DECONSTRUCTING THE GAMING ECOSYSTEM

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ANNEX 4

DECONSTRUCTING THE GAMING ECOSYSTEM

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INTRODUCTION

Ongoing global debates over the internet tend to focus on major social media companies like Meta, Google, or Twitter. This inevitably shapes discussion and ideation around approaches to content moderation, trust and safety, and even future technology. In the past year, talk of the "metaverse," the rise of distributed technologies, and a sudden explosion of consumer-accessible artificial-intelligence (AI) applications have begun to broaden conceptions of what our digital world might resemble. While there is still a great deal of uncertainty around exactly which of these trends is most likely to dominate future digital spaces and how, the companies building and experimenting with everything from extended reality (XR) to AI are in many cases not new, but, rather, are converging from adjacent industries.

One such industry is gaming—which has long served as a significant piece of the growing digital ecosystem but, for a number of reasons, has been siloed from policy conversations and broader conceptions of the internet. It is estimated that three billion people around the world play digital games, with a projected market value of more than $300 billion by 2026. Gamers have for years discussed games and organized communities on internet forums, generated a market for platforms like Discord and Twitch, and, of course, used traditional social media to promote, discuss, and share information. In this sense, the gaming ecosystem is a significant, yet under-examined part of the existing digital world. It is also the ecosystem through which the bulk of the immersive or XR technology and content is built, and is actively experimenting with applications of distributed technologies and AI.

The gaming ecosystem is also global in scope and mirrors many of the broader debates over questions of critical technology, investment, ownership, and norms. Many of the world's largest gaming companies are headquartered in the United States and Europe, with significant players also found in Japan and South Korea. Many of these dominant players have received significant investment from Chinese and Saudi Arabian government-backed firms, with both countries placing significant emphasis on developing ownership stakes in foreign gaming companies and increasing the reach of their own industries in the lucrative market. If these technologies become core components of the future web, then understanding the impact such investments may have on market incentives, content, product, and trust and safety practices will be important.

Further, because gaming companies have long had to work across mixed media contexts, including audio, video, and text, there are lessons to be learned from the industry's successful and less successful

approaches to content moderation, trust and safety, and product design, as such elements become standard across the existing digital ecosystem.

Understanding what that gaming ecosystem is, how it operates, and who the key players are within it is, therefore, important to conversations about what will be needed to ensure that the digital spaces where people interact in the future are safe and manageable, and that those conversations reflect the full scope the digital world is likely to encompass.

A CATEGORIZATION OF COMPANIES IN THE GAMING ECOSYSTEM

The following section illuminates the wide range of sectors or functions that comprise the gaming industry, ranging from gaming content itself—and those creating, shaping, licensing, and selling it—to the devices used to access and engage with it. This does not constitute a comprehensive or exhaustive list of companies or players. Rather, it is an attempt to make the industry and its related ecosystem clearer to those just beginning to engage with it by explaining its core components through an illustrative categorization exercise. The following describes companies and tools across the categories of: hardware, content, game developers, development technology, storefronts, publishers, and related ecosystems.

A FRAMEWORK FOR UNDERSTANDING THE GAMING ECOSYSTEM

This chart summarizes the "Categorization of Companies in the Gaming Ecosystem" section of this annex. The companies, products, games, and platforms listed here are intended to be illustrative, and not exhaustive.

CATEGORY	EXAMPLES			
HARDWARE	Playstation console Apple iPhone	Dell desktop Meta Quest	Snap Spectacles Nintendo Switch	Xbox Console
CONTENT	*Call of Duty* *Candy Crush*	*Beat Saber* *Sims*	*Roblox* *Fortnite*	*Pokémon Go*
GAME DEVELOPERS	SuperGiant Naughty Dog	Rockstar Games	Niantic	Electronic Arts
DEVELOPMENT TECHNOLOGY	Unity	Unreal Engine	Frostbite Engine	GameMaker
PUBLISHERS	Activision-Blizzard Ubisoft	Sony	Microsoft	Nintendo
STOREFRONTS	Steam Google Play	Apple App Store Meta Quest Store	PlayStation Store	Xbox Store
RELATED ECOSYSTEMS	Twitch Discord	Reddit NeoGAF	*Minecraft* Forum Twitter	YouTube

HARDWARE

Games are played on hardware that includes both specialized machines, i.e., gaming consoles (e.g., Microsoft Xbox or Sony PlayStation) and headsets (e.g., Meta's Meta Quest or Sony PlayStation VR), as well as multipurpose computing devices, such as laptops and desktop computers (e.g., PC, Mac), tablets (e.g., Apple iPad or Samsung Galaxy), and smartphones (e.g., Google Pixel or Apple iPhone). Until recently, most games needed to be installed from a physical disc or cartridge or downloaded onto these devices in order to be playable. Increasingly, games are also, or instead, accessed and played directly through an internet connection. Dedicated "cloud gaming" services—such as Microsoft's Xbox Cloud Gaming, Google Stadia (now defunct), and Amazon Luna—are gaining in popularity. An increasing number of games require the player to be connected online for the game to run, even if the game has been downloaded or otherwise installed onto the player's device. In the context of extended-reality technologies, in addition to the aforementioned virtual-reality headsets, hardware like Snap Spectacles or Meta's RayBan Stories represent a developing market of new products that expand the range of ways in which related content can be accessed.

As measured by market share and stated preference of gamers, the most popular way to play games is on mobile phones, with consoles a distant second, closely followed by personal computers. While virtual-reality (VR) game revenues are steadily rising, (hitting $1.4 billion in 2021) VR is still a fairly marginal piece of the gaming market, with only 7 percent of players identifying VR equipment as a preferred device on which to play games. Still, many people access content across a range of devices, meaning they may play games on their PC, phone, and console in parallel.

To give a brief sense of the scale of the gaming hardware market, it is currently valued at $39.3 billion, and dominated by the "big three": Microsoft, Sony, and Nintendo. VR games are largely played on VR headsets, although slimmer "goggle" devices are also available. Meta leads the way in VR headset sales with 75 percent of the market share, generating $5.2 billion in sales between 2016 and 2021. Sony makes a headset called PlayStation VR, which requires a PlayStation console to operate. It holds 5 percent of the market share ($5.2 billion between 2016–2021). The HTC Vive Pro 2 holds 3 percent, with $2.6 billion in revenue.

