, and Microsoft. This ensured a rich dialogue that covered the spectrum of large-scale operations to innovative endeavors by smaller studios.

Moreover, the research extended beyond the immediate circle of game developers to include conversations with both public and private sector stakeholders in the Polish video game industry. This provided a unique lens into the regional dynamics and challenges within a significant European market. Additionally, the international perspective was further enriched by discussions with video game experts from WIPO, the Japan Patent Office and the UK Intellectual Property Office, offering insights into the global regulatory and intellectual property landscape that underpins the video game industry.

QUANTITATIVE ANALYSIS TO COMPLEMENT QUALITATIVE INSIGHTS

Complementing the qualitative insights, this paper incorporates extensive quantitative data to provide a robust analytical foundation. Sources included gamedevmap, a comprehensive directory of game development organizations worldwide; Mobygames, a detailed database of video game information; The Movie Database (TMdB), a comprehensive source of film information; Patstat, a global patent statistical database; WIPO Global Brands Database, which offers a wealth of information on trademarked brands across the globe; and Orbis, known for its detailed company data and business intelligence. These sources were meticulously analyzed to extract relevant data points that inform the trends, patterns, and metrics essential to understanding the current state and future directions of the video game industry.

Technical notes on IP data

The video game industry patent mapping strategy is based on a combination of keywords CPC and IPC codes

1. Electronic versions of card games, board games, roulette or casino games: A63F 13*; A63F13*; A63F 9/24*; A63F 9/24*
2. Features of electronic games: A63F2300*
3. Software and processing technologies: G06*
4. Technologies for voice commands in gaming and interactive technologies: G10L*
5. Simulators and games for training: G09B*
6. Interactive sports or physical games that have an electronic or digital component. A63B 69*; A63B69*

The search also includes the following keywords: video, consol, PC, comput, game, gaming, play, esport, e sport, e sports, electronic sport, e virtual realit, virtual-realit, virtual world, virtual-world, virtual-realit, mixed realit, augmented realit, augmented-realit

The trademark mapping strategy for this chapter involved searching trademark filling descriptions for combinations of the following keywords: video, computer, PC, console, game, gaming, e sport, esport, e-sport, video-game, and video-gaming.

RESEARCH SYNTHESIS

The qualitative and quantitative data was synthesized with prior studies including industry association reports from Finland, Japan and Poland, as well as third-party reports and academic articles. By integrating these diverse methodological approaches, the paper aims to present a nuanced understanding of the video game industry. The blend of direct insights from industry executives with empirical data offers a unique vantage point from which to assess the challenges, opportunities, and emerging trends within this dynamic sector. This methodology ensures that the findings and recommendations are grounded in real-world experiences and backed by concrete data, providing a resource for stakeholders looking to better understand innovation in the global video game industry.

DATA LIMITATIONS

Some of the data sources used in these analyses such as Mobygames, gamedevmap and TMDb appear to have better coverage of titles that are available in English. In addition, Mobygames and gamedevmap seem to show better coverage for games and firms in certain developed economies. This may be because these data sources are wikis, dependent on the contributions of users. As these websites require an internet connection to contribute and are primarily available in English, these circumstances may inform the potential coverage bias. In addition, Mobygames seems to show weak coverage for mobile games, as the explosion in mobile gaming reported by several other sources is not apparent in this source.

On the other hand, WIPO Global Brands Database only includes collections from participating trademark offices. For example, in April 2024, this database did not include trademarks from Argentina, China, Nigeria, and many others.

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