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Cloud Gaming Demystified: An Introduction to the Legal Implications of Cloud-Based Video Games

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CLOUD GAMING DEMYSTIFIED: AN INTRODUCTION TO THE LEGAL IMPLICATIONS OF CLOUD-BASED VIDEO GAMES[+]

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ABSTRACT

In this paper, we set out to 'demystify' cloud-based videogaming and its legal implications. We do this in two stages. First, we offer a descriptive analysis of the videogame sector, including relevant markets and supply chains. We explain the basics of cloud computing technology, traditional videogame technology, and how the two converge in cloud-based videogame ecosystems. We also analyze market structures for both the cloud and video game industries, as well as relevant supply chains, in order to understand how these markets will overlap. Based on these analyses, we make predictions about how the cloud gaming market will be structured, including a breakdown of three separate models for cloud gaming services: the 'layered' model of Gaming-as-a-Service ('GaaS'), the 'integrated' model of GaaS, and the 'consumer infrastructure-as-a-service' model. Finally, we use these three models to analyze how certain intellectual property rights, contractual rights, and regulatory issues will develop in this novel environment for videogame distribution and access.

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1. INTRODUCTION

Cloud computing is disrupting the videogame industry, with both significant commercial impacts and legal implications. The aim of this paper is two-fold. First, we explain key technologies that underly the cloud and videogame sectors, as well as relevant market structures, in an accessible, non-technical way. In particular, in Section 2, we explain the basics of how video-game technology works, and the key changes that stem from the adoption of cloud computing. We also identify which cloud services will be relevant to the videogame industry, the major actors in videogame and cloud supply chains, and we make predictions based on our analysis of how these two markets will likely converge. Finally, in Section 3 of this paper, we outline the areas where we foresee significant, and potentially disruptive, legal consequences and identify questions for further research. Throughout this paper, we use certain terms as defined below.

- Gamer: end users and consumers of videogames.
- Cloud Provider: a company that offers cloud services such as Amazon Web Services or Microsoft Azure.
- Videogame Developer: a company that oversees the design and programming of a videogame.
- Videogame Publisher: a company that handles the pre- and post-production elements of bringing a videogame to market, including financing, marketing, licencing, and sometimes distribution.
- Videogame Company: a generic term for a company involved in the videogame market, either as a developer, publisher, or distributor.

2. CLOUD GAMING: TECHNOLOGY AND MARKET DEVELOPMENTS

2.1 HOW CLOUD GAMING WORKS

To assess how cloud technologies and services will disrupt the videogame industry, we first need an understanding of how traditional videogame technology and distribution models work.

2.1.1 VIDEOGAMING ENVIRONMENTS

Videogames are software applications that allow users to play a virtual game. The videogames industry can be divided by the technological means gamers use to access and play games. These divisions are typically referred to as gaming 'platforms.' However, as 'platform' is used in cloud computing with an entirely different meaning, we use the term videogame 'environments'. While there is some crossover between the games available, each environment differs at the hardware level. There are four established videogame environments: Personal Computer ('PC'), Console, Mobile, and Browser.[1]

- PC gaming is characterized by the use of a general-purpose personal computer, often outfitted with specific components to play videogames.

- Console gaming is characterized by the use of a dedicated device (a videogame console) designed for the primary purpose of gaming, connected to a television or monitor. Examples include Microsoft's Xbox, Sony's PlayStation, and Nintendo's Switch. There is a further subdivision of console gaming between 'home' and 'portable' devices, such as Nintendo's 3DS and Sony's PS Vita.

- Mobile gaming is the use of a general-purpose mobile phone or tablet to play games. There are simple games designed specifically for mobile devices, but, with advances in mobile technology, there are also mobile versions of more complex games originally designed for consoles and PCs.[2]

- Browser-based gaming is the use of an internet browser to access a game. The games are often simple and require

[1] This is both a distinction made by players as well as a market classification tool. For examples of market analyses, see: Field Level Media, 'Report: Gaming revenue to top $159B in 2020' (*Reuters*, 12 May 2020) https://www.reuters.com/article/esports-business-gaming-revenues-idUSFLM8jkJMl accessed 23 July 2021; Kevin Anderton, 'The Business of Video Games: Market Share for Gaming Platforms' (*Forbes*, 26 June 2019) https://www.forbes.com/sites/kevinanderton/2019/06/26/the-business-of-video-games-market-share-for-gaming-platforms-in-2019-infographic/?sh=14442eb57b25 accessed 23 July 2021.

[2] Andrew Williams and Vic Hood, 'Best console games you can play on a phone or tablet' (*Techradar*, 4 February 2020) https://www.techradar.com/news/best-console-games-on-phone-or-tablet accessed 23 July 2021.

relatively little processing power. This is not, strictly speaking, a distinct hardware environment, since it can, theoretically, be deployed on any device with an internet browser. However, mobile browsers will not support all browser-based games.

In future, cloud gaming may come to be recognized as a 5th distinct environment, with users accessing games that run on remote cloud servers from their local devices (whether computers, gaming consoles, mobile phones/tablets, or smart TVs). However, cloud computing technology also has potential applications within each environment (as further discussed below), so the 'cloud gaming' trend cannot be characterized solely as adding a separate environment.

2.1.2 OFFLINE VIDEOGAMING

Simplifying somewhat, traditional offline videogaming requires four technical components: one software component and three hardware components. The first component is the software: the videogame itself. The 'game' is code that a computing device must interpret. It is often stored on either a device's internal storage, on an externally connected storage device, or on removable discs or cartridges.

The second component is a hardware device capable of interpreting the videogame's software and the external inputs from the gamer and rendering the game's graphics and audio in real time. The necessary components of a gaming device are a central processing unit ('CPU'), a graphics processing unit ('GPU'), storage, and random-access memory ('RAM'). The CPU processes the game's instructions and logic in the form of movement or interaction with in-game objects, as well as the player's input. The CPU also passes information to the GPU which renders the instructions as a video image. RAM is a section of the device's memory used to store the game's information while it is being played. While not in use, the game is stored on the device's hard drive ('HD') but the CPU can access data stored in RAM more quickly than it can access such data on the HD. Therefore, while in use, game data may be transferred from the HD to RAM to accelerate loading.[3] While these are common components in all PCs, in order to handle the processor-intensive

[3] Bryan J. Wardyga, *The Video Games Textbook: History, Business, Technology* (CRC Press, 2018) Chapter 2; Jessica Hopkins, 'Behind the Scenes of Video Game Consoles: Embedded Systems' (*TotalPhase,* 27 June 2019) https://www.totalphase.com/blog/2019/06/behind-the-scenes-of-video-game-consoles-embedded-systems/ accessed 23 July 2021.

calculations and graphics rendering necessary for most videogames, a specialized PC or gaming console is required for most 'AAA' games.[4]

The third component is a physical interface by which the user may input commands to affect the gameplay. This 'user control interface' differs per videogame environment: for consoles it is often a specially built piece of hardware with buttons and joysticks; for PC gaming, gamers typically use a keyboard and mouse to input commands; mobile games mostly use the built-in touchscreen. The CPU running the game will interpret the signals sent from the videogame controller or other interface and respond to the commands by adjusting the gameplay accordingly.

The final components are pieces of hardware to display and project the visual and audio components of the game, such as a computer monitor with external speakers, television screen with built-in speakers, or built-in monitor and speakers for mobile and portable videogame consoles. (Virtual reality headsets are becoming popular and also serve as audiovisual output devices). The CPU analyzes data from the game and the user-controlled input and sends the final signal in real-time to the GPU, which translates the data collected into a video on the screen.

Overall, an offline gaming process works as follows: the gaming device interprets the gaming software and user inputs from the user control interface and blends them into a real-time audio and video output sent to a monitor. All processing is done locally on the gaming device.

2.1.3 Online Multiplayer Videogaming

Online multiplayer videogaming works in much the same way that offline videogaming does, only with an added component to allow players to play together remotely.[5] Each player's local device actually runs the game (that is, processing the game logic, the audio, the

[4] 'AAA' is an informal classification used to identify games as being produced by an established publisher with large budgets for both development and marketing. Samuel Stuart, 'What is a Triple-A (AAA) Game?' (*GamingScan*, 10 September 2020) https://www.gamingscan.com/what-is-a-triple-a-game/ accessed 23 July 2021.

[5] While multiplayer functionality is the main reason for a game to have an online component, it is not the *only* one. Some single player games, such as browser-based games also have online components.

visuals, etc.).[6] Information that affects other players or the surrounding environment, such as position or actions, is sent to remote servers over the internet and then relayed to the other players' devices.[7] The effect created is that when Player 1 in one location turns his character to the left, Player 2 in another location sees this action on her screen as well. However, gamer inputs can be, and often are, more complex than simple movement commands. Often, players will take actions that affect other players' characters or the environment they play in. In shooting games, players rely on the location data of other players provided to them by the online servers to shoot at and/or dodge shots from their opponents. Each player's local device interprets their actions and relays it to the multiplayer server, which compiles these actions and relays cause and effect data back to all of the relevant devices. The game server is therefore the authoritative source for all in-game events.[8]

The transfer of information between local devices and the remote server occurs in milliseconds and, for the player, creates an impression of real-time interaction as long as her internet connection is stable and fast. The result, in the previous example of a shooting game, is that Player 1 can see Player 2 in a 'shared' environment. The online server will register the actions of all players and relay the consequences of those actions as they happen. The result is a seamless online interaction in a shared virtual environment, although each player's local machine is doing a majority of the computational work.

2.1.4 CLOUD GAMING

Cloud services allow customers to access a shared pool of remote computing resources over the internet for the purposes of storing and processing data.[9] Similarly, 'cloud gaming' refers to a form of remote computing that allows gamers to use powerful computing resources

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[6] Yunhua Deng, Yusen Li, Xueyan Tang, and Wentong Cai, 'Server Allocation for Multiplayer Cloud Gaming' (2016) Proceedings of the 24th ACM international conference on Multimedia, 918–927; Matthew Ball & Jacob Navok, 'Cloud Gaming: Why it Matters and the Games it Will Create' (*Matthewball.vc*, 5 May 2020) https://www.matthewball.vc/all/cloudmiles?utm_source=morning_brew accessed 23 July 2021.

[7] Deng, Li, Tang, and Cai (2016) n 6.

[8] Deng, Li, Tang, and Cai (2016) n 6.

[9] For a more detailed introduction to cloud computing see W Kuan Hon, Christopher Millard, and Jatinder Singh 'Cloud Technologies and Services' in Christopher Millard (ed) *Cloud Computing Law* (2nd edn OUP 2021).

remotely to run videogame software and stream the resulting gameplay to the user's local monitoring device.[10] For example, instead of using a powerful PC or videogame console to process data locally, gamers can access, via the internet, a cloud server which performs the heavy computations. The player's inputs via their controllers are transmitted to the remote cloud server, which then sends back a signal to the player's monitoring device which displays the audio-visual content. This is also called 'thin client' gaming, with the end user's device acting as a 'thin client device' because only a relatively simple (or 'thin') computational device is required.[11] The only required technical components for a thin client device are a command receiver, which connects to the game controller, and a video decoder which is a relatively simple and inexpensive piece of computer hardware.[12] The result is essentially a video stream that the player can control.[13] However, the perceived effect is a videogaming experience comparable to one played on a high-end PC or gaming console, without the need for the player to invest in high-spec local hardware.

There are differences between the way in which single player and multiplayer cloud gaming function that directly parallel their non-cloud versions. In single-player cloud gaming, the thin client communicates directly with the cloud server that runs the game. However, in cloud multiplayer gaming, there may be multiple servers involved. An overall game server ('G-server') hosts the session and acts like the multiplayer server in traditional, non-cloud multiplayer gaming.[14] Cloud-based rendering servers ('R-servers') take on the duties to run the actual game. Depending on the capabilities of the rendering server, all of the players in a multiplayer game may use the same R-server or multiple R-servers may be needed. Information

[10] Jacob Roach, 'How Does Cloud Gaming Work? A Guide for 2020' (*Cloudwards*, 9 June 2020) https://www.cloudwards.net/how-does-cloud-gaming-work/ accessed 23 July 2021.

[11] Kuan-Ta Chen, Yu-Chun Chang, Po-Han Tseng, Chun-Ying Huang, and Chin-Laung Lei. 'Measuring the latency of cloud gaming systems' (2011) Proceedings of the 19th ACM international conference on Multimedia (MM '11), 1269–1272.

[12] Wei Cai, Ryan Shea, Chun-Ying Huang, Kuan-Ta Chen, Jiangchuan Liu, Victor C. M. Leung, and Cheng-Hsin Hsu, 'A Survey on Cloud Gaming: Future of Computer Games' (2016) 4 IEEE Access, 7605.

[13] Chen, Chang, Tseng, Huang, and Lei (2011) n 11,

[14] Deng, Li, Tang, and Cai (2016) n 6, 918.

flows between the (potentially multiple) R-servers and the G-server as well as between the R-servers and the end users' thin clients.[15]

2.1.5 ADVANTAGES OF CLOUD GAMING

The advantages of cloud gaming can be considered from three different perspectives: namely cloud providers, gamers, and videogame developers/publishers/distributors. For cloud providers, the videogame industry presents a vast and profitable market with a massive base of potential customers. Expanding into the videogame sector will not only increase direct revenues for cloud providers but may also allow them to achieve even higher server utilization rates, thereby improving efficiency.

For gamers, there are two major advantages to the cloud gaming model. First, players need not invest in expensive gaming hardware, as noted above, nor upgrade their gaming hardware every few years as new, technologically superior, equipment is released. Similarly, gamers no longer need to download and store a local copy of a game or maintain their local copy via storage-intensive[16] updates. Instead, the cloud provider can update the copy of the game stored on the server as new content or new versions are released.