CONTENT

PURCHASED AND DOWNLOADED GAMES

As discussed above, content in this ecosystem consists of games and interactive formats that are downloaded or accessed through physical media and played on a console, computer, mobile phone, headset or other device. That might look like a well-known game like *Call of Duty* played on an Xbox or PC, a game like *Candy Crush* played on a mobile phone, or even a game like *Pokémon Go* leveraging the augmented-reality capabilities of most smartphones. Increasingly it might include someone playing a game like *Beat Saber* on Meta's Oculus headset. Games, like movies, span a wide spectrum of what is called "gameplay," meaning everything from action-oriented games (like a "first-person shooter," "fighting," or "battle royale") to more narrative adventures, puzzles, strategy, sports, or reflex- and physics-based games. There are also role-playing games, including well-known massively multiplayer online role-playing game (MMOs) like *World of Warcraft* or *Fortnite*.

USER-GENERATED CONTENT

Some of these MMOs constitute some of the most popular games right now, and include features that, in some ways, merit their own unique category due the ways in which users generate portions of the key content and interactions themselves. These "user-generated content" (UGC) game platforms provide users with tools, templates, and the underlying code required to make and share their own games. This includes Roblox Corporation's *Roblox* (58.8 million daily active users worldwide in the fourth quarter (Q4) of 2022), Epic

Games' *Fortnite* (250 million registered users worldwide as of 2020), and Microsoft/Mojang's *Minecraft* (141 million active players worldwide as of 2021). The level of engagement, personal, creative, and commercial investment, and blurring of virtual and "real" worlds unfolding in these games has led several pundits and scholars to describe *Roblox* and other UGC-driven open-world games as early versions of the "metaverse."

UGC PLATFORM EXAMPLE: ROBLOX

Roblox is one of the most popular UGC platforms in the world right now. By the end of 2022, *Roblox* claimed fifty-nine million daily active users, 25 percent of whom were under the age of nine years, and an additional 29 percent were aged 9–12. A study conducted in 2020 by market-research firm Dubit found that, in the United States, 51 percent of all kids aged 9–12 had played *Roblox* in the last week. *Roblox* is a UGC platform that lets you make your own games or "experiences," which can then be shared and played by other players. Creators can also make items, costumes and other in-game assets, and share or even sell them to other players through an in-game marketplace. To date, more than 90 percent of content in the *Roblox* marketplace has been generated by player-creators, with developers and creators publishing more than fifteen thousand new experiences every day. In 2022, *Roblox* generated $2.2 billion in revenue, some of which it "pays out" to creators who made purchasable items for the *Roblox* market. As on the *Fortnite* platform, UGC companies work with development studios to create content within the *Roblox* platform, some of which is promotional content (e.g., product placement via branded items) or immersive advertising (entire levels based on a brand or product). These applications have been critiqued as unfair or deceptive advertising. For example, consumer-advocacy groups took issue with a Walmart-sponsored "event" in *Roblox* in September 2020, involving a "Walmart Land" playable *Roblox* experience, that advocates claimed wasn't clearly labeled as an advertisement. How advertising and the creator economy emerge as revenue models within the gaming industry will be key to understanding how risk, threats, and opportunities will also emerge in that sector.

CONTENT CREATORS

Content creators in the game ecosystem include individuals, organizations, and companies ("studios") that develop games, experiences, and other immersive content as a creative industry activity (game producers or developers); as well as players who produce UGC games and assets for themselves and others to play with on an existing UGC game platform (UGC creators). Although these two groups are often differentiated as "professional" versus "amateur," there are exceptions such as professional UGC creators, and overlaps like hobbyist game developers. While some game content is now made by users, the games market (i.e., games sold and played) continues to be dominated by game developers.

GAME DEVELOPERS

Historically, studios have specialized in games played on a particular device or type of device: (e.g., mobile, computer, VR, one or more consoles). Successful games would then be "ported" to multiple consoles and/or devices (i.e., the programming code would be adapted to allow the game to be played on another device). Today, studios are increasingly making multiplatform games that can be played across platforms and devices (including VR headsets) from the outset, or shortly after release. Game-developer studios are often a complex web of companies that sit across multiple verticals of the gaming-industry ecosystem. This is further complicated by a recent trend of consolidation, with many successful smaller developers acquired by major

studios, and even major gaming companies merging into one another (Microsoft's attempted acquisition of Activision-Blizzard is a contentious current example). Across that ecosystem, development of content happens through some combination of the below.

Indie developers/studios: Independently owned studios, most of which are not exclusively tied to a major publisher or distributor. In some instances, "indie devs" come up with an original concept or prototype, which is then pitched to a publisher that provides resources to develop the game. In others, indie devs might bring the game to beta before a publisher becomes involved. In still other instances, they develop the full game, and a publishing deal is then made to help with distribution, marketing, and (often) adapting the game to different platforms. Lastly, indie devs can also self-publish and market their games, distributing them through Steam or other major platform "storefronts" (see below, e.g., Apple Store, Oculus App Lab and Store) or online (e.g., itch.io). There are a shrinking number of indie developers as the major players increasingly acquire these studios. It is worth noting that several key developers in VR, augmented reality (AR), and immersive games are mid-tier companies that describe themselves as indie.

> ► **Examples**: Supergiant Games (*Hades, Bastion, Transister*), Deck Nine, Extremely OK Games, Innersloth. And now acquired Ape (*Stardew Valley*) and Mojang (*Minecraft*)

Major industry and in-house studios: Large studios dominate the games industry and market. They develop the bulk of the biggest, most popular, and most lucrative ("blockbuster") titles, and they publish and license games made by other studios. Over the past twenty years, the industry trend has been consolidating, with what are often referred to as triple-A studios acquiring indie and mid-tier studios, funding subsidiaries, exclusive and nonexclusive publishing contracts, etc. Triple-A studios commit large teams (many with specialized skills) to the development of high-caliber games with large production and marketing budgets, designed and targeted to sell: they offer high risk for high return. There are also a number of in-house game developers/ studios owned by large media and other conglomerates that form part of this better-funded ecosystem. For example, Disney Mobile makes tie-in games for iOS and Android featuring Disney characters, while Niantic develops its own games like *Pokémon Go*.

> ► **Examples**: Rockstar Games (*Grand Theft Auto*), Naughty Dog (*The Last of Us*), Electronic Arts (*Madden, FIFA*), Activision-Blizzard (*Call of Duty*, *World of Warcraft*, *Diablo*), PlayStation Studios (owns Naughty Dog), Microsoft Game Studios, Ubisoft (*Assassin's Creed*), Niantic (*Pokémon Go*)

Outsourced labor: A growing portion of development processes are outsourced to companies located in countries with poor labor standards and regulations. This is especially common among the triple-A studios, but many mid-sized studios also outsource components of the development process. As more elements of game design and development are shifted to AI and procedural generation, outsourcing is not so much reduced as shifting to "conditioning" work, a term used to describe the fine-tuning or tweaking of AI-generated results done by human workers. There are sizable communities of game developers that work with these larger companies in Russia and China, in particular, with further concentrations across Eastern Europe and Asia.

DEVELOPMENT TECHNOLOGY

These are the companies that provide the technology that content developers use to create games, many of which are made using software systems called "game engines." A game engine provides the computer code framework for developing a game, which includes libraries of resources used by computer programs (like prewritten code), and various tools and assets (i.e., a representation of an item that appears in the game). Game engines typically provide the core functionality of the game—for example, they can supply the program that simulates "physics" (e.g., gravity) within the game environment. They are akin to Photoshop for

image creation, or Microsoft Word for written documents: providing templates and customization options that users choose from and build on to create new works. Multiplatform game engines such as Unity are heralded as having "democratized" game development by making it more accessible to beginners and to those without advanced programming skills.

There are a few dominant game engines, though most of the largest and most profitable game studios use their own, custom game engines. This includes the following.

►   **Unity (developed by Unity Technologies):** Currently one of the most popular game engines in the world, Unity is particularly valued for its user friendliness, flexibility, and community support, including vast sources of freely available documentation. Unity Technologies offers a tiered-licensing system that makes the engine accessible to small and large studios, as well as individuals, and provides a free licensing program for nonprofits and educational institutions. In 2018, the company claimed that half of all games were built using Unity, accounting for approximately $35 billion of the 137.9-billion game industry. Of note, Unity has also expanded its technology for use in the auto, film, and architecture industries, and is particularly popular for mobile-game development.

►   **Unreal Engine (developed by Epic Games):** Though fewer games are made using Unreal Engine, it is nonetheless a popular and powerful engine. Particularly noted for its advanced graphics capabilities and available tooling for large-scale projects, Unreal is especially popular for higher-budget projects or those requiring high visual fidelity. Epic also provides full access to Unreal's source code, making it not only adaptable but easier to debug. Though less user friendly than other engines like Unity, the introduction of its visual-scripting language Blueprints, as well as friendly pricing structures for small studios, has made Unreal Engine increasingly popular. The company developing this engine, Epic Games, also uses it in house, including for its massively successful game, *Fortnite*.

►   **Proprietary game engines:** Most triple-A studios use their custom-built game engines, including Nintendo, Rockstar (Rockstar Advanced Game Engine, RAGE), and Electronic Arts (EA/Frostbite). These are mostly made in house or commissioned for exclusive use, and are proprietary. A decreasing number of indie studios build their own game engines due to the high cost involved, paired with the prevalence and ease of use of popular game engines like Unity. It's not clear the extent to which proprietary engines will be used for VR experiences. For example, EA announced in 2016 that it was developing Frostbite Labs to create triple-A virtual worlds and assets, but its recent high-profile VR releases (e.g., *Medal of Honor: Above and Beyond*, 2020) were developed by mid-sized studios (e.g., Respawn Entertainment) using multiplatform engines (e.g., Unreal).

Godot and GameMaker are additional interesting examples to consider. Increasingly, young people are finding their way into game development through Scratch and other visual-programming languages.

While not exactly the same as a game engine, game platforms such as *Roblox* and *Minecraft* provide a similar, albeit much simpler, function—through the provision of templates, tools, and the core underlying programming that players can then use to create their own UGC games, experiences, and assets (such as items that can be used or worn in game, objects that appear in a game environment, etc.). These UGC game platforms working to provide "low-code" or "no-code" tools are mostly used by amateur and pro-am users, but, in some cases, are used by developers to create games, and used to create "immersive advertising" for or by third-party companies.

PUBLISHERS

Game publishers play a similar role in the games industry to that producers do in film. They finance games that are developed either in house or externally (or in collaboration between the two). They can own multiple smaller and mid-tier studios, and/or have exclusive (or nonexclusive) rights to the games that these studios develop. Publishers can get involved at various stages in a game's development, including at the outset (e.g., games developed in house, game concepts that are pitched by indie developers, games developed by subsidiaries), midway, or after the game is complete (or near complete). They often have a say in what goes into the game because they provide critical resources, including market research, creative teams, additional developers to "finalize" the game or enhance its production value, sound designers, etc.

Large publishers have in-house resources that they mobilize across both internal and external development projects, some of which are highly specialized, such as Ubisoft's Performance Capture Studio. They also usually take charge of promoting and distributing the game (or paying for distribution), licensing and "localization" (translating or adapting a game for foreign markets), and handling various other elements aimed at helping a game succeed in finding its audience (e.g., showcasing the game at industry conventions or fan expos).

Many major game publishers are also game developers, with in-house studios as well as game distributors. Five publishers also make hardware on which games are played: Sony PlayStation consoles/VR headsets, Microsoft Xbox consoles, Apple iPhones/iPads, Nintendo Switch consoles, and Google phone. All of these companies are large multisector conglomerates, illustrating a global trend in the games industry toward consolidation as major industry players buy up indie and mid-sized game-development studios. This mirrors and overlaps with what has happened within social media and other tech platforms (e.g., Meta acquiring Instagram, Google acquiring YouTube). Indeed, some of these same players are driving consolidation in the game industry, including Meta and Google.

STOREFRONTS

Once content is published, it is distributed through storefronts, some of which are specific to the hardware that will be used to access that content (VR headsets, phones, etc.). This could mean downloading a game like *Call of Duty* through the Xbox Store, *Candy Crush* or *Pokémon Go* from the Google Play store, or *Beat Saber* through the MetaQuest Store. Games are now mostly (83 percent) sold in digital format, though there is still a small (17 percent) market for physical copies (i.e., discs or cartridges played on a console or computer). Below are additional examples of dominant storefronts broken down by hardware type.

► **PC/desktop game-distribution platforms:** Steam is the market leader in PC-game sales and indie-game distribution. The company reported 132 million monthly active users in 2021 and released 10,963 games in 2022 alone. Other desktop distribution platforms include Epic Games Store (sixty-two million active monthly users in 2022), GOG.com, Apple Store, Microsoft Store, and Google Play.

► **Mobile-game distribution platforms:** Apple Store, Google Play, Samsung Galaxy, Amazon Appstore, Microsoft Store, Huawei AppGallery.

► **Console-specific game distribution systems:** Xbox Store, PlayStation Store, Nintendo eShop, Meta Quest Store, Steam Store (for Steam Deck).

► **Cross-platform integration:** Many storefronts have their own apps that allow users to access the store to purchase games and other limited features through their mobile phones for use on multiple devices (Xbox Store, Steam, etc.).

On all of the major console-based gaming platforms (e.g., Microsoft Xbox, Sony PlayStation, Nintendo), spe-cial access to games and other features, including online multiplayer, are bundled and sold in the form of subscription-based annual or monthly memberships through their proprietary virtual storefronts. The most prominent example is the Xbox Game Pass, a cross-platform tiered subscription service that is required for accessing cloud gaming and for playing online multiplayer games and "modes." Microsoft claims to have twenty-five million Game Pass members worldwide.

In this way, digital game distribution can be dominated by companies that make the hardware on which games are played, as well as the games people are playing (Microsoft Store on Xbox, Sony's PlayStation Store, and the Nintendo eShop). However, Valve's indie-game-focused Steam distribution service and storefront is an example of a more open platform that provides a key distribution mechanism across this ecosystem. Vast libraries of games are available for purchase (or free download) through these storefronts, including ones the storefront's parent company has developed, as well as those made available by third-party publishers or developers (often for a fee and commission on sales).

Game-distribution storefronts that are embedded in associated gaming platforms serve as more than just a way to buy games. Microsoft's Xbox and Sony's PlayStation, for example, seek to create a sense of continuity across games and devices, and to support a community or social network among players. Each of them has social-connectivity aspects that allow users to engage with one another on the platforms in ways that may look and feel like traditional social media, with profiles, friends, and other related features.

CONSUMER JOURNEY

The following chart is meant to help those new to the gaming ecosystem understand the categoriza-tion of gaming companies provided above through the entry point of a well known game, device, or storefront. Each consumer journey is not exclusive, but rather illustrative. Someone might play Call of Duty on a PC or game console. In the example below, it is a PC.

CONTENT	CALL OF DUTY	POKÉMON GO	BEAT SABER	FORTNITE
HARDWARE	DELL PC	APPLE IPHONE	META QUEST	XBOX
DEVELOPER	INFINITY WARD (ACQUIRED BY ACTIVISION)	NIANTIC	BEAT GAMES (ACQUIRED BY META)	EPIC GAMES
DEVELOPMENT TECHNOLOGY	IN-HOUSE ENGINE	UNITY ENGINE	UNITY ENGINE	UNREAL ENGINE
STOREFRONT	STEAM	APPLE APP STORE	META QUEST STORE	MICROSOFT GAME STORE
PUBLISHER	ACTIVISION BLIZZARD	NIANTIC	BEAT GAMES (ACQUIRED BY META)	EPIC GAMES

ADJACENT COMMUNITIES AND PLATFORMS

The social aspect of gaming is not limited to these gaming-platform accounts. Game-player communities have long included numerous very active, early adopters of online tools and forums. Many of these communities are integrated into game development (invited to playtest, provide early feedback, etc.) and the promotion of new or upcoming games. As a tech-savvy group, these communities can be found across the internet: online gamers make up for a significant part of social online spaces such as Reddit, and routinely gather the biggest audiences on social media sites (e.g., PewDiePie on YouTube). These communities play an important enough role in the broader online ecosystem that it is important to understand the main platforms through which they engage, communicate, and collaborate.

Gaming communities use these platforms to discuss approaches to games, watch others play games, and share opinions. Some communities have also leveraged these platforms to coordinate harassment and real-world harm. In this way, issues of trust and safety are significantly affected by communities on these adjacent platforms, as trends, coordinated harassment, and workarounds for game content controls and safety mechanisms may be shared and facilitated in these spaces, as well as in chat functions within games themselves. One of the most insidious examples of this was the #Gamergate campaign, which involved gamers coordinating targeted and real-world harassment against female gamers through platforms like 4chan, 8chan, Reddit, and, eventually, Twitter.

Some of the key platforms and forums developed for gamers have since become mainstream platforms far beyond games. This includes platforms like server-based Discord and live-streaming platform Twitch. In other cases, gamers leverage existing platforms in unique ways, as is the case with Reddit's heavily used r/gaming or r/games subreddits. Gamers also gather on a range of gaming-specific message boards. Additional information on these platforms can be found below.

►   **Platforms developed for gamers that are finding wider use:** Discord is a US-based platform centered on voice communication (live, recorded messages) and posting (text, images, etc.) in private or community chat rooms called "servers," each of which is managed or moderated by different users. It has more than 150 million active monthly users, and game-related servers are still some of its most popular (e.g., Blox Fruits, a *Roblox*-focused server, has one million users). Twitch is a US-based live-streaming and video-on-demand service focused primarily on video games, including electronic sports (esports), as well as other media topics and genres. It was purchased by Amazon for close to $1 billion is 2014. It has more than 7.4 million active streamers, and is still home to many video-game players who monetize their playing through Twitch streaming channels. Gamers also use and engage through Google's YouTube.

►   **Gaming-specific messaging boards:** Gamers gather in a number of forums, ranging from those hosted by games themselves (*Minecraft* Forum) to storefronts like Steam, as well as a number of gaming-specific messaging boards that vary greatly in their moderation policies. For example, messaging board ResetEra split from messaging board NeoGAF after a controversy over the behavior of NeoGAF's founder and a desire for more stringent moderation policies.

►   **Traditional and niche social media:** Gaming communities also communicate and coordinate through major social media platforms such as Meta, Twitter, and Reddit. They also have organized using less prominent platforms like 4Chan or 8chan, which long served as a center of gravity for gamers, with a number of popular boards focused on games, game developers, and players. The site has been subject to endless controversies for its alleged association with radical and extremist political movements, and is reportedly closely associated with the "toxic gaming culture" widely covered in the press.

CURRENT GAMING BUSINESS MODELS

The integration of online features in game hardware and software has led to a number of new business models focused on content monetization, user-data collection, and advertising. Most players of multiplayer games expect new content and storyline developments to emerge over time, especially if their gameplay extends over several months, or even years. This ties into larger industry trends to expand on a game's original content through the development and release of add-ons, expansions, extra levels or characters, and other forms of downloadable content (DLC). This supplementary content is most often made available for purchase as a monetization strategy, which has been significantly facilitated by the rise of digital distribution platforms. According to Unity's Gaming Report 2023, the lifespan of existing mobile games was extended by 33 percent in 2022 due, in part, to regular updates. Notably, larger studios are more likely (and able) than indie devs to update games for more than six months following release (84 percent vs. 55 percent).

The ongoing release of additional content is a central component of "freemium" and "free-to-play" revenue models and other micro-transaction-based monetization strategies, and part of the broader shift toward publishing games as a "service" rather than an end-user product. A key example here is *Fortnite*. According to a survey conducted in 2020 (before the game surged in popularity during the pandemic), *Fortnite* players had spent an average of $102.52 on in-game purchases. Overall, 77 percent had spent money on in-game items, avatar clothing, and other micro-transaction purchases. The shift to free-to-play and other micro-transaction-based business models is changing how games are designed and the types of player experiences that are prioritized in game reward systems. It is also worth noting that video-game companies, for these reasons, have found themselves at the forefront of challenging app stores on their fee structures, a notable example being the 2020 case Epic Games v. Apple.

Much like other internet-based platforms, games are designed to be "sticky," to keep people entertained and engaged. That means they can also incentivize predatory monetization hooks, such as loot boxes, prompting players to spend real money in games for virtual (and uncertain) content. Public outrage over loot boxes' similarity to online gambling, and the perception that they are particularly targeted to children, has resulted in government authorities and industry associations exploring outright bans, disclosure requirements, and other regulations. As a result, the practice has significantly decreased, but is a useful reminder of incentives at play.

Because people either purchase a game outright or purchase additional features or experiences within a game, micro-targeted ad-based revenue is a less prominent feature in the ecosystem to date than on other internet-based platforms (mobile games, in particular, make use of in-app ads for other games). However, as immersive options grow in this industry, a point of significant debate is whether companies are likely to turn to this data-collection-intensive approach, with so many additional sources of biometric and other interaction data available and likely interest from advertisers in adjacent industries.

There has also been a fair amount of interest in a burgeoning Web3-based gaming industry, partially due to the new and innovative business models promoted as beneficial to both gamers and game developers. These models include play-to-earn, non-fungible tokens, decentralized autonomous organizations, and subscription-based models. The most prominent example was a game called Axie-infinity, created by a Vietnam-based company, which was met with a great deal of publicity as it seemed to break through as a crypto-based game enabling players to earn money by playing. About a year later, the acclaimed game was hacked and just about completely collapsed, leading to a tempering of enthusiasm about Web3 gaming potential.

MARKET LEADERS IN GAMING AND THEIR COUNTRIES OF ORIGIN

While there are countless companies working across each of the categories above, a number of the largest industry players sit across multiple categories. In this regard, the gaming ecosystem is not dissimilar from traditional Web2 industry monopolies. One key difference is the geographic diversity of the largest industry actors and their owners.

Currently, the top game developers in the world, in terms of market value, are also publishers. This includes companies in the United States, Japan, France, Poland, and Sweden. As of April 2023, their respective market values were: Activision Blizzard ($67.06 billion, United States), Nintendo ($47.8 billion, Japan), Electronic Arts ($35.12 billion, United States), Roblox Corporation ($24.55 billion, United States), Take-Two Interactive Software (which owns Rockstar and 2K; $20.98 billion, United States), Square Enix ($5.72 billion, Japan), Embracer Group AB (formerly THQ Nordic/Nordic Games; $5.12 billion, Sweden), Ubisoft ($3.04 billion, France), and CD Projekt ($2.64 billion, Poland).

The top gaming developer in the world, Activision Blizzard, owns King.com Ltd., the makers of *Candy Crush*, which was the highest revenue-earning mobile game in 2022 (NDP Group, 2023) and one of the most popular (i.e., most downloaded) games of all time. As of January 2023, Activision's market value reflected its $75-billion proposed acquisition by Microsoft, which, at the time of writing, is being challenged by regulators in the United States, European Union (EU), and United Kingdom (UK) on the basis of Microsoft's existing dominance in game distribution and hardware.

Legacy gaming companies also play a prominent role in the development of immersive content, VR, and AR games (combined under the term XR). A recent study of professional game developers found that 38 percent were involved in VR/AR game development, and 23 percent said that the platforms that most interested them were VR headsets, especially Meta Quest and Sony'4 s PSVR2. Both indie and triple-A studios are leaders in XR game development. One of the most downloaded VR games to date, *Beat Saber*, was developed by Czech indie studio Beat Games (which has since been acquired by Meta).

Most of the top game companies worldwide in terms of revenue are game publishers with significant overlap with hardware producers and some developers. This includes companies in China, Japan, the United States and Singapore. In 2021, the top ten were: Tencent ($32.8 billion, China), Sony ($18.2 billion, Japan), Apple ($15.3 billion, United States), Microsoft ($12.9 billion, United States), Google ($11 billion, United States), NetEase (internet and video-game company; $9.6 billion, China), Activision Blizzard ($8.1 billion, United States), Nintendo ($8.1 billion, Japan), Electronic Arts ($6.5 billion, United States), and Sea Limited (a game-development and publishing company turned tech conglomerate; $4.3 billion, Singapore).

Note that in this space, China's Tencent has more than twice the revenue of US tech giant Apple, and almost twice the revenue of its next closest competitor, Japan's Sony. This brings home both the scale of the gaming market and the fraught geopolitical implications of the industry's geographic distribution.

GLOBAL INVESTMENTS IN IMMERSIVE TECHNOLOGIES AND GAMING PLATFORMS

Just as technologies flow and originate from around the world, so do investments in gaming and technology platforms. Chinese tech giant Tencent is a leader in gaming and a major investor in gaming platforms globally. These investments are notable because many of the gaming companies in which Tencent and other Chinese firms have invested are based in the United States, European countries, Japan, and other US ally and partner nations. Tencent's investments in the gaming space internationally span ownership of Riot Games (United

States), Funcom (Norway), Sharkmob (Sweden), and Leyou Technologies Group (Hong Kong); and stakes in Remedy (about 5 percent, Finland), Epic Games (about 40 percent, United States), Activision-Blizzard (about 5 percent, United States, amid Microsoft's attempted acquisition), Ubisoft (about 10 percent, France), Krafton (about 10 percent, South Korea), and Supercell (about 70 percent, Finland), among others.

In 2021, UK-headquartered gaming firm Sumo sold to Tencent for $1.26 billion. Tencent had previously invested $150 million in Reddit in 2019. China's esports market grew by 14 percent in revenue from 2020 to 2021, even though the Chinese government imposed a tough regulatory environment, and the biggest esports streaming apps in China currently boasts millions of users, including Huya (about 30.46 million), Douyu Live (26.25 million), and Huajiao (9.97 million). Chinese tech giant Alibaba made a push into gaming in 2020, but has not focused much on the area since.

Saudi investors likewise are an increasingly major player in the international gaming-platform market. In April 2023, the Saudi Arabian government announced a strategy to invest $38 billion in making Saudi Arabia a global video-game industry hub. Already, the Saudi sovereign wealth fund holds an 8.26-percent investment in Nintendo, runs the Savvy Games Group looking to establish two hundred and fifty gaming firms in Saudi Arabia, and holds stock in Activision Blizzard, Electronic Arts, and Take-Two Interactive.

For both China and Saudi Arabia (as well as other countries), investments—and strategic, geopolitical, and profit opportunities—also lie with the infrastructure that supports gaming platforms and services. For instance, Tencent is a major cloud provider. As the cloud-gaming market in China grows rapidly, Tencent is positioned to benefit greatly from both stake in gaming companies and control of cloud infrastructure that can support delivery to their users. Ironically, Saudi Arabia's large investment in gaming companies and platforms could also benefit a different Chinese firm, the telecom Huawei, which has recently expanded its cloud-service infrastructure in the country.

These developments raise many points. While it does not receive as much media attention as social media platforms, the virtual gaming space is exploding across the world, and governments and companies with the funding, technology, and/or underlying infrastructure are taking notice. It is another realm in which countries are economically competing with one another in technology. The gaming companies receiving investment often build technologies that go far beyond gaming itself, whether designing buildings and cars, filming movies, or building simulations for militaries.

Exactly what interest each country has in these companies may vary, but it is clear they believe that the gaming industry and the growing use of its technology are strategically important enough to incentivize significant and coordinated investment. The broader trust and safety risks associated with potential foreign engagement with gaming platforms (from ownership, to code development, to infiltration of platforms for other purposes) relate to broader debates about internet governance as well.[1]

IMPLICATIONS FOR FURTHER STUDY AND EXPLORATION

The intention of this annex has been to provide a basic introduction to the gaming ecosystem, including the key players, companies, technologies, nations of origin, and sources of investment and profit. The remaining sections will explore the implications of these components, identifying questions requiring greater examination and areas for investment and policy attention.

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[1] For a deeper analysis of this topic, see *Annex 6: Learning from Cybersecurity, Preparing for Generative AI*.

TRUST AND SAFETY

In some ways, the gaming world has pioneered new types of harm, eventually replicated in other digital spaces. It has also pioneered innovations to address those harms and proactively build better interactions. Because the gaming world has been siloed from traditional policy conversations and trust and safety communities, this remains an under-examined area of practical study. This is even more so as elements of gaming and legacy interactive media begin to merge, particularly when it comes to immersive contexts. There are a number of particular elements of this double-edged gaming sword to examine.

LEARNING FROM GAMING'S CHALLENGES AND UNIQUE PERSPECTIVE

Games have long existed as multimedia interactive spaces that commingle audio, video, and text components as a key feature of the technology. Importantly, many of these multimedia interactions occur in real time. This differs from traditional social media, which have been dominated by text-based, asynchronous platforms with slower adoption of audio, video, and real-time interactions, and less familiarity with managing the risks involved in these contexts. As immersive technologies become more pervasive, they are not only likely to stem from the gaming ecosystem, but will replicate many of the dynamics with which games have long grappled.

Another unique element of games is its intentional inclusion of children, including those younger than thirteen, and adults. Whereas most traditional social media platforms work to prevent their products and platforms from being used by children, the gaming industry regularly builds for, and markets to, them. Many games are published with a rating (more on that in the section on regulation), which means game developers often declare an intended audience before releasing a game for play. As debates grow over the impact of technology on children, and the best approaches to keeping them safe online, lessons from the gaming world are worthy of closer examination.

There is also a well-documented history of harassment, hate speech, sexism, and racism in the gaming world. In more well-known cases like the Gamergate scandal, this harassment can move from gaming-community spaces to mainstream social media, and break into violence and harassment in the physical world. Some credit the methods of harassment honed through the Gamergate process with informing the approach and success of those who used the internet to spread false narratives about the US election in 2020, and to organize the January 6, 2021, insurrection. Regardless of where one comes down on those linkages, for those seeking to address toxicity and harassment in digital spaces, it is unquestionable that some of the mainstream trends we struggle to address in today's digital world have roots in the gaming world. As these linkages will continue, we would be wise to treat the gaming ecosystem as part of the broader information environment moving forward.

LEARNING FROM GAMING'S INNOVATIONS AND APPROACHES

The flipside of these challenges and unique gaming features is that the gaming industry's approach to policy, trust and safety, tooling, and design differs significantly from that of traditional social media. Better understanding this may illuminate new tools and approaches for our future digital world. It also may provide lessons on what does not work in solving problems that may be new, or simply new to certain sectors.

One of gaming's unique areas for further exploration is its focus on designing intended interactions. As opposed to traditional social media, which often focus on a concept of neutrality, most games are an exercise in trying to create specific kinds of interactions for a player with content, or with other people, within a highly controlled environment. This does not mean those intended interactions are normative—at the most basic level, a game defines how your character can move through a story, challenge, or series of skills. An intended interaction may be to kill an enemy, or to work with other players to open a door.

However, in recent years, some in the gaming industry have added a normative frame to game develop-ment, pioneering "prosocial" approaches—more intentional and proactive design methods that preemptively shape and encourage healthy and inclusive play patterns. These methods pull from best practices in design, psychology, sociology, human factors, and more, as well as case studies from earlier multiplayer games. Those at associations and organizations like the Fair Play Alliance are experimenting with these approaches as a complement to more traditional moderation tools, with the goal of reducing net harms and improving recidivism rates.

As some of the early companies building immersive content, gaming companies have also begun to leverage player dynamics and safety by design in the conception and construction of virtual worlds and experiences. With the increasing popularity of VR games and applications, companies are focusing on developing new safety features to protect users in these immersive environments. These features can include limiting play-time, providing warnings for potential motion sickness, allowing users to control who can interact with them in any particular gaming space, developing stronger tooling to support real-time monitoring in dynamic-video and audio-based user environments, and ensuring that users are aware of their physical surroundings while playing. Efforts to improve the ability to provide real-time monitoring in privacy-respecting and less data-in-tensive ways will have applications for numerous industries.

There are also long-standing challenges that gaming companies have prioritized solving that could have application in a broader trust and safety context. One example is anti-cheating policies, enforcement, and tooling. In online games, some players seek to use third-party software or other hacks to augment aspects of a game to their advantage. If this behavior reaches a critical threshold, online games can become almost unplayable for those not cheating. As a result, game developers have created a number of tools to make cheating harder, disincentivized, or punished. Some of these techniques, whether throwing cheaters on serv-ers full of only other cheaters, triggering insurmountable challenges or a massive increase in difficulty levels as a result of certain behaviors, or effectively instituting timeouts, have corollaries in traditional interactive spaces. It is worth examining the wide arrange of approaches gaming companies use to shift the incentives of certain behaviors in their ecosystems.

It is also worth noting that there is an established history within the gaming ecosystem of various forms of community moderation. Whether *League of Legends* Players Tribunal, Reddit gaming threads, Discord channels, or any of the countless gaming message boards, the gaming world has leaned into the idea of enabling unique rules and norms for unique spaces, set and enforced by communities. Better understanding the mechanisms, benefits, and drawbacks of these approaches could have utility in other digital contexts.

ILLUMINATING EXISTING GAMING CONTENT MODERATION AND TRUST AND SAFETY LAYERS

Just as in other digital sectors, the term "trust and safety" is relatively new, and encompasses a wide range of teams, functions and tools in gaming. In recent years, there has been a significant rise in the focus of gaming companies on addressing problematic behavior and harms within games, leading some to build new in-house trust and safety teams and recruit established trust and safety professionals from other digital industries to lead them. One of the challenges of applying this lens to the gaming industry, however, is just how spread out and disconnected from one another existing content policies, security requirements, and trust and safety mechanisms are throughout the tech stack described in the first part of this paper.

For example, storefronts like app stores have privacy requirements that apps must meet in order to be approved for inclusion; game studios have content standards and rules they require their developers to incorporate; game developers actively design features of games to minimize certain harassing or cheating

behavior; and interactive games systems allow users to report bad behavior or inappropriate content direct-ly within a game. Each of these policies may be set and implemented by a different company, with players largely unaware of them. More can be done to map and understand these interlocking layers as part of the trust and safety ecosystem.

These are just a few of the areas worthy of exploration and study. We recommend additional work to better connect the gaming ecosystem to other media and information spaces, exchange approaches and informa-tion between their trust and safety, development, and other communities, and explore areas of vulnerabili-ties and opportunities.

REGULATION AND GOVERNANCE OF THE GAMING SECTOR

As more of the gaming ecosystem and social media-dominant digital spaces converge, questions of which regulations and oversight bodies might apply, and in which ways, is an area deserving more study and policy clarification.

Regulations affecting gaming companies include policies and laws that relate specifically to games, as well as some media regulation, consumer-protection laws, privacy and data-protection laws, laws prohibiting hate speech and/or protecting freedom of speech, laws focusing on child safety, copyright laws, and the regula-tion of digital services and content.

Of particular note are game rating systems, set by regional game content-classification bodies, each with their own standards and rules, mostly focused on age appropriateness. In the United States, console and some computer and mobile games are rated by the Entertainment Software Ratings Board (ESRB), an indus-try organization similar to the Motion Picture Association (MPA) for film. Compliance is voluntary. The EU and UK both follow the PEGI system (Pan European Game Information), which is managed by both industry and government, and enforced by governments in various participating countries. Neither system rates online in-teractions, although PEGI oversees a supplementary "PEGI Online" certification system for games that "commit themselves to banning inappropriate material" and interactions between players. In Japan, the Computer Entertainment Rating Organization (CERO) consists of a rating system similar to PEGI and the ESRB. South Korea has a governmental organization called the Game Rating and Administration Committee (GRAC). Other nations and regions have other systems. None provide a comprehensive review of online interactions.

For a company to release a game in each of these markets, it often must undergo review to ensure it com-plies with each individual standard. In a country like China, where the government sets strict content stan-dards that it enforces itself, companies often need to create a unique version of their game to comply when a common denominator is not possible.

China, it is worth noting, is a completely unique ecosystem, with tighter regulation around nearly all aspects of game development, operation, and use. For example, children and teens are banned from online gaming during school days, and have been limited to one hour a day on non-school days. Companies looking to sell their games within China must be able to demonstrate that their games can comply with and support such restrictions, and are subject to review by the Ministry of Culture. Mapping geopolitical dynamics, and under-standing which rating systems dominate game-company decision-making, where these ratings systems do and do not apply with regard to new forms of interactive media, and where other regulatory regimes might become relevant are all areas worthy of greater examination.

Another area of particular focus is privacy and data collection. While gaming companies have long collect-ed data on their users and their interactions, because their business models have not been dominated by

hyper-personalized ad models—as has been the case in the social media ecosystem—conversations have focused less on this area of policy. However, with increasing forms of immersive and interactive technologies creating opportunities for new kinds of personal, behavioral, and biometric data, many people are concerned this will create an incentive for the dominant social media business model to become more common in gaming spaces. This presents new risks worthy of investigation and deeper study.

THE RISE AND IMPACT OF GENERATIVE AI IN GAMING

As is the case in each section of this report, the rapid application of generative AI within existing and developing digital ecosystems presents a number of areas requiring close attention. Within gaming in particular, generative AI is already playing a role in content creation, creating new questions about intellectual-property rights, as well as privacy concerns.

FINDING SIGNAL AMID NEW TECHNOLOGY HYPE CYCLES

As discussed throughout this paper, no one is certain which of the emerging connective tech trends will become dominant, pervasive, or game changing. Readers would be forgiven for dismissing all talk of the metaverse, Web3, and generative AI at various points of their respective hype cycles, but the current explosion of AI technologies brings home just how important it is to pay particular attention to the ways each of these technologies is changing existing practices and infrastructure.

For example, the massive popularity of UGC games (which straddle traditional gaming and something approximating the metaverse) raise a number of unique questions and issues, pertaining to content creation and authorship (e.g., who owns the content co-created in these games?), how monetization strategies can be expanded to players (as revenue earners, not just as consumers) as well as exploited by players (e.g., to cheat other players, or steal currency or personal data from them), how to ensure trust and safety when content is added endlessly by a diffuse and massive player population (which sometimes count in the millions), and what special protections might be needed to support the children and teen players who dominate these spaces.

Whichever technologies emerge most impactfully will inform which risks, opportunities, and resources need to be prioritized, be it augmented reality via existing devices taking off, or virtual-reality hardware becoming more widespread, or other metaverse applications, such as wearables, becoming ubiquitous. Do Amazon's investments in health tech increase its interest in device-generated data? Does that impact the content created for distribution across Amazon's platforms? Do nonfinancial applications of Web3 take hold in gaming or elsewhere? Does that impact the consolidation we are seeing within the gaming industry, or geopolitical trends of nation-state competition through this arena?

More work needs to be done to explore where these technologies bump into existing regulatory regimes and communities of practice, and how they might change those spaces.

GEOPOLITICAL IMPLICATIONS AND INFLUENCE

As discussed above, gaming and other technology platforms are clearly of interest to a growing range of nation states, and can provide them with geopolitical advantages. There is enormous profit to be made in everything from content creation to platform development to supplying the infrastructure underlying gaming platforms themselves, and significant geopolitical benefit to being market leaders. Governments could also potentially approach the companies building these gaming products and services to request data—and

could also impose content requirements on those platforms. This could range from removing content that is disfavored by the state to requiring companies entering the market to pre-censor and tailor their games to align with state narratives from the outset—a kind of economic coercion of the gaming market. The Saudi Arabian government's $38-billion investment plan for gaming introduces questions about these kinds of risks. Of course, China is particularly well positioned to (and often does) exert this kind of economic leverage on non-Chinese firms, given the size of its domestic market.

For example, the Chinese government has for decades cracked down on video games that do not follow the state's narrative line. It has also punished celebrities, spokespeople, and well-known gamers for communicating unwelcome support for causes ranging from Tibet to Hong Kong pro-democracy protests. This has included pressuring gaming companies to cut off revenue streams to these influencers, or refusing to speak to certain journalists. These actions, combined with the sheer market power China presents, have also had an effect on some game content. While in the past, Chinese content requirements usually meant gaming companies would be forced to produce secondary Chinese versions of games for sale in the Chinese market, companies are increasingly developing their primary version of games in alignment with Chinese content rules, and selling those versions everywhere. Is a potential, logical extension of this a wider move to design games through a default framework of surveillance by design rather than safety by design?

Elevating these concerns, of course, are the sizable investments both China and Saudi Arabia have made in Western gaming companies. Aside from questions around their ability to influence content decisions and trust and safety approaches, some experts worry about the potential access to user data and other sensitive information. Further study is needed on investments in, and potential impact on, emerging tech and platforms, whether immersive, generative AI, or distributed.

These platforms and environments can also become targets during geopolitical tension, and even war. Aside from concerns over the cybersecurity of these systems (increasingly targeted by government and independent hackers), Microsoft's President Brad Smith has pointed out vulnerabilities extend further, noting, for example, that Russian intelligence organizations are seeking to penetrate gaming communities to spread pro-Kremlin propaganda about the Vladimir Putin regime's war on Ukraine.

CONCLUSION

The gaming ecosystem is massive and expanding rapidly. It is also merging with other parts of the digital ecosystem. Whether it is properly understood as part of this broader digital and information landscape will have significant impact on our ability to build the tools, approaches, and communities required to achieve a healthier version in this next phase of our connected world.

The fact of gaming's isolation from policy communities focused on internet governance, social media, and big-tech issues has resulted in a lack of appreciation of the gaming industry's long-standing market share, geopolitical impact, technology innovation, and connection to the rest of the information ecosystem. Because much of the emerging immersive technology is developed through the gaming ecosystem, understanding the players and how they work takes on even greater importance. This includes understanding ownership, incentives, and business models.

The gaming community, in some cases, generated—and, in other cases, was the first to experience—many of the harms, risks, and challenges everyone is grappling with today. This includes both the social impact of harassment and toxic online behaviors, as well as simply experience operating in multimedia, interactive, and real-time spaces. More should be done to understand the unique impact gaming's intentional design has on these dynamics, and to explore lessons and models that may be transferable or avoidable.

As the community working to build a healthier digital world explores new models and ways of doing things, it should collaborate with and include the gaming community as a core part moving forward. Likewise, governments and civil-society leaders would be wise to pay closer attention to key parts of the gaming industry, as other governments seek to amass and exert power through gaming companies. These companies are spread throughout the world, building tools and content that will be used by billions of people for everything from expressing their views to running their businesses to innovating designs entirely for online spaces.

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APPENDIX

GAMING ECOSYSTEM MATRIX

Due to differences in reporting practices and fiscal year calendars, the figures below are not directly comparable to each other. They are meant solely to provide a broad overview of the scale of revenue generated by different companies in the gaming ecosystem, and demonstrate the categories they have business in.

COMPANY	REVENUE (USD) 2022	HARDWARE	DEVELOPMENT	ENGINES	PUBLISHING	STOREFRONT	AR / VR / XR
TENCENT[1]	32.2 BILLION		▶		▶		▶
SONY	18.2 BILLION	▶	▶ PLAYSTATION STUDIOS		▶	▶	▶
APPLE	15.3 BILLION	▶			▶	▶	▶
MICROSOFT	12.9 BILLION	▶	▶ BETHESDA MOJANG		▶	▶	▶
GOOGLE	11.08 BILLION	▶			▶	▶	▶
NETEASE	9.6 BILLION		▶		▶		▶
ACTIVISION/BLIZZARD	8.1 BILLION		▶		▶	▶	▶
NINTENDO	8.1 BILLION	▶	▶		▶	▶	▶
ELECTRONIC ARTS	6.5 BILLION		▶		▶	▶	▶
EPIC GAMES	6.23 BILLION			▶	▶	▶	▶
SEA LTD. (GARENA)	4.3 BILLION		▶		▶		▶
TAKE-TWO	3.5 BILLION		▶		▶		▶
SQUARE ENIX	2.99 BILLION[2]		▶		▶		▶
ROBLOX	2.2 BILLION		▶		▶ SELF-PUBLISHED		▶
UBISOFT	2.47 BILLION		▶		▶	▶	▶
EMBRACER GROUP (THQ NORDIC)	1.65 BILLION[3]		▶		▶	▶	▶
UNITY TECHNOLOGIES	1.39 BILLION			▶	▶		▶

[1] Tencent owns Funcom, Riot Games, and a number of other gaming properties. They also hold significant stakes in major companies like Epic.

[2] This figure is inferred; the company publishes "net sales" rather than revenue figures. Available stats do not reflect Embracer Group's recent acquisition of Square Enix-owned studios and IP.

[3] Available figures do not reflect Embracer Group's recent acquisition of Square Enix-owned studios and IP.