Second, in theory at least, the technology allows users to play any of their games on any device with a screen and an internet connection[17] instead of the traditional model where access to games may be limited to a particular type of device or 'gaming environment' (see above).[18] For example, gamers could start a game from their laptop and pick up where they left off on their mobile phone or a friend's smart TV. In this way, cloud gaming has the potential to offer ubiquitous access.

For videogame developers, publishers, and distributors, the main advantages of cloud include cost savings and flexible server

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[15] Deng, Li, Tang, and Cai (2016) n 6, 919.

[16] See e.g. Steve Watts, 'Call Of Duty: Modern Warfare's Season 2 Patch Was Huge And Prompted An Apology,' (*GameSpot*, 19 February 2020) https://www.gamespot.com/articles/call-of-duty-modern-warfares-season-2-patch-was-hu/1100-6473605/ accessed 23 July 2021.

[17] De-Yu Chen and Magda El-Zarki, 'A Framework for Adaptive Residual Streaming for Single-Player Cloud Gaming' (2019) ACM Trans. Multimedia Comput. Commun. Appl. 15, 2s, Article 66, 2.

[18] For example, PlayStation users may only access their PlayStation games from their PlayStation; PC users may only access their games from their PC; and mobile users from their mobile device.

availability for rapid scalability, more efficient distribution of content, and added protection against piracy.

Cost and Flexible Scaling

By adopting cloud services, videogame developers, publishers, and distributors should be able to obtain cost-effective access to rapidly-scalable computing resources. Cloud technology offers an efficient means of game delivery and other backend services, without upfront investment in infrastructure. For example, a videogame company looking to offer multiplayer or other online functionality, could use cloud services to host its videogame service, without having to invest in building and maintaining expensive server architecture. Moreover, because cloud services are typically billed on a usage basis, the videogame company does not need to worry up-front about demand and server capacity needs, since its use and the associated costs can scale with the game's popularity.[19]

By way of contrast, in traditional multi-player gaming, an online server is used to register the actions of all relevant players and relay the consequences of those actions as they happen back to the gamer's local devices. Game developers and distributors typically manage those servers themselves, building their own server networks. This requires investment in enough hardware to support the estimated number of gamers who would want to play online at a certain time. Too few servers, and the online multi-player functionality will go down[20] – too many servers, and expensive hardware sits idle. Cloud computing offers game developers and distributors the flexibility to deal seamlessly with rapid scaling issues by renting computing resources on a 'pay-as-you-go' model.[21] To give an example, in 2016, Niantic used Google Cloud Platform Services to provide an extra buffer of server availability for its US release of Pokémon Go after seeing much higher demand than

[19] See, generally: Hon, Millard, and Singh, *Cloud Computing Law* n 9.

[20] For example, at the release of the new Shadowlands expansion pack in November 2020, World of Warcraft players experienced up to 3 hour long queues to join a server and play the game. Christian Vaz, 'The broken World of Warcraft servers are Blizzard's 'number one priority,'' (*PC Games*, 26 November 2020) https://www.pcgamesn.com/world-of-warcraft/shadowlands-server-problems accessed 23 July 2021.

[21] Eya Dhib, Nawel Zangar, Nabil Tabbane and Khaled Boussetta, 'Resources allocation trade-off between cost and delay over a distributed Cloud infrastructure' (2016) 2016 7th International Conference on Sciences of Electronics, Technologies of Information and Telecommunications (SETIT), 486-490.

expected in its earlier Australian release.[22] Because of the added cloud infrastructure, Niantic was able to handle the extraordinarily high amounts of traffic that ensued. Ultimately, the actual traffic generated by Pokémon Go's launch was 50 times that of Niantic's launch target and 10 times that of their highest-case-scenario estimate.[23] Having access to cloud servers allowed the game to scale at this extraordinary pace. Many games see a spike in interest and traffic at their release dates and cloud systems can offer flexible scaling to accommodate this. Fortnite, the highest grossing videogame of 2019,[24] uses AWS to accommodate massive variance in player needs including a 10x difference in player activity during peak times.[25]

Efficient Distribution of Content

Gaming is still currently divided into multiple environments, each with its own player base. All of the major gaming consoles are in competition with each other and likewise all are in competition with PC gaming systems. Games are sometimes offered exclusively on one brand of console or only on PC, but most AAA games are made available across the two environments. Releasing a game on multiple hardware environments requires an extensive amount of work to recode or 'port' the game.[26] Cloud gaming can, in theory, remove the

[22] Luke Stone, 'Bringing Pokémon Go to Life on Google Cloud,' (*Google Cloud*, 29 September 2016) https://cloud.google.com/blog/products/gcp/bringing-pokemon-go-to-life-on-google-cloud accessed 23 July 2021.

[23] Nick Heath, 'Pokémon Go: How the cloud saved the smash hit game from collapse' (*Techrepublic*, 20 October 2016) https://www.techrepublic.com/article/pokemon-go-how-the-cloud-saved-the-smash-hit-game-from-collapse/ accessed 23 July 2021.

[24] Tom Phillips, 'Fortnite was 2019's top-grossing game, despite 25% revenue dip' (*Eurogamer*, 3 January 2020) https://www.eurogamer.net/articles/2020-01-03-fortnite-was-2019s-top-grossing-game-despite-25-percent-revenue-dip accessed 23 July 2021.

[25] Royal O'Brien, 'How would you keep 125 million gamers playing smoothly online? Epic Games shares its Fortnite Story' (*AWS Game Tech Blog,* 24 July 2018) https://aws.amazon.com/blogs/gametech/epic-fortnite-all-in-on-aws-cloud/ accessed 7 December 2020. See also: Steam, 'Steam and Game Stats' (*Steam*) https://store.steampowered.com/stats accessed 23 July 2021. (For statistics on concurrent Steam users over the last 48 hours demonstrating a similarly high variance between peak and off-peak times).

[26] Cyberpunk 2077 is a perfect example of porting gone wrong as the game developers admitted they 'underestimated the task' of adapting the PC game for consoles which led to refunds being offered to those who

need to adapt a single game multiple times for environment compatibility, since the game need only be designed to run on a central cloud server, from where it can be accessed on almost any device with a screen and internet connection. Thus, widespread adoption of cloud gaming could allow game developers to reach all gaming audiences without the need to adjust and remarket a single game multiple times.[27]

Anti-Piracy

Cloud technology may also help reduce piracy. In a cloud gaming system, game software is stored on the cloud provider's servers, instead of on the gamer's local device. Running game software centrally (without actually distributing copies of the game to each gamer) may help prevent piracy, as the actual gaming software is not made directly available to the public.[28]

2.1.6 Disadvantages and Barriers to Cloud Gaming

Despite the above advantages, there are also barriers to the adoption of cloud gaming. In particular, the use of remote servers requires stable, high-speed internet access connections. Environmental concerns have also been raised[29] related to the energy consumption necessary for cloud gaming to become mainstream.

Latency

Latency is 'the time taken for a given signal or data packet to propagate through a circuit or network from its source point to its destination.'[30] For online gaming, latency refers to the time it takes for an input to be sent across the network and back.[31] It is typically measured in milliseconds and is often referred to by gamers as 'ping' or 'lag' (when latency is high enough to create a lagging effect in the

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purchased it for PS4 and Xbox One when the game would not function on those devices. BBC News, 'Cyberpunk 2077: We Underestimated the Difficulties' (*BBC*, 14 January 2021) https://www.bbc.co.uk/news/newsbeat-55659075 accessed 23 July 2021.

[27] Cai, Shea, Huang, Chen, Liu, Leung, and Hsu (2016) n 12.

[28] Cai, Shea, Huang, Chen, Liu, Leung, and Hsu (2016) n 12.

[29] Matthew Marsden, Mike Hazas, and Matthew Broadbent, 'From One Edge to the Other: Exploring Gaming's Rising Presence on the Network' (2020) In Proceedings of the 7th International Conference on ICT for Sustainability (ICT4S2020), 247–254.

[30] Andrew Butterfield and John Szymanski, *A Dictionary of Electronics and Electrical Engineering* (Oxford University Press, 2018).

[31] Roach (2020) n 10.

game).[32] For example, if you are playing a shooting game and the latency is 50ms, it will take 50ms for whatever action you take in the game (e.g. shooting at one of your opponents) to reach the multiplayer servers and return to your machine. The lower the latency, the more the game feels like it is happening in real-time. At higher latencies, actions will not be registered correctly. This means that you may shoot at a character who appears to be in one place but has actually already moved elsewhere and the signal relaying that information has not yet reached you. At a certain point, high latency renders a game unplayable because of the lag between commands and execution. Past studies have shown that gamers are able to notice latency once it reaches 100ms.[33] However, tolerance for latency varies depending on the type of game being played.[34] For example, first person shooter ('FPS') games require extremely low latencies but when playing a war strategy game, players will not necessarily notice delays that would make FPS games unplayable.[35] While 100ms represents the maximum acceptable latency for FPS games, 500ms is acceptable for role playing games.[36] Overall, games that require intense interactions, such as action and racing games, are more sensitive to delay compared to those with less intense interactions such as puzzle and strategy games.[37]

Because cloud gaming depends on the ability to maintain a steady flow of potentially thousands of requests per second between the gamer's local device and the remote computer, the process is especially reliant on low latency. Moreover, as described previously, cloud multiplayer gaming requires a dialogue between multiple separate servers (the G server and the R servers) as well as one

[32] Roach (2020) n 10.

[33] Michael Jarschel, Daniel Schlosser, Sven Scheuring, and Tobias Hoßfeld, 'An Evaluation of QoE in Cloud Gaming Based on Subjective Tests,' (2011) *IMIS*; Mark Claypool and Kajal Claypool, 'Latency and player actions in online games,' (2006) Communications of The ACM 49 40–45; Mark Claypool and Kajal Claypool, 'Latency can kill: precision and deadline in online games,'(2010) *MMSys*, 2010: Proceedings of the first annual ACM SIGMM conference on Multimedia systems, 215-222.

[34] Peter Quax, Anastasiia Beznosyk, Wouter Vanmontfort, Robin Marx, and Wim Lamotte, 'An evaluation of the impact of game genre on user experience in cloud gaming,' (2013) Proc. IEEE Int. Games Innov. Conf. (IGIC), 216–221.

[35] Hao Tian, Di Wu, Jian He, Yuedong Xu and Min Chen, 'On Achieving Cost-Effective Adaptive Cloud Gaming in Geo-Distributed Data Centers,' (2015) in IEEE Transactions on Circuits and Systems for Video Technology, 25:12, 2064-2077.

[36] Claypool and Claypool (2006) n 33.

[37] Quax, Beznosvk, Vanmontfort, Marx, and Lamotte (2013) n 34.

between the R servers and the users' thin clients. This added complexity coupled with the fact that these conversations between computers must take place over the internet exacerbate potential latency issues.

Latency for cloud gaming is affected by a multitude of factors and is difficult to minimize. These factors include the geographical distance between the cloud servers and end users, the internet connection speeds of the end users, and the video encoding and decoding capabilities of the relevant local devices. The geographical distance between the cloud gamer and the data center that processes her game is a major factor in latency. For example, the transmission of data packets from the US to Germany takes approximately 60ms.[38] This latency time will be reduced the closer a cloud gamer is to the server that is hosting her game. Internet connection speed is also important. A normal HD video stream requires an internet download speed of around 3-5mb per second ('mbps') for seamless transmission.[39] By comparison, for cloud gaming, in order to deliver 1080p resolution at 60 frames per second ('fps'), a minimum internet download speed of 20mbps is needed - and 35mbps for 4k game streaming.[40] The quality of an end user's broadband connection will directly affect the latency in the games they play on a cloud server.

Cloud gaming therefore requires that gamers have reliable high-speed internet connections and that Internet Service Providers' networks are not congested. Ultimately, as the technology supporting cloud gaming evolves, this issue will likely dissipate. For perspective, 95% of UK households currently have access to broadband download speeds of at least 30mbps.[41]

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[38] DE CIX, 'Cloud Gaming Depends on Low Latency' (*DE CIX*, 20 October 2020) https://www.de-cix.net/en/about-de-cix/news/cloud-gaming-depends-on-low-latency accessed 23 July 2021.

[39] DE CIX (2020) n 38.

[40] Joel Hruska, 'Google Stadia Will Eat 1TB Bandwidth Caps for Breakfast' (*ExtremeTech*, 7 June 2019) https://www.extremetech.com/gaming/292743-google-stadia-4k-will-eat-1tb-bandwith-caps-for-breakfast accessed 23 July 2021; Gino Dion, 'Game on! How broadband providers can monetize ultra-low latency services for gamers' (*Nokia*, 23 June 2020) https://www.nokia.com/blog/game-on-how-broadband-providers-can-monetize-ultra-low-latency-services-for-gamers/ accessed 23 July 2021.

[41] Ofcom, 'Connected Nations Update' (2020) https://www.ofcom.org.uk/__data/assets/pdf_file/0017/202571/connected-nations-summer-update-2020.pdf accessed 10 December 2020, 2. However,

Environmental Impact

Cloud technologies are energy-intensive and the deployment of cloud services in the already huge gaming industry has raised environmental concerns. According to a study by the University of Lancaster, carbon emissions associated with the gaming industry could double if the market transitions to a state where 90% of gamers are streaming their content.[42] Meanwhile, the Green Gaming Project at the US Department of Energy estimated that if 75% of current gamers were to transition to cloud-based gaming, gaming-related energy demands would rise by 17%.[43] Moreover, these numbers may be conservative as they focus solely on the current gaming industry participants. One of the advantages of cloud gaming is that it may appeal to a new demographic of players by lowering entry costs and expanding accessibility. If this technology succeeds in drawing in consumers who never played videogames before, the environmental impacts could be even greater.

However, at this stage it is difficult to determine what exactly the environmental impact of cloud gaming will be compared to its traditional counterpart. There are potential mitigating factors that are not taken into account in the previously mentioned studies. For example, Microsoft has announced that all of its data centers will be powered by 100% renewable energy by 2025.[44] Google and Sony have made similar commitments.[45] Further, because the cloud server

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the percentage of homes actually receiving these download speeds is lower than the 95% indication. 'Our research suggests that 69% of residential broadband lines had a 24-hour average download speed of 30 Mbit/s or higher in 2019, up from 58% in 2018.' Ofcom, 'UK Home Broadband Performance' (2020) https://www.ofcom.org.uk/__data/assets/pdf_file/0038/194897/uk-home-broadband-performance.pdf accessed 23 July 2021, 20.

[42] Marsden, Hazas, and Broadbent (2020) n 29.

[43] Evan Mills, Norman Bourassa, Leo Rainer, Jimmy Mai, Arman Shehabi, Nathanial Mills, 'Toward Greener Gaming: Estimating National Energy Use and Energy Efficiency Potential' (2019) The Computer Games Journal.

[44] Brad Smith, 'Microsoft will be carbon negative by 2030' (*Microsoft*, 16 January 2020) https://blogs.microsoft.com/blog/2020/01/16/microsoft-will-be-carbon-negative-by-2030/ accessed 23 July 2021.

[45] Sundar Pichai, 'Our third decade of climate action: Realizing a carbon-free future' (*Google*, 14 September 2020) https://blog.google/outreach-initiatives/sustainability/our-third-decade-climate-action-realizing-carbon-free-future/ accessed 23 July 2021; Nicole Carpenter, 'Why cloud gaming could be a big problem for the climate' (*Polygon*, 14 October 2020)

conducts the majority of the computation and complex rendering, the energy consumption of the end user's machine is reduced.[46] If the infrastructure for cloud gaming is ultimately powered by green energy and end user energy consumption for gaming is reduced, then a mass migration to the service from traditional gaming models could have net positive effects on the environment. More research is needed in this area before any conclusions can be reached.

2.1.7 Cloud Gaming vs Subscription Packages

Cloud gaming is sometimes referred to as the 'Netflix of videogames.'[47] However, as explained above, we define 'cloud gaming' as a service with distinct delivery mechanisms and infrastructure architecture. In contrast, a subscription is merely a business model that may or may not be built into cloud gaming systems. For example, Netflix combines a cloud-based layered infrastructure architecture (using AWS infrastructure), with a business model that gives subscribers unlimited access to a library of video content. In contrast to the Netflix model, cloud providers may opt to sell gamers (access to) individual videogames at a one-off cost. Indeed, a cloud gaming service need not include any games at all. For example, GeForce Now is a cloud-based gaming services that doesn't come bundled with any content, but which operates on a 'bring your own license' ('BYOL') basis.[48] In other cases, services may combine elements of more than one model: for instance, Google Stadia features both a (relatively small) library of games which subscribers can access, as well as a larger store from which videogames may be purchased. By way of contrast to all of these types of cloud gaming service, Apple's Arcade is an example of a non-cloud-based videogame subscription service:

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https://www.polygon.com/features/2020/10/14/21449158/cloud-gaming-ps-now-geforce-project-xcloud-environmental-impact accessed 23 July 2021.

[46] Muhammad Usman, Adnan Iqbal and M. Kiran, 'A bandwidth friendly architecture for Cloud Gaming,' (2017) International Conference on Information Networking (ICOIN), 179-184.

[47] Sean Hollister, 'To Succeed, Cloud Gaming Needs to Disappear' (*The Verge*, 23 June 2021) https://www.theverge.com/2021/6/23/22547334/cloud-gaming-xbox-xcloud-microsoft-streaming-google-stadia-amazon accessed 23 July 2021.

[48] 'With a GFN membership plan, NVIDIA is renting you a virtual PC for gaming, and it is your responsibility to have sufficient rights to use the content (i.e. third-party video games or DLC (downloadable content)).' Nvidia, 'Membership Terms,' https://www.nvidia.com/en-gb/geforce-now/membership-terms/ accessed 22 July 2021.

the subscriber gets access to a library of videogames, which they can run on their local device.[49]

Although subscription packages are not a necessary element of cloud gaming, they may in practice go hand-in-hand. The majority of the upcoming and existing cloud gaming providers bundle some sort of game library subscription with their service. We expect this to continue – since bundling some videogame content with the cloud gaming service seems likely to help to attract new customers, who may be less inclined to pay for access to a cloud service that comes without content.

The transition from individual sales to subscription services is also foreshadowed by both the music and film/TV industries. In the music industry, streaming subscriptions gradually overtook physical and digital sales. In the United States, streaming represented 79% of the total revenue for recorded music in 2019, up from 27% in 2014.[50] Similarly, in the US, subscription video on demand ('SVoD') services like Netflix represented 63% of all home video entertainment revenue in 2019,[51] up from 22% in 2014.[52] The videogame industry may follow a similar trajectory.

That said, there are several differences between gaming and music/video consumption that may make subscription packages less attractive. First, free-to-play games represent the largest revenue

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[49] Here, Apple offers access to 100+ mobile game apps for a monthly subscription price. While it is important to note that some games may have underlying cloud-based support such as infrastructure for online components or databases, the service itself is not cloud-based as the games run on the player's local device, not a remote computer that streams content to a thin client. Apple, 'Arcade,' https://www.apple.com/uk/apple-arcade/ accessed 23 July 2021.

[50] Recording Industry Association of America, 'Year-End 2019 RIAA Music Revenues Report' (2020) https://www.riaa.com/wp-content/uploads/2020/02/RIAA-2019-Year-End-Music-Industry-Revenue-Report.pdf accessed 23 July 2021.

[51] The Digital Entertainment Group, 'The Digital Entertainment Group today released its Year-End 2019 Digital Media Entertainment Report compiled by DEG members, tracking sources and retail input' (2020) https://www.degonline.org/wp-content/uploads/2020/01/f4_DEG2019YE_Digital_Media_Ent_Report-grid-and-cover-note.pdf accessed 23 July 2021.

[52] The Digital Entertainment Group, 'The Digital Entertainment Group today released its year-end 2014 Home Entertainment Report compiled by DEG members, tracking sources and retail input' (2015) https://www.degonline.org/wp-content/uploads/2017/06/DEG-Home-Entertainment-Report-Complete-YE-2014.pdf accessed 23 July 2021.

generators in the videogame market.[53] Second, premium AAA games command prices of $50 and up. Further, compared to the film industry, the premium games market is much more concentrated, and the majority of sales occur in the month following release.[54] Featuring premium games at their release dates could mean higher monthly subscription fees than the $5-15 typical of music and SVoD services.

Third, older content may be less attractive to video-gamers, compared to films and music. While Netflix can drive its popularity with less modern hits like Friends (finished 2004) and How I Met Your Mother (finished 2014), because of the drastic difference in computer processing power over time, there is less of a market for 16-year-old games or even 6-year-old games. Nonetheless, offering subscription packages may make most sense for companies with large catalogues of popular titles and franchises – who can choose either to offer their own subscription services- either as a standalone cloud gaming service[55] or as an add-on subscription to an existing cloud gaming service.[56] It may be that we see *all* of the major studios offering subscription plans that will grant access to their content on multiple cloud platforms.[57] As such, the subscription market may not become consolidated for videogames as much as it has for film and TV content. Conversely, if studios agree exclusive content deals with

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[53] James Batchelor, 'Record $120.1 billion earned by games and interactive media in 2019' (*Games Industry Biz,* 2 January 2020) https://www.gamesindustry.biz/articles/2020-01-02-record-usd120-1-billion-earned-by-games-and-interactive-media-in-2019 accessed 23 July 2021.

[54] Dan Singer and Enrico D'Angelo, 'The Netflix of Gaming? Why subscription video game services face an up hill battle' (*McKinsey & Company*, 8 July 2020) https://www.mckinsey.com/industries/technology-media-and-telecommunications/our-insights/the-netflix-of-gaming-why-subscription-video-game-services-face-an-uphill-battle# accessed 23 July 2021.

[55] This is likely the model for EA's Project Atlas, discussed below.

[56] This is the model for Ubisoft's partnership with Amazon Luna+ whereby, for an additional subscription, users may access Ubisoft's entire library of games on the Luna+ cloud gaming platform.

[57] Ubisoft+ is currently only available on Amazon Luna though it has plans to allow subscribers to also access their library on Stadia soon. Ubisoft, 'UPLAY+ Becomes Ubisoft+, Introduces Beta with Stadia and Amazon Luna' (*Ubisoft,* 27 October 2020) https://news.ubisoft.com/en-us/article/5FFLV80PgIMlKf4CPyFnwi/uplay-becomes-ubisoft-introduces-beta-with-stadia-and-amazon-luna accessed 23 July 2021.

certain cloud gaming services, gamers may end up needing several subscription packages to access all the games they want to play.

2.2 WHICH SERVICES ARE RELEVANT TO CLOUD GAMING?

2.2.1 INTRODUCTION

Cloud services are typically divided into three categories or service models:[58] Infrastructure as a Service ('IaaS'), Platform as a Service ('PaaS'), and Software as a Service ('SaaS'). The following sections describe each of these service models and set out how they apply to the videogaming industry. However, in practice, the divisions between each of these three service models are not strictly demarcated and some overlap or blurring of the services offered occurs.[59]

2.2.2 INFRASTRUCTURE AS A SERVICE (IAAS)

IaaS is the provision of raw computing resources such as processing power and storage.[60] Simply, IaaS provides basic computing resources, such as a virtual machine, on which customers manage their applications and the supporting software. Because IaaS typically only provides underlying infrastructure and few software components (beyond the virtualization software, also known as the hypervisor), it requires a greater level of technical expertise and more hands-on involvement from the customer. At the same time, this affords the customer more control and flexibility in how they use the service.[61]

The most important feature of IaaS for cloud gaming is the provision of server infrastructure. Cloud infrastructure may be used for everything from multiplayer servers,[62] to rapidly-scaling

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[58] Peter Mell and Tim Grance, National Institute of Standards and Technology, U.S. Department of Commerce, 'The NIST Definition of Cloud Computing, Special Publication 800-145' (2011), 2 https://nvlpubs.nist.gov/nistpubs/Legacy/SP/nistspecialpublication800-145.pdf accessed 23 July 2021.

[59] Hon, Millard, and Singh, *Cloud Computing Law* n 9, 9-10.

[60] Hon, Millard, and Singh, *Cloud Computing Law* n 9, 8.

[61] Hon, Millard, and Singh, *Cloud Computing Law* n 9, 8.

[62] Amazon Game Tech Team, 'Multiplayer of MotoGP19: How Milestore Moved to Amazon GameLift' (*AWS Game Tech Blog,* 9 May 2019) https://aws.amazon.com/blogs/gametech/multiplayer-of-motogp19-how-milestone-moved-to-amazon-gamelift/ accessed 23 July 2021.

databases for mobile games,[63] to the foundation of an entire gaming service functioning in the cloud.[64] While, strictly speaking, IaaS would be limited to the provision of server resources, some IaaS services for gaming also provide the option of compatible additional (non-IaaS) services like game analytics, matchmaking software, leader boards, and even machine learning technology for gaming that blur the lines between infrastructure, platform, and software offerings.[65]

According to research by Gartner, in terms of the global market for IaaS services, Amazon Web Services ('AWS') was estimated to have almost 50% market share by revenue in 2018, while Microsoft Azure had 16%, Alibaba had 8%, and Google Cloud had 4%.[66] Tencent and IBM also provide IaaS and have experience offering cloud services for the gaming industry.

IaaS is mostly relevant as cloud infrastructure for large gaming companies as a means of supporting and/or delivering games to players. Yet it also has a niche function for individual gamers, who can use IaaS to build their own virtual cloud gaming environment. For example, a technologically sophisticated gamer can rent their own remote virtual machine through a service like AWS, purchase and install games on that machine through Steam or another distribution service, and pay AWS an hourly rate for remote access.[67] This sort of DIY-cloud gaming setup allows gamers to reap many of the benefits of cloud technology. However, in practice, only a small minority of tech-enthusiast gamers will have the skills and desire to set up their own IaaS-based system. Nonetheless, videogame-

[63] Google Cloud, 'Datastore' https://cloud.google.com/datastore/ accessed 23 July 2021.

[64] For example, AWS for Amazon Luna+ cloud gaming service.

[65] Microsoft, 'Azure for Gaming' https://docs.microsoft.com/en-gb/gaming/azure/ accessed 23 July 2021.

[66] Gartner Newsroom, 'Gartner Says Worldwide IaaS Public Cloud Services Market Grew 31.3% in 2018' (*Gartner*, 29 July 2019) https://www.gartner.com/en/newsroom/press-releases/2019-07-29-gartner-says-worldwide-iaas-public-cloud-services-market-grew-31point3-percent-in-2018 accessed 23 July 2021.

[67] For a more technical explanation on how to set up a personal cloud gaming instance on AWS see: Alix Akhribi, 'Cloud Gaming on Amazon Web Services,' (*Medium*, 21 January 2020) https://medium.com/tensoriot/cloud-gaming-on-amazon-web-services-4be806c0051b accessed 23 July 2021. The system this article recommends currently costs $.46 per hour while running windows as a Spot Instance in Europe's London region. See: AWS, 'Amazon EC2 Spot Instances Pricing' https://aws.amazon.com/ec2/spot/pricing/ accessed 23 July 2021.

oriented services like 'Shadow.tech' have emerged, which promise to give a gamer access to a high-spec remote computing resource with the Windows OS pre-installed, for gamers to install and run their own videogames.[68]

2.2.3 Platform as a Service (PaaS)

PaaS is the provision of platforms for developing and deploying software applications and services.[69] PaaS is the middle ground between IaaS and SaaS. It 'typically provides the technical 'building blocks' for supporting applications, including various software libraries and services that can underly and drive application functionality.'[70] Users of a PaaS system need not actively manage the underlying processing or storage resources. Instead, they are able to focus on programming applications that will be hosted or supported via the service.[71]

For the videogame industry, PaaS includes dedicated tools that gaming companies can use to build and deploy games in the cloud. Such tools and services include multiplayer matchmaking, full-scale development platforms,[72] and videogame engines[73] designed to be integrated with other cloud services.[74] Market share data related specifically to PaaS is not as widely available as it is for IaaS. This is likely to be due to the diversity of PaaS offerings and the inability of any one company to adequately offer a broad enough spectrum of platform services to control a significant portion of the market.[75] However, the key providers of PaaS systems that will be relevant to the videogame industry are likely to include AWS, Google Cloud, Microsoft Azure, IBM, and Alibaba. In addition, companies like Roblox offer customers simple software tools through its Roblox Studio Software to create new games (called 'experiences'), which

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[68] Shadow, 'Shadow Tech' https://shadow.tech/en-gb/ accessed 22 July 2021.

[69] Hon, Millard, and Singh, *Cloud Computing Law* n 9, 8.

[70] Hon, Millard, and Singh, *Cloud Computing Law* n 9, 9.

[71] Hon, Millard, and Singh, *Cloud Computing Law* n 9, 9.

[72] Azure, 'Playfab' https://azure.microsoft.com/en-gb/services/playfab/#featured accessed 23 July 2021.

[73] Google, 'Angry Birds Soars Online with Google App Engine' https://cloud.google.com/files/Rovio.pdf accessed 23 July 2021.

[74] AWS, 'Amazon Lumberyard' https://aws.amazon.com/lumberyard/ accessed 23 July 2021.

[75] Edward Jones, 'Cloud Market Share- a Look at the Cloud Ecosystem in 2020' (*Kinsta*, 13 November 2020) https://kinsta.com/blog/cloud-market-share/ accessed 23 July 2021.

they can then publish to the Roblox Cloud, so other Roblox customers can play them. In 2020, Roblox reported over 30m daily active users.[76] Roblox 'experiences' range from simple user-generated content created by consumers to more complicated games created by small, independent studios.[77]

2.2.4 Software as a Service (SaaS)

SaaS is the provision of end user applications.[78] It offers high-level functionality, generally via pre-built (though typically configurable) applications. In contrast to IaaS, SaaS offers a greater ease of use, while sacrificing customer control and flexibility.[79]

SaaS has two main applications to the videogame industry. First, game developers, publishers, and distributors can use SaaS services like database-as-a-service,[80] translation and text-to-speech software,[81] operational data analytics,[82] and virtual voice actors,[83] to optimize the functioning of their games in the cloud.[84] In these instances, the software application offered as a service is a component that goes into the game design and deployment process. SaaS services offer different functionality – and so do not necessarily compete with each other. As a result, there is not a single market for

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[76] Roblox, https://www.roblox.com/ accessed 18 August 2021; Roblox Corporation, US SEC Form S-1, 19 November 2020, https://www.sec.gov/Archives/edgar/data/1315098/000119312520298230/d87104ds1.htm accessed 18 August 2021.

[77] See e.g. Patrick Klepek, ' How These Developers Hope to Build a 100-Person Game Studio Inside 'Roblox" (*Vice*, 13 May 2021), https://www.vice.com/amp/en/article/z3xn4e/how-these-developers-hope-to-build-a-100-person-game-studio-inside-roblox accessed 18 August 2021.

[78] Hon, Millard, and Singh, *Cloud Computing Law* n 9, 8.

[79] Hon, Millard, and Singh, *Cloud Computing Law* n 9, 9.

[80] AWS, 'Amazon Aurora' https://aws.amazon.com/rds/aurora/?aurora-whats-new.sort-by=item.additionalFields.postDateTime&aurora-whats-new.sort-order=desc accessed 23 July 2021.

[81] Azure, 'Text to Speech Reference Architecture' https://docs.microsoft.com/en-gb/gaming/azure/reference-architectures/cognitive-text-to-speech accessed 23 July 2021.

[82] AWS, 'Cloudwatch' https://aws.amazon.com/cloudwatch/ accessed 23 July 2021.

[83] AWS, 'Amazon Polly' https://aws.amazon.com/polly/ accessed 23 July 2021.

[84] Amazon Aurora n 80. For a real-world example, see: AWS, 'Supercell Goes All-In on AWS to Deliver Mobile Games at Scale' (2020) https://aws.amazon.com/solutions/case-studies/supercell-all-in/ accessed 23 July 2021.

SaaS-services. Nonetheless, for the video-gaming industry specifically, major providers like Amazon, Microsoft, and Google are well-positioned to be leaders in the provision of SaaS-services. Along with massive cloud infrastructure investments and entry into the cloud gaming market, all these companies currently offer a variety of backend software options for game developers building content for the cloud.

The second application of SaaS to the gaming industry is SaaS for gamers, also referred to as Games as a Service ('GaaS'). In this case, the software application offered as a service is the game itself. GaaS services typically take the form of game streaming platforms often packaged with subscriptions to game libraries, creating a Netflix-like gaming experience for end users.

2.3 WHO ARE THE MAJOR PROVIDERS IN CLOUD GAMING?

2.3.1 INTRODUCTION

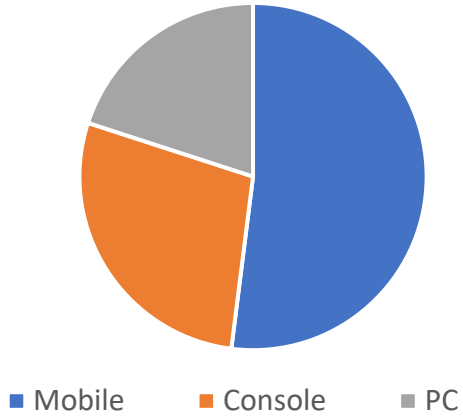
Videogaming is a large industry with global revenues exceeding $150 billion in 2020 and it is projected to grow to over $200 billion by 2023.[85] As noted above, the industry is divided into four key environments: mobile, console, PC, and browser. With the browser environment absorbed into the PC environment because of its small share of the market (just over 1%), overall market shares by environment are:

- Mobile gaming at 52% with $90.7 billion in revenue projected for 2021;
- Console gaming at 28% with $49.2 billion in revenue projected for 2021;
- PC gaming at 20% with $35.9 billion in revenue projected for 2021 (including $2.6 billion from browser-based games)[86]

[85] Field Level Media, 'Report: Gaming Revenue to top $159B in 2020' (*Reuters*, 12 May 2020) https://www.reuters.com/article/esports-business-gaming-revenues-idUSFLM8jkJMl accessed 23 July 2021.

[86] Tom Wijman, 'Global Games Market to Generate $175.8 Billion in 2021; Despite a Slight Decline, the Market is on Track to Surpass $200 Billion in 2023,' (*Newzoo*, 6 May 2021) https://newzoo.com/insights/articles/global-games-market-to-generate-175-8-billion-in-2021-despite-a-slight-decline-the-market-is-on-track-to-surpass-200-billion-in-2023/ accessed 21 July 2021.

Figure 1: Gaming Environment Market Share by Sales (Projected 2021)



The videogaming supply chain is complex, with four distinct identifiable layers of products and services (discussed below) across four separate markets based on gaming environment and with certain companies vertically integrated across multiple layers. The addition of cloud services will only serve to compound this complexity. This section describes the supply chains for the videogaming industry separated by console, mobile, and PC environments. It also illustrates where and how cloud systems may fall into these supply chains. The goal of this section is to sketch out the evolving landscape to better understand what cloud gaming trends will mean for different players and provide a foundation for the legal implications of the transition to the cloud. The key layers in the videogaming supply chain are: hardware provision, digital software distribution, software development, gameplay live-streaming platforms, and cloud gaming services.

2.3.2 HARDWARE PROVIDERS

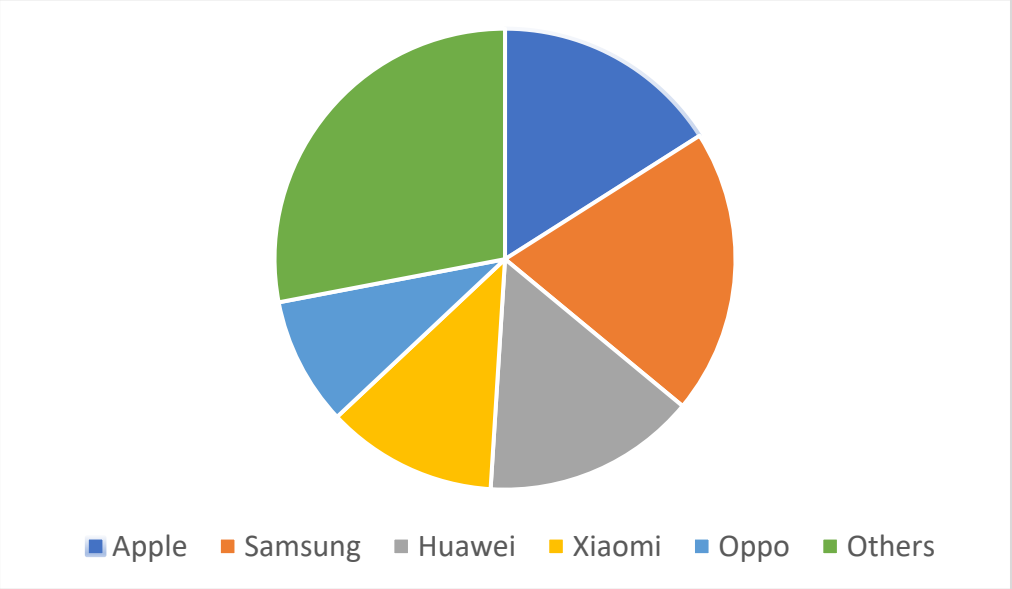
The first layer of the gaming supply chain is composed of the companies that manufacture and sell hardware. In the mobile environment this is represented by manufacturers of mobile devices such as mobile phones and tablets. In the console environment, this layer is composed of manufacturers of videogames consoles. For PC, this includes by manufacturers of PCs and of computer components that are especially important to videogaming.

Mobile

The mobile environment covers two separate types of hardware: mobile phones and tablets, though the key players are generally the same for both. Market share data for the major manufactures of mobile phones and tablets are listed below.

Phones[87]

- Samsung: 20%
- Apple: 16%
- Huawei: 15%
- Xiaomi: 12%
- Oppo: 9%
- Others: 28%

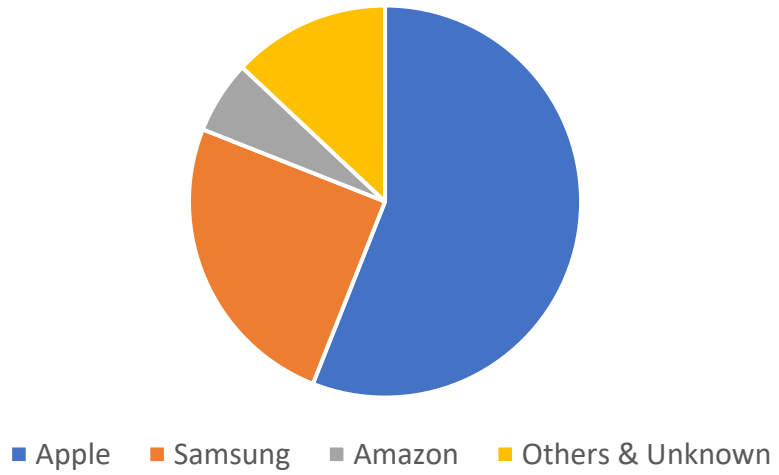


[87] Canalys, 'Worldwide smartphone shipments Q4 2020 and full year 2020' (*Canalys*, 28 January 2021) https://www.canalys.com/newsroom/global-smartphone-shipment-Q4-2020 accessed 21 July 2021.

Tablets[88]

- Apple: 56%
- Samsung: 25%
- Amazon: 6%
- Others & Unknown: 13%

Figure 3: Tablets Market Share by Sales



Consoles

The three most prominent companies in the market for gaming consoles are Sony, Microsoft, and Nintendo. A UK study showed that 8.2 million households in the UK have at least one gaming console.[89] This equates to roughly 29% of total UK households.[90] Global sales

[88] Statcounter, 'Tablet Vendor Market Share Worldwide - June 2020- June 2021,' https://gs.statcounter.com/vendor-market-share/tablet/worldwide accessed 21 July 2021.

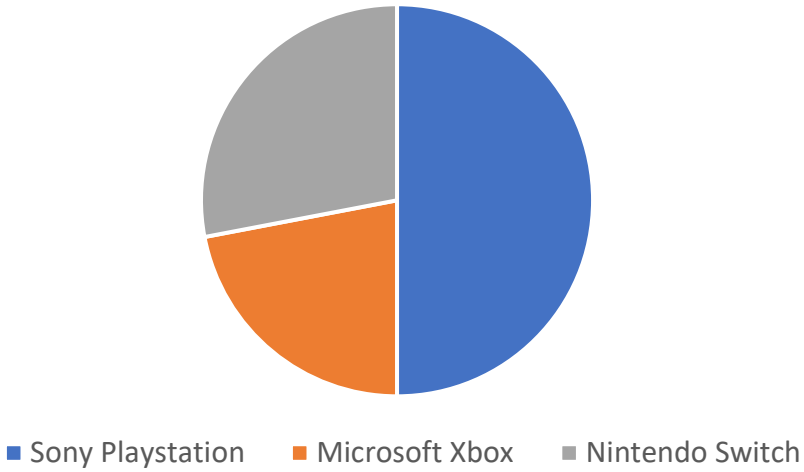
[89] Lionel Vailshery, 'Number of households with a games console in the United Kingdom (UK) from first quarter 2010 to first quarter 2020' by console' (*Statista*, 22 January 2021) https://www.statista.com/statistics/1123795/games-console-households-in-the-uk/ accessed 23 July 2021.

[90] Office for National Statistics, 'Families' https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/families#:~:text=Families%20and%20households%20in%20the%20UK%3A%202019&text=The%20number%20of%20households%20grew,over%20the%20last%2010%20years accessed 3 December 2020.

data indicate that a total of approximately 230 million of these consoles have been sold over their lifetimes.

- Sony has sold a reported 113.5 million PlayStation 4 consoles, representing a 49% market share.
- Nintendo has sold a reported 68 million Switch consoles, representing a 30% market share.
- Microsoft has sold an estimated 48.5 million Xbox One consoles, representing a 21% market share.[91]

Figure 4: Console Market Share by Sales



While these console manufacturers are considered to be directly in competition with one another, there is some overlap and sharing of customers.

PC

The PC hardware market is a crowded space, and it is difficult to parse companies' market shares for gaming-specific PC purchases as opposed to those for other uses. Moreover, many gamers build their own custom PCs[92] which further obscures market shares. At the component level, NVIDIA appears to have the highest market share

[91] Felix Richter, 'Playstation Dominates Video Game Hall of Fame' (*Statista*, 12 November 2020) https://www.statista.com/chart/18903/video-game-console-sales/ accessed 22 February 2021.

[92] Eric Griffith, 'PC Gamers Prioritise High End Graphics and Back Support' (*PCMag*, 27 April 2020) https://uk.pcmag.com/why-axis/126712/pc-gamers-prioritize-high-end-graphics-and-back-support accessed 23 July 2021.

for high-spec dedicated GPUs (with an estimated 80% of the market), followed by AMD (20%).[93]

2.3.3 GAME DISTRIBUTORS

The second layer in the videogame market supply chain is the digital distribution of videogame software. In the mobile environment, this market is defined by online application marketplaces. In the console environment it is defined by similar marketplaces accessed through the internet directly from the console. For PC, it is defined by various online game marketplaces, generally owned by game developers.

There is also a distribution market for software on physical carriers (e.g. games sold on discs). Worldwide, digital sales revenue has overtaken revenue from physical sales.[94] Nonetheless, sales of physical carriers for videogames in the console market remain strong compared to PC games,[95] probably because of the continued viable secondary market for used games.[96] For example, 75% of UK sales of FIFA 19 (a popular football game) were physical.[97] However, there is likely to be an industry-led transition away from games on physical carriers as both Microsoft and Sony have released an all-digital version of their newest console generation with a significantly lower

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[93] Rob Thubron, 'Nvidia increases its dedicated GPU market share to 80%', (*TechSpot*, 27 August 2020), https://www.techspot.com/news/86532-nvidia-now-holds-80-dedicated-gpu-market.html accessed 23 July 2021.

[94] J. Clement, 'Console gaming content market value worldwide from 2011 to 2022 by distribution type,' (*Statista*, 26 May 2021) https://www.statista.com/statistics/292460/video-game-consumer-market-value-worldwide-platform/ accessed 23 July 2021.

[95] Physical sales for PC games represents 2% of distribution revenue compared to 28% for consoles. Mina Smith, '91% of 2020's Game Industry Revenue was Digital' (*Gamerant*, 24 December 2020) https://gamerant.com/2020-game-industry-revenue-digital/ accessed 23 July 2021.

[96] In fact, courts in both Europe and the United States have ruled that digitally-purchased versions of copyright works should be treated differently under the law than those bought on physical carriers with respect to the first sale doctrine (U.S.) and principles of exhaustion of rights (Europe). Thus, there is no legal secondary market for these types of video games in either the U.S. or Europe. See: *Capitol Records, LLC v. ReDigi Inc.*, No. 16-2321 (2d Cir. 2018); CJEU, *Nederlands Uitgeversverbond, Groep Algemene Uigevers v. Tom Kabinet Internet BV et al*, (2019) Case C-263/18.

[97] Wesley Yin-Poole, 'UK video game sales now 80% digital,' (*Eurogamer*, 3 January 2019) https://www.eurogamer.net/articles/2019-01-03-uk-video-game-sales-now-80-percent-digital accessed 23 July 2021.

price point than their disc drive-equipped counterparts. Some predict that disc-based games will become a thing entirely of the past in a relatively short time.[98]

Mobile

The mobile gaming market is subdivided by operating system, with Android and iOS representing separate distribution channels within this environment. Likewise, the two major players in videogame software distribution represent the most popular, or in Apple's case the only, application marketplace for each operating system. Apple's App Store is the only available marketplace for users on Apple devices, while Google's Play store is the most popular marketplace for Android users. The data, based on 2020 global consumer spending, indicating market share is as follows:

- App Store: $72.3 billion revenue;
- Google Play $38.6 billion revenue.[99]

Consoles

Digital software distribution for videogame consoles is controlled solely by the console manufacturer, similar to Apple's control of its App Store for Apple devices. Therefore, each hardware provider monopolizes the market for digital distribution of videogame content for its hardware.

PC

Digital software distribution for PC videogames features a diverse group of online marketplaces mostly owned by game developers, each

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[98] Gina, 'What Digital-Only Consoles Mean for Gaming's Future' (*CBR,* 21 June 2020) https://www.cbr.com/what-digital-only-consoles-mean-for-gaming/ accessed 23 July 2021; Same Byford, 'With the next console generation, buying digital looks better than ever' (*The Verge,* 17 September 2020) https://www.theverge.com/21441153/ps5-xbox-series-s-physical-vs-digital-next-gen accessed 23 July 2021; Dan Santaromita, 'PS5's Digital Edition May Show a Shift from Physical Media is Inevitable' (*Third Coast Review,* 23 June 2020) https://thirdcoastreview.com/2020/06/23/ps5-digital-shift/ accessed 23 July 2021.

[99] Stephanie Chan, 'Global Consumer Spending in Mobile Apps Reached a Record $111 Billion in 2020, Up 30% from 2019,' (*Sensor Tower*, 4 January 2021) https://sensortower.com/blog/app-revenue-and-downloads-2020 accessed 21 July 2021.

with its own storefront. Valve Games' Steam is a popular distribution platform, but many others have emerged to challenge its share. Estimates indicate that Steam controls 75% of the market share for PC game sales.[100] However, data are limited, and the market is changing rapidly with the release of the increasingly popular Epic Games Store, which appears to be trying to challenge Steam by undercutting its rates.[101] Moreover, Steam also competes with the Microsoft Games Store, Ubisoft's UPlay Store, EA's Origin Store, Blizzard Entertainment's Battle.net, and GOG.com. With the exception of GOG, these marketplaces are all run by software developers.[102] GOG offers all of its content free of any digital rights management ('DRM') locks, allowing its users to download their purchases to as many devices as they wish.[103]

2.3.4 Game Developers and Publishers

The third layer in the gaming industry supply chain is software development. This includes both game developers[104] and publishers.[105] Below is a list of the top 10 videogame publishers and developers based on 4th quarter revenue from 2020 with a description of the environment/s in which they operate. For comparison, we have included Apple and Google, although these are primarily game distributors (rather than publishers or developers).[106]

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[100] Arthur Zuckerman, '75 Steam Statistics: 2020/2021 Facts, Market Share & Data Analysis,' (*CompareCamp*, 15 May 2020) https://comparecamp.com/steam-statistics/ accessed 21 July 2021.

[101] Robert Zak, 'Epic Games Store vs Steam: a tale of two digital storefronts,' (*Techradar*, 30 September 2019) https://www.techradar.com/uk/news/epic-games-store-vs-steam-battle-of-the-online-stores accessed 23 July 2021.

[102] Furthermore, among these digital storefronts run by software developers, the Microsoft Games Store is the only one that also distributes third-party content alongside its own.

[103] GOG, 'About,' https://www.gog.com/about_gog accessed 23 July 2021.

[104] A game developer is a company that oversees the design and programming of a videogame.

[105] A game publisher handles the pre and post-production elements of bringing a videogame to market including financing development, marketing, licencing, and sometimes distribution.

[106] Revenue was calculated based on game sales only and is estimated for companies who do not split out their game sale revenues.

#	Parent Company	Revenue Q42020[107]	Game Studios	Popular Games
1	Tencent	$6.733 bn	Riot Games, Epic Games, Supercell	League of Legends, PUBG
2	Sony	$5.353 bn	Sony Interactive Entertainment	Ratchet and Clank, Spiderman
3	Apple	$3.758 bn[108]	N/A	N/A
4	Microsoft	$3.473 bn	Microsoft Game Studios, Bethesda	Age of Empires, Minecraft
5	Nintendo	$2.459 bn	Nintendo	Pokémon, Super Mario Brothers
6	Google	$2.428 bn	N/A	N/A
7	Activision Blizzard	$2.108 bn	Activision, Blizzard, King, Infinity Ward	World of Warcraft, Call of Duty
8	NetEase	$1.924 bn	NetEase	Marvel Super War, Knives Out
9	Electronic Arts	$1.673 bn	EA, Bioware, Respawn Entertainment, Criterion Games	FIFA, Apex Legends
10	Ubisoft	$1.121 bn	Ubisoft games, Massive Entertainment	Assassin's Creed, Far Cry

2.3.5 Live-Streaming Platforms

The fourth layer in the gaming industry supply chain is that of gameplay live-streaming platforms. These are online platforms that host gamers who stream live feeds of their gameplay with commentary. These communities are popular, garnering millions of viewers each day. The three main platforms in this market as of April 2021 are Amazon's Twitch, Google's YouTube Gaming Live, and

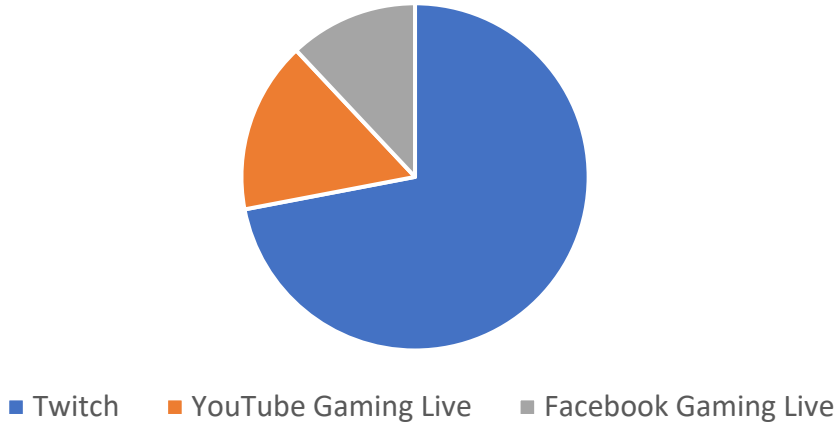
[107] NewZoo, 'Top 25 Public Companies by Game Revenues,' https://newzoo.com/insights/rankings/top-25-companies-game-revenues/ accessed 21 July 2021.

[108] Note that the revenues described for both Apple and Google are largely or entirely from distribution rather than development.

Facebook's Gaming Live. The data concerning market share in Q1 2021 were:

- Twitch: 6.34 billion total hours watched, with 72.3% market share.
- YouTube Gaming Live: 1.37 billion total hours watched, with 15.6% market share.
- Facebook Gaming Live: 1.06 billion total hours, with 12.1% market share.[109]

Figure 5: Game Live-Streaming Market Share Q1 2021



With the popularity of these communities, game developers have begun to utilize them as marketing tools for their games, paying the most popular streamers up to $50,000 per hour to stream their games.[110]

[109] Ethan May, 'Streamlabs & Stream Hatchet Q1 2021 Live Streaming Industry Report,' (*Streamlabs*, 9 April 2021) https://blog.streamlabs.com/streamlabs-stream-hatchet-q1-2021-live-streaming-industry-report-eaba2143f492 accessed 21 July 2021.

[110] Sarah E. Needleman, 'Top 'Live-Streamers' Get $50,000 an Hour to Play New Videogames Online,' (*Wall Street Journal*, 18 May 2019) https://www.wsj.com/articles/top-live-streamers-get-50-000-an-hour-to-play-new-videogames-online-11558184421 accessed 23 July 2021.

2.3.6 Cloud Gaming Service Providers

As of now, cloud gaming is a new service with most of the major providers in the market either in beta testing or only having recently released their platforms to the public. The market, therefore, will likely change in the coming years as companies vie for customers and user preferences develop. The services and price points differ, and it is difficult to predict which model will evolve into the industry standard. It is therefore premature to make any sort of market share analysis. We describe each of the cloud gaming services currently available below and organize them by the type of cloud service they represent (SaaS, PaaS, IaaS).

Gaming as SaaS (GaaS)

- **Amazon Luna+:** Amazon has announced the launch of its Luna+ cloud gaming service. The service includes a 'growing library of games' and is intended to mirror its Prime Video streaming service. A base subscription includes access to a general library of content, and users can then add dedicated game 'channels' offering specific content from developers. As of September 2021, the only channel listed is 'Ubisoft+' which will presumably include games from Ubisoft's catalogue, though the specifics of the library offered are not listed. The service is currently operating under a limited release for users in the US by invitation. Luna+ currently costs $5.99 per month. It includes unlimited playtime at 1080p and 60fps (with 4K coming soon), and access on PC, Mac, Fire TV (Amazon's smart TV interface), and through apps for iPhone and iPad. Amazon also offers a proprietary gaming controller that it claims will reduce round-trip latency by 17-30 milliseconds when used with Luna compared to a Bluetooth controller of a different brand. It also has plans to integrate the service with its popular live-streaming platform, Twitch, allowing users to seamlessly transition from watching a live-stream of a particular game to playing that game on Luna and vice-versa.[111]

- **Electronic Arts Project Atlas:** Electronic Arts ('EA'), one of the largest gaming companies in the world, announced its Project Atlas cloud gaming project in October 2018.[112] It will

[111] Amazon, 'Luna,' https://www.amazon.com/luna/landing-page accessed 23 July 2021.

[112] Ken Moss, 'Announcing Project Atlas,' (*Electronic Arts*, 29 October 2018) https://www.ea.com/news/announcing-project-atlas accessed 23 July 2021.

make use of EA's large catalogue of games and will operate on AWS servers.[113] As of 2021, EA had not made any further announcements about the project's launch.

- **Google Stadia:** Google's Stadia cloud gaming service runs on its proprietary cloud infrastructure and offers a subscription for $9.99 per month which gives players access to a library of '20+ games' from which they may choose one or two each month to add to their library. It also allows users to purchase other games (both AAA and indie) separately from its store that they may stream using the cloud service. Stadia can be accessed on a Mac or Windows PC using Google's Chrome browser, on Android devices via the Stadia app, iOS devices through a progressive web app or through a TV equipped with Google's Chromecast Smart TV interface.[114] Google also offers the Stadia Gaming Controller which is a required accessory when accessing Stadia through a Chromecast-enabled smart TV but may be substituted with a keyboard and mouse when accessing Stadia on a computer, or many other Bluetooth gaming controllers when accessing on a mobile device.[115]

- **Xbox Cloud Gaming:** Microsoft's cloud gaming service, formerly 'xCloud,' is linked to its game subscription service (Xbox Game Pass) previously offered only to users of its Xbox games console. Subscribers to the Xbox Game Pass can access a library of over 100 games to play on their Xbox games console or PC. Users may upgrade their subscription to the 'ultimate' tier to add access to this library on android mobile devices from the cloud. This package costs $14.99 per month.[116] This service runs on Microsoft's existing Azure cloud infrastructure.

- **Sony PlayStation Now:** This service is targeted mainly at users who already own a PlayStation gaming console, though it may also be accessed from a PC. Sony offers a library of over

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[113] Gabe Gurwin, 'Here is what we know about EA's streaming service Project Atlas' (*Digital Trends*, 4 November 2019) https://www.digitaltrends.com/gaming/ea-project-atlas-cloud-game-streaming-news-rumors-release-date/ accessed 23 July 2021.

[114] Stadia, 'About,' https://stadia.google.com accessed 23 July 2021.

[115] Google Store, 'Introducing the Stadia Controller,' https://store.google.com/gb/product/stadia_controller accessed 23 July 2021.

[116] Xbox, 'Xbox Game Pass,' https://www.xbox.com/en-GB/xbox-game-pass/#join accessed 23 July 2021; Xbox, ' Xbox Cloud Gaming (Beta) with Xbox Game Pass' xbox.com/en-GB/xbox-game-pass/cloud-gaming accessed 17 August 2021.

700 games to stream with 300 of those games also available to be downloaded directly to the user's gaming device.[117] The price is $9.99 per month or $59.99 per year. The catalogue is large but mostly consists of older, less graphically intensive games, originally released forPS2 and PS3. As of 2021, the service is only available on PCs and PlayStation gaming devices and is therefore limited compared to the other emerging cloud GaaS systems. In 2019, Microsoft and Sony announced a 'strategic partnership' that would explore 'future cloud solutions in Microsoft Azure to support their respective game and content-streaming services'.[118] This partnership may initially come as a surprise, since Sony and Microsoft compete in consoles and are likely to compete in GaaS-services as well. Nonetheless, Sony may have felt that it needed to partner with a major IaaS cloud provider (and negotiations with AWS reportedly ended after the parties failed to agree commercial terms).[119] It in fact mirrors the video-on-demand market, where Netflix uses the underlying IaaS services of AWS, while Amazon also offers a competing video-on-demand service in Amazon Prime.

- **Tencent Start:** Tencent has partnered with NVIDIA to offer a high-quality cloud gaming service in China.[120] The service includes a subscription to a library of games (including blockbusters NBA2K Online 2 and Fortnite). Start is currently limited to Chinese markets but, given Tencent's global

[117] PlayStation, 'Playstation Now,' https://www.playstation.com/en-gb/ps-now/ accessed 23 July 2021.

[118] Microsoft News Center, 'Sony and Microsoft to explore strategic partnership', 16 May 2019, https://news.microsoft.com/2019/05/16/sony-and-microsoft-to-explore-strategic-partnership/ accessed 23 July 2021; Andy Robinson, 'Sony says its relationship with Microsoft is 'deepening' following cloud tech deal', (*VideogamesChronicle*, 19 May 2020) https://www.videogameschronicle.com/news/sony-says-its-relationship-with-microsoft-is-deepening-following-cloud-tech-deal/ accessed 23 July 2021.

[119] Sead Fadilpašić, 'Sony picked Microsoft cloud deal after AWS talks fell through', (*IT Portal*, 21 May 2019), https://www.itproportal.com/news/sony-picked-microsoft-cloud-deal-after-aws-talks-fell-through/ accessed 23 July 2021.

[120] Chris Kerr, 'Tencent expands 'Start' cloud gaming platform in China' (*Gamasutra*, 20 December 2019) https://www.gamasutra.com/view/news/356049/Tencent_expands_Start_cloud_gaming_platform_in_China.php accessed 23 July 2021.

strength and worldwide cloud infrastructure, could potentially expand elsewhere in the future.

- **Vortex:** Vortex offers a library of around 160 games for players to stream to any Mac or Windows computer as well as mobile devices and Android TVs. It has a tiered pricing scheme ranging from $9.99 to $24.99 per month with higher priced tiers offering more games, more monthly playtime and higher resolutions.[121]

Alternative models: Gaming as PaaS and IaaS

- **NVIDIA GeForce Now:** NVIDIA, inventor of the GPU and industry standard provider of graphics processing components for gaming PCs, also offers a cloud gaming service called GeForce Now. GeForce Now connects to online PC games marketplaces like Steam and allows players to stream games they have previously purchased to different devices.[122] As a result, GeForce Now is not a GaaS-service since it does not offer players direct access to a videogame. Instead, it offers players the chance to play games for which they have purchased licenses elsewhere, using Nvidia's proprietary RTX software that improves streaming performance.[123] NVIDIA has also developed its own cloud server infrastructure for this service.[124] The service offers both infrastructure and a software platform within which customers can deploy game software purchased elsewhere.

- **Shadow:** Shadow differentiates itself from the other services we are considering by not limiting its service to gaming. Instead of offering a games-only service, it offers subscribers

[121] Vortex, 'Gaming Everywhere,' https://vortex.gg accessed 23 July 2021.

[122] NVIDIA, 'GEForce Now,' https://www.nvidia.com/en-gb/geforce-now/games/ accessed 23 July 2021.

[123] NVIDIA, 'Choose a Membership,' https://www.nvidia.com/en-gb/geforce-now/memberships/ accessed 23 July 2021.

[124] There is limited data on the specifics of NVIDIA's servers for GEForce Now. However, it lists the locations of each server on the GEForce Now website so users may check server status at any time. NVIDIA, 'Server Status' (*NVIDIA*) https://status.geforcenow.com accessed 23 July 2021. Also, videogaming news outlet, Beebom has posted the technical specifications for NVIDIA's servers here: Pranob Mehrotra, 'NVIDIA GEForce Now Server Specifications Revealed' (*Beebom*, 15 February 2019) https://beebom.com/nvidia-geforce-now-server-specifications/ accessed 23 July 2021.

access to a fairly high-powered[125] remote PC which they may use however they want with access from various thin clients including Windows PCs, Macs, Android mobile devices, Android TV, iOS, tvOS, and Linux apps.[126] While being marketed primarily to gamers, the service may also be used in any way a traditional computer would be, such as surfing the web or running processor-intensive software like video or photo editing tools.[127] This service simply offers remote access to a computer with no built in platform upon which to operate or software to access. However, while Shadow's service is cloud-like, it appears that users are renting an entire dedicated machine and there is seemingly no shared tenancy within the hardware. Consequently, it does not appear to meet the NIST definition of a true cloud service.[128] Yet, it merits a mention because it is directly competing with true cloud gaming services in a way that feels the same to end users.

2.4 THREE PREDICTIONS FOR THE EVOLUTION OF CLOUD GAMING

We conclude Section 2 of this paper with three predictions about the evolution of cloud gaming and its effects on the gaming industry and market.

2.4.1 THE CONSOLE IS DYING; LONG LIVE THE CLOUD

We predict that, at the hardware layer, 'cloud gaming' (i.e. games running on remote servers streamed to local devices) will become one of the main gaming environments, largely replacing home videogame consoles. Instead, gamers will use their local general-purpose computing devices, such as PCs, tablets, and smartphones, and general entertainment devices such as Smart TVs, to access cloud gaming services. Consoles are designed as affordable alternatives to expensive gaming computers and provide high quality gaming experiences without prohibitive price tags for casual gamers. They

[125] Shadow, 'Tech Specs,' https://shadow.tech/en-gb/specs/ accessed 23 July 2021.

[126] Shadow, 'Frequently Asked Questions,' https://shadow.tech/en-gb/faq accessed 23 July 2021.

[127] Shadow, 'Frequently Asked Questions,' https://shadow.tech/en-gb/faq accessed 23 July 2021.

[128] Pooled resources and rapid elasticity are essential characteristics of a cloud computing service which are not present in the Shadow service. See National Institute of Standards and Technology (2011) n 58.

also offer portability (compared to PCs) as well as non-gaming extra services like web-surfing and other entertainment. However, once cloud gaming technology can replicate the gaming experience offered by consoles, there will be little room for consoles to compete, as cloud services will be able to fill the same needs without the upfront cost to casual players. Dedicated players may still prove willing to pay more to acquire high-spec PCs to run AAA videogames on their local machines, but cloud gaming will take over the market for budget and casual players from consoles.

Simply put, when players buy an Xbox or PlayStation, they do so as a means to *access the gaming experience*. If access no longer requires additional hardware, why pay substantial sums for that hardware? This explains why Ubisoft CEO Yves Guillemot predicted in June 2018 that the PS5 and Xbox X (released in November 2020) would be the last generation of consoles, and that 'streaming will become more accessible to many players and make it not necessary to have big hardware at home.'[129]

There is an argument that cloud gaming is not actually cheaper than console gaming, but instead spreads costs out over time through monthly subscription charges. However, all three major console providers also charge users a recurring fee (with tiered pricing based on contract length) for online play.[130] The cheapest model for PlayStation and Xbox users is $59.99 per year. If you compare this to a cloud gaming service like Amazon Luna+, which released in the US at $5.99 a month ($71.88 per year), the recurring cost of cloud gaming to the end user is relatively similar, and there is no requirement to make an initial investment in specific hardware. Moreover, considering the conveniences offered by cloud gaming including playability on a range of devices, no need to update games or manage device storage,[131] and often a bundle of included games to

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[129] Brian Crecente, 'Ubisoft Believes Next Gen Is the Last for Consoles as Microsoft Looks Beyond Platforms', (*Variety*, 6 June 2018) https://variety.com/2018/gaming/features/death-of-the-console-1202833926/ accessed 22 July 2021.

[130] PlayStation, 'PlayStation Plus' https://www.playstation.com/en-gb/ps-plus/ accessed 1 December 2020; Microsoft, 'One Account for Everything Xbox' https://www.xbox.com/en-GB/live accessed 23 July 2021; Nintendo, 'Online Play,' https://www.nintendo.com/switch/online-service/online-play/ accessed 23 July 2021.

[131] Adam Vjestica, 'PS5 and Xbox Series X storage explained: how it works and what you need to know' (*Techradar*, 13 November 2020) https://www.techradar.com/uk/news/ps5-and-xbox-series-x-storage-explained-how-it-works-and-what-you-need-to-know accessed 23 July

play, the small disparity in yearly price of use is easily justified - assuming the service offered is of a quality that can compete with the console experience.

Admittedly, it will take time for cloud gaming services to match the experience offered by current consoles. For example, the broadband speeds needed for cloud gaming to function at acceptable latencies are not available everywhere. However, the ongoing rollout of 5G mobile technology with increased speeds and bandwidth will greatly enhance the delivery of cloud games.

If console gaming declines in future, the three providers of consoles (Sony, Microsoft, and Nintendo) will lose revenues not just from reduced hardware sales, but also from a reduced cut of the digital distribution of videogames, such as through the PlayStation Store. Nonetheless, Microsoft may be well-placed to take advantage of the transition to cloud gaming, through its xCloud GaaS service combined with its Azure cloud infrastructure. Sony also appears to be preparing for the cloud transition, by partnering with Microsoft[132] to offer its PlayStation Now GaaS service and compete with Amazon and Google.

Finally, Nintendo may also find a way to adapt to the transition. It has been able to remain competitive with Microsoft and Sony in the console market, despite producing what some consider to be a technologically inferior console product.[133] Nintendo's success in the console market is due to a creative approach to hardware that offers different gaming experiences, such as the motion controllers for its Wii and the portability of the Switch, coupled with a massively popular catalogue of exclusive game franchises like Super Mario Brothers, Pokémon, and Legends of Zelda.[134] This library of popular

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2021. With some AAA games taking up over 60GB of space, these hard drives will fill up quickly.

[132] Tom Warren, 'Microsoft and Sony are Teaming up for the Future of Gaming' (*The Verge*, 20 May 2019) https://www.theverge.com/2019/5/20/18632374/microsoft-sony-cloud-gaming-partnership-amazon-google accessed 23 July 2021.

[133] 'Nintendo lags behind its competitors in raw power, but makes up for it in form factor.' Will Greenwald, 'Nintendo Switch vs. Playstation 4 vs. Xbox One: Top Game Consoles Duke it Out' (*PC Mag*, 18 January 2019) https://uk.pcmag.com/gaming-systems/6023/nintendo-switch-vs-playstation-4-vs-xbox-one-top-game-consoles-duke-it-out accessed 23 July 2021.

[134] All three are in the top 50 highest grossing game franchises with Pokémon and Mario at positions 1 and 2 respectively and having a

IP and creative console gaming experiences drives hardware sales. It is reasonable to expect Nintendo to find a way to survive - whether by continuing to offer its sought-after games exclusively on its proprietary consoles or by entering the cloud GaaS market in some form. Nintendo may actually be the best placed to replicate the Disney+ model in GaaS, as it owns the rights to a huge library of popular franchises as well as nostalgic classics.[135] A recent analysis found that Nintendo had filed a large number of patents related to cloud gaming, indicating significant investment in research and development. This suggests that Nintendo is preparing for a transition to cloud and may just be waiting for the right commercial opportunity.[136]

2.4.2 Not All Clouds are Alike: Three Models for GaaS

It is tempting to think of a transition to 'the cloud' as a singular trend. However, different cloud service models entail different levels of provider and customer control. As a result, a transition to cloud gaming could have widely different impacts for game publishers, developers, and distributors, depending on which cloud service models are adopted. With respect to GaaS, we foresee three separate models emerging with an additional model that serves as a subset of the second.

The first is what we call the 'Layered Model'. It is a system of layered SaaS on top of IaaS whereby a videogame developer/publisher builds its own system on top of a cloud company's IaaS and offers its games via SaaS to players. Examples of this model include EA's Project Atlas, which will reportedly be built on AWS, and Sony's PlayStation Now, which will reportedly rely, at least in part, on Microsoft Azure. In this model, the videogame company pays the cloud provider to access computing resources as IaaS, and then

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combined revenue higher than the rest of the top 10. Carly Hallman, 'The Top 50 Highest-Grossing Video Game Franchises' (*Titlemax*) https://www.titlemax.com/discovery-center/lifestyle/the-top-50-highest-grossing-video-game-franchises/ accessed 23 July 2021.

[135] Janko Roettgers, 'Walt Disney Studios Teams Up With Microsoft to Make Movies in the Cloud', (Variety, 13 September 2019), https://variety.com/2019/digital/uncategorized/walt-disney-studios-microsoft-azure-1203334658/ accessed 23 July 2021.

[136] Disney+ reportedly runs its SaaS video-on-demand services based on AWS IaaS cloud infrastructure. Disney reportedly also uses Microsoft Azure services for content creation such as cloud-based editing. See: Clarivate, 'Cowboys, combat and candy: Cloud gaming through the lens of IP', (2020), https://clarivate.com/compumark/campaigns/cowboys-combat-and-candy-cloud-gaming-through-the-lens-of-ip/ accessed 22 July 2021.

deploys its own GaaS-delivery system, and sells the resulting GaaS-service as SaaS to consumers. This is similar to the way Netflix is layered on AWS's IaaS in the video-on-demand market. In effect, the cloud provider is only an IT service provider.

We call the second type the 'Integrated Model'. This model is Game SaaS offered to the consumer by the cloud provider, with the developer/publisher licensing its videogames to the cloud provider, for sub-licensing through its Game SaaS system. Examples include Google Stadia and Amazon Luna+, whereby Google and Amazon provide a GaaS service to consumers and negotiate with developers/publishers to make their games available to users of the service. This is similar to the way Amazon operates Amazon Prime Video, when licensing content from third-party providers such as film studios, in the video-on-demand market. In effect, the videogame company acts as developer and publisher, while the cloud provider takes on the role of distributor, as well as IT provider.

As a subset of the integrated model, there is the 'Fully Integrated Model,' whereby either a videogaming company builds out cloud infrastructure and services or a cloud company develops its own game content and distribution system. This can create a model that is vertically integrated at every layer of the stack. Microsoft provides an example of the Fully Integrated Model with substantial experience as both a gaming and cloud company. For a videogame company to mirror this model would require substantial investment in cloud infrastructure, including both hardware and expertise. A recent report on cloud gaming which looked at the patent filings of major cloud providers found that cloud providers spent, on average, around seven years of research and development on game-streaming-related technologies before launching their GaaS-services.[137]

Finally, the third model is the 'Consumer IaaS Model'. This model is characterized by services that look solely to provide users with cloud computing resources for gaming without attempting to take on additional roles as games distributors or developers. Examples of this model are Shadow, Nvidia' GEForce Now, and various workarounds to use AWS or other cloud providers' general services as a makeshift remote gaming PC.[138] In this case, the cloud provider acts as an IT service provider to the gamer directly, who purchases game software and licenses from a distributor.

[137] Clarivate (2020) n 136.

[138] Akhribi (2020) n 67.

There are key differences between these three models because of the different nature of the business relationships between participating service providers. These differences include:

- **The amount of control** a developer/publisher has over how the system works.

- **Portability** of both user purchases and data.

- **The charging model and therefore pricing schemes.** Who takes on the role of distributor, and therefore collects the revenue cut for this contribution, will depend on which service model is employed. In the first model (layered) the developer/publisher pays for its use of the cloud provider's IaaS resources, typically on a pay-per-use basis. As distributor, the gaming company controls pricing for consumers and receives the full revenue. In the second model (cloud-provider-led), the cloud provider receives the revenue from the service, paying the developer/publisher a license fee and keeping a percentage of revenue for itself as a distribution fee. As distributor, the cloud provider controls pricing and may decide to offer the game as part of a subscription bundle. As a result, the developer/publisher may have little control over how much consumers pay to access their game. As a recent report on cloud gaming and IP put it: 'For game publishers, the shift to their content being provided on someone else's platform, via a subscription model to which they are a third party, represents a significant threat to revenue.'[139] In the third model, the cloud gaming company provides only infrastructure (and sometimes a platform) to end users and does not distribute content. Therefore, the Consumer IaaS model will not disrupt current digital games distribution systems.

- **Customer data sharing.** Gamer data represents a valuable resource for providers of cloud gaming services. Currently, gaming companies use customer data to improve gameplay experience,[140] to advertise upgraded membership options and

[139] Clarivate (2020) n 136.

[140] This can be everything from simply bug fixes to adjusting difficulties for gamer retention. For example, when King Games discovered that a large number of Candy Crush Saga players were quitting at level 65, it made that level easier and saw player retention rise. Alex Boutilier, 'Video game companies are collecting massive amounts of data about you' (*The Star*, 29 December 2015)

new games, and to drive in-game microtransactions. Raustiala and Sprigman further argue that access to data about consumer behavior allows streaming service operators like Amazon, Netflix, and Spotify to engage in 'data-driven creativity' – by using such data to drive decisions about what content to create, promote, and distribute. As they put it: '[t]he key, but underappreciated, feature of streaming is that as content flows out, data flows in. Enabled by fine-grained insights into consumer behavior, creators can increasingly tailor ads and even content to preferences. This is especially true for large firms, whose dominant role in content distribution gives them access to data that smaller rivals cannot replicate.'[141] However, who may access and make commercial use of gamer data will depend on the cloud service model used as well as the contractual arrangements between customer and provider and the need to comply with data protection laws.

It is too early to determine which of these models will prove most successful. In the video-on-demand market, layered SaaS on IaaS services, like Netflix and Disney+ on AWS, sit alongside vertically integrated cloud-provider-led services, like Amazon Prime Video. This suggests different GaaS models may co-exist, competing for market share.

In terms of who is best-placed to take advantage of this transition, we predict that the companies who have experience in every layer of the videogame technology stack will have an advantage. The ability to provide vertically-integrated gaming services is likely to facilitate the provision of services that best meet customer needs in the most economically efficient way.

The following table compares the starting point as of 2021 for seven companies likely to play a major role in cloud gaming. In particular, it illustrates the position of the four major companies that are currently positioned to provide services in every layer of the cloud gaming supply chain (Amazon, Google, Microsoft, Tencent). These are compared to NVIDIA, the only other cloud gaming provider operating a platform on top of its own server infrastructure, as well

https://www.thestar.com/news/canada/2015/12/29/how-much-data-are-video-games-collecting-about-you.html accessed 23 July 2021.

[141] Kal Raustiala and Christopher Jon Sprigman, 'The Second Digital Disruption: Streaming & the Dawn of Data-Driven Creativity' (2019) 94 New York University Law Review 1555.

as Sony and EA, to demonstrate the comparatively weak starting position of other videogame companies.

Company	Cloud Infra-structure	Videogame Hardware	Videogame Software Development	Videogame Software Distribution	Videogame Live- Streaming
Amazon	AWS	Luna controller, tablets, Fire Stick Smart TV Dongle	Amazon Games Studios	Luna	Twitch
Google	Google Cloud	Stadia controller, tablets, Chromebooks, Chromecast Smart TV		Google Stadia, Play Store	YouTube Gaming Live
Microsoft	Azure	Xbox, Surface Pro tablets and laptops	Xbox Games Studios, Zenimax (incl. Bethesda)	Xbox Game-store	Partnered with Facebook Gaming
Tencent	Tencent Cloud	Under development [142]	Riot games, Epic Games, Bluehole, Ubisoft (5%), Activision Blizzard (5%), Supercell	Tencent Start, WeGame	Trovo (beta testing)
Sony		PlayStation	Sony Inter-active Entertainment	PlayStation Store	
NVIDIA	GeForce Now data centres	GPUs			
EA			EA	Origin Store, Project Atlas	

This comparison suggests that, of the major cloud providers, Microsoft may be well-placed to offer GaaS-services, given its historic involvement in videogames through the Xbox consoles and Xbox Game Studios. In contrast, Amazon and Google are relative newcomers to videogame-specific hardware and software development but may be able to combine their experience in cloud with video-streaming services (Twitch and YouTube Gaming Live). For example, Google offers users who watch streams on YouTube

[142] Rebekah Valentine, 'Tencent partners with Razer for cloud gaming hardware, overseas expansion' (*Gamesindustry.biz,* 22 August 2019) https://www.gamesindustry.biz/articles/2019-08-22-tencent-partners-with-razer-for-cloud-gaming-hardware-overseas-expansion accessed 23 July 2021.

Gaming Live the ability to access the game they are watching on stream through its Stadia cloud platform via one click.[143] Microsoft previously owned the streaming platform Mixer, but it has recently shut down Mixer in order to focus on a partnership with Facebook Gaming instead.[144] Finally, Tencent is the world's largest public games publisher by revenue and has a growing cloud services business, with a large presence in China and plans to expand globally.[145]

While the ability to integrate vertically across the entire technological stack may prove beneficial, seamless service is useless without high-quality content. This suggests videogame companies like EA, with a history of creating high-quality games and a library of popular IP franchises, are also well-placed to take advantage of the transition to cloud gaming. They can choose to do so either by offering their own layered GaaS on a cloud provider's IaaS (like EA's Project Atlas on AWS), or by licensing their games through a cloud provider's GaaS Service (EA's FIFA launched on Google Stadia in 2021) – or both. In the short term, we predict that videogame companies will experiment with different models for different games.

In the meantime, the major cloud providers are investing in content creation. In March 2021, Microsoft completed its acquisition of ZeniMax Media, the parent company of Bethesda Softworks, bringing Bethesda's extremely popular library of gaming franchises to its Game Pass cloud service.[146] Previously, in April 2020, Microsoft had pulled its library of games from Nvidia's GeForce Now platform, a direct competitor in cloud gaming.[147] Amazon has also been

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[143] Tom Caswell, 'Google finally adds long-awaited YouTube integrations to Stadia,' (*DigitalTrends*, 14 July 2020) https://www.digitaltrends.com/gaming/google-stadia-finally-adds-youtube-integration/ accessed 23 July 2021.

[144] Tom Warren, 'Microsoft is shutting down Mixer and partnering with Facebook Gaming' (*The Verge*, 22 June 2020) https://www.theverge.com/2020/6/22/21299032/microsoft-mixer-closing-facebook-gaming-partnership-xcloud-features accessed 23 July 2021.

[145] NewZoo, 'Top 25 Public Companies by Game Revenues' https://newzoo.com/insights/rankings/top-25-companies-game-revenues/ accessed 29 July 2021.

[146] Phil Spencer, 'Officially Welcoming Bethesda to Team Xbox' (*Microsoft Xbox Wire*, 9 March 2020) https://news.xbox.com/en-us/2021/03/09/officially-welcoming-bethesda-to-the-xbox-family/ accessed 23 July 2021.

[147] Nick Statt, 'Nvidia's GeForce Now will lose access to titles from Xbox Game Studios and Warner Bros.' (*The Verge*, 20 April 2020)

acquiring games studios for years[148] and, despite a failed attempt at releasing a AAA game in 2020,[149] has recently released another.[150]

Ultimately, we predict that while the ability to offer an integrated service will facilitate early adoption, (exclusive) content will be the determinative factor in the later stages of consumer adoption. As cloud gaming technology matures, the main GaaS-services will likely become similar in terms of technological capabilities (as happened with the Xbox and PlayStation consoles). In that case, exclusive content may prove a key selling point. This suggests that software developers and publishers will maintain a strong position, since they can choose to either make their games available across all environments (including consoles, PC, and cloud GaaS), use their games to launch their own GaaS-services, or to negotiate favorable terms from cloud providers acting as GaaS-distributors.

2.4.3 Shaking up Software Distribution

At present, there are multiple companies within the gaming supply chain whose business models rely heavily on taking revenue cuts from game sales. In the mobile environment, Apple takes 30% from every sale on the app store, while Google takes 30% on its Play store.[151] In the PC environment, Steam takes up to 30% of the revenue for each piece of software sold on its platform (which may drop to as low as 20% for larger revenue games). The Epic Games Store is looking to displace Steam as the primary distributor in the

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https://www.theverge.com/2020/4/20/21228792/nvidia-geforce-now-microsoft-xbox-game-studios-warner-bros-remove-games accessed 23 July 2021.

[148] Amazon bought Double Helix Games in 2014. Sarah Perez and Colleen Taylor, 'Amazon Acquires Video Gaming Studio Double Helix Games,' (*TechCrunch,* 6 February 2014) https://techcrunch.com/2014/02/05/amazon-acquires-video-gaming-studio-double-helix-games/ accessed 23 July 2021.

[149] Jay Peters, 'Amazon has canceled Crucible, its free-to-play multiplayer shooter that had already been returned to closed beta' (*The Verge*, 9 October 2020) https://www.theverge.com/2020/10/9/21510190/amazon-crucible-canceled-game-studios-closed-beta accessed 23 July 2021.

[150] Daniel Van Boom, 'New World: What you need to know about Amazon's new MMO' (*Cnet*, 28 September 2021) https://www.cnet.com/news/new-world-what-you-need-to-know-about-amazons-new-mmo/ accessed 18 October 2021.

[151] Julia Alexander, 'A Guide to Platform Fees,' (*The Verge*, 22 September 2020) https://www.theverge.com/21445923/platform-fees-apps-games-business-marketplace-apple-google accessed 23 July 2021.

PC gaming software distribution market by taking a lower percentage (12%) of each game sold.[152]

In future, if videogames are distributed primarily through cloud-based virtual environments, such as web-browser-based access to games running on remote servers, that will present a challenge to companies who are used to collecting distribution fees based on their control of hardware environments based on local machines, such as mobile phones. In practice, Google may be well-placed to adapt to the transition to cloud gaming, with its Google Stadia service. Thus, the challenge will mainly apply to Apple.

In the mobile environment, the two dominant providers of mobile OS also act as distributors (Apple and Google), with their app marketplaces bundled with the OS. As a result, cloud-provider-led GaaS services may lead to conflicts between OS-operators and GaaS-game-distributors, since both companies will want to collect a distribution fee (typically around 20-30% of revenue). Indeed, such conflicts are already occurring. In 2020, Apple refused to allow cloud gaming apps on its app store, unless each individual game within the cloud platform was also put on the app store for sale.[153] In doing so, Apple was attempting to take its 30% cut from the sale of *every* game offered within the GaaS service, and not just the overall GaaS subscriptions purchased and renewed through its app store. This policy prevented any cloud providers from being able to offer their GaaS service to iOS users through the App Store. In September 2020, Amazon bypassed this requirement by launching its Luna+ cloud gaming service as a Progressive Web App ('PWA').[154] This type of app launches from an internet browser and does not need to be downloaded on the app store, thereby completely sidestepping Apple's rules. In December 2020, Google likewise made its Google Stadia service available on iOS devices through a web browser.[155]

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[152] Alexander (2020) n 151.

[153] Tom Warren, 'Microsoft snubs Apple's olive branch to cloud gaming: 'a bad experience for customers' (*The Verge*, 11 September 2020) https://www.theverge.com/2020/9/11/21433071/microsoft-apple-app-store-rules-xcloud-game-streaming-xbox-game-pass accessed 23 July 2021.

[154] Sean Hollister, 'Yes, Amazon Luna dodges Apple's cloud gaming rules- when will Nvidia and Google?' (*The Verge*, 25 September 2020) https://www.theverge.com/2020/9/25/21455343/amazon-luna-apple-app-store-rules-cloud-gaming-streaming-google-nvidia accessed 23 July 2021.

[155] Romain Dillet, 'Google Stadia is now available on iOS', (*TechCrunch,* 16 December 2020), https://techcrunch.com/2020/12/16/google-stadia-is-now-available-on-ios/ accessed 22 July 2021.

Conversely, in the PC environment, gamers are free to choose between a number of competing videogame distribution platforms, including Steam and the Epic Game Store (as discussed above). As a result, the emergence of GaaS-services will only lead to more competition in the short term. Nonetheless, if cloud gaming presents a superior consumer experience for PC gamers, then software distributors like Steam may need to offer GaaS-services as well, or risk becoming irrelevant. In that case, they will likely need to partner with a major IaaS provider for computing resources. However, for now, Valve has launched a pseudo-cloud gaming extension for its Steam customers. Its new Remote Play functionality allows users to access and play games on their home PC remotely through their Steam account on another PC or mobile device.[156] The system does not make use of cloud infrastructure. Instead of using a cloud server, the games are run on the user's home PC and are streamed to their device of choice.[157] This offers a cloud-like experience without the use of actual cloud infrastructure. Therefore, the quality of the service will directly correlate to the processing power of each user's relevant machines (as well as internet connection speeds).

2.5 Conclusions: Technology and Market Developments

In essence, cloud gaming is characterized by two major trends: dematerialization and intermediation. The traditional gaming environment is becoming dematerialized, as physical consoles are replaced with virtual machines running on remote cloud servers. These servers are operated by a new intermediary: the cloud service provider. What role(s) cloud service providers will play remains to be seen. In the 'Layered Model', cloud providers act mainly as providers of IT services to game companies, who serve gamers a GaaS service. In contrast, in the 'Integrated Model' cloud providers serve gamers a GaaS service directly, with gaming companies acting merely as content providers/licensors. In any event, this disruption will have significant commercial impacts, which we have highlighted in this section, as well as legal implications – which we turn to next.

3. Cloud Gaming: Legal Implications

In this section, we identify key areas of law and regulation that are likely to have an impact on, and potentially be affected by, a

[156] Steam, 'Remote Play' https://store.steampowered.com/remoteplay accessed 23 July 2021.

[157] Steam, (2021) n 156.

transition to cloud-based video games. Given the early stage of development and the broad range of potential implications, our analysis is not comprehensive. Instead, we introduce questions in each area which merit further research. We consider how each of these areas of the law may be affected by two elements of gaming's transition to cloud. First, we look at complications that may arise because of the differences between cloud-based access and traditional (non-cloud) access to games. Second, we consider how these legal consequences may differ depending on the model of cloud gaming service being utilized. Our legal analysis takes a global approach with a focus on the relevant legal concepts and refers to examples from legislation and case law in the United States, the European Union, and the United Kingdom to illustrate our points.

Above, we discussed three separate models that we foresee within the cloud gaming space.

1. The first model ('Layered Model') refers to 'layered SaaS on top of IaaS,' that is: where a gaming company builds a business-to-consumer ('B2C') gaming-as-as-service ('GaaS') offering on top of a cloud company's business-to-business ('B2B') infrastructure service.

2. The second model ('Integrated Model') is a B2C GaaS-service offered by a cloud company using its own internal hardware. In this case, the cloud company relies, at least in part, on licensed content from third-party game companies. As a subset of the integrated model, there is the 'Fully Integrated Model', whereby either (i) a gaming company builds out cloud infrastructure to support its B2C GaaS-service, or (ii) a cloud company develops its own game content to offer on a GaaS service. This model is vertically integrated in every layer of the stack, including copyright in the videogame.

3. The third model ('Consumer IaaS Model') refers to B2C services that provide only remote access to computing resources, such as in the form of a virtual machine ('VM') which gamers can control remotely via a thin client. In such cases, the consumer can use the VM to install video game software, using a license purchased elsewhere (also referred to as the 'bring your own license' or 'BYOL' model).

Below, we describe both complications and simplifications that may result from the introduction of cloud technologies in general, and the more nuanced differences within each model of GaaS. Section 3.1 covers intellectual property ('IP') issues. Many of the relevant IP

issues are not *new*. Yet by analyzing how the rights to control reproduction of copyright works and to communicate / make them available to the public apply to cloud gaming scenarios, we conclude that end users will no longer require a license to play games for certain cloud gaming services. We also touch on other IP issues related to trademark and patent, as well as cross-jurisdiction portability. These issues have largely been addressed already in the context of digital distribution, or solved by other similar entertainment industries such as video-on-demand ('VoD').

In Section 3.2, entitled 'contractual issues,' we discuss cloud gaming contracts and how they fit into the existing videogames contractual matrix, as well as user access arrangements for purchased cloud videogame content, consumer protection and liability issues. We find that end users are granted a similar, though in some situations more restrictive, bundle of rights and that cloud gaming will likely impact user perceptions of ownership for the games they purchase.

In Section 3.3 we address regulatory issues in the video game industry and how they apply to cloud gaming services. We predict that geo-blocking will be the tool of choice for cloud videogaming service providers as they seek to navigate unharmonized regulations, as is currently the case with digital distribution. We also analyze the structure of acceptable use policies for protection against harmful content and other unwanted behaviors. We address how these policies from each relevant party will interact in each of the three models and the implications of the addition of cloud providers as a new party in this ecosystem.

3.1 INTELLECTUAL PROPERTY LAW

3.1.1 INTRODUCTION

In this section, we consider issues that may arise under IP law in relation to each of the models for cloud gaming services we have identified. We focus specifically on copyright law. This is because, with respect to trademark, design, patent, and creative use of third-party IP (including personality/publicity/image rights), we see no *new* issues related to the adoption of cloud gaming technology that have not previously been addressed in the contexts of either digital distribution or VoD. For example, from a trademark perspective, the cloud does not raise any questions not already brought about by multi-territorial distribution of videogames. The common issues are registration, infringement, and limitations/exceptions. While these issues are still present in cloud-based distribution models, the

solutions already in use by the videogame industry (such as geo-blocking, localized versions, or taking the risk of infringement) will likely remain the same. The same could be argued with respect to design rights. Similarly, with patents, issues of gameplay, software patents, and infringement by remote distribution are unlikely to be modified by the transition to the cloud.[158]

Admittedly, under copyright law, many potential complications for cloud providers also have clear-cut solutions provided by their predecessors in digital distribution and VoD. For example, issues such as cross-jurisdiction accessibility and unharmonized rights across jurisdictions may be new to the videogame industry but have previously been addressed by VoD providers in a way that may be adopted seamlessly for cloud gaming.[159] Instead, we focus on the application of copyright's basic rights within a cloud context and argue that the adoption of cloud services may greatly simplify copyright arrangements in the gaming sector. To that end, we first outline the relevant rights, how they relate to cloud gaming business models, how application of these rights may be different according to the cloud gaming service model, and how the framework of licensing content will operate for all parties involved.

3.1.2 Gaming Copyright and Cloud-based Distribution

The legal nature of videogames is not harmonized at an international level. How they are protected differs per jurisdiction. For instance, in the US, videogames have been protected as both software (literary works) and audiovisual works under the dual-layer theory since the early 1980s.[160] In Europe, the scenario was substantially more complex with national courts approaching videogames as software, films, graphic, literary, or 'hybrid' works coupled with the often conflicting application of the Information Society directive and the *lex specialis* for computer programs (software directive)[161] until the

[158] See e.g. *GREE, Inc. v Supercell OY* (E.D. TX, 2021) ongoing.

[159] These problems have largely been resolved by geo-blocking and territorially-restricted content catalogues. We discuss these concepts in more depth in section 3.3.2, 'Regulating Across Jurisdictions.'

[160] Many of the early US court decisions on software copyright related to videogames. This is not surprising since the gaming sector was already of major commercial significance four decades ago. For an analysis of the case law see Christopher Millard, *Legal Protection of Computer Programs and Data* (Carswell / Sweet & Maxwell, 1985) 39-47.

[161] Directive 2001/29/EC of 22 May 2001 on the harmonisation of certain aspects of copyright and related rights in the information society (2001)

CJEU's clarification in *Nintendo v PC Box*.[162] The CJEU defined videogames as complex subject matter comprising of software and graphic and sound elements. This suggests that the CJEU considered each videogame to be a single complex work, although the consequences of the ruling are still to be fully explored.[163] Notwithstanding these complexities, when it comes to cloud gaming the principal rights involved are the WIPO right of making available and the right of reproduction.

Making Available

The WIPO Copyright Treaty created an umbrella solution to accommodate the different global approaches to making available.[164] In the EU, the right of making available has been incorporated into the EU Information Society ('InfoSoc') Directive as the exclusive right to communicate works to the public,[165] and subsequently into

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OJL 167 ('InfoSoc Directive'); Directive 2009/24/EC of 23 April 2009 on the legal protection of computer programs (2009) OJ L 111 ('Software Directive').

[162] CJEU, *Nintendo v PC Box* (2014) Case C-355/12, at [23]: 'videogames, such as those at issue in the main proceedings, constitute complex matter comprising not only a computer program but also graphic and sound elements, which, although encrypted in computer language, have a unique creative value which cannot be reduced to that encryption. In so far as the parts of a videogame, in this case, the graphic and sound elements, are part of its originality, they are protected, together with the entire work, by copyright in the context of the system established by Directive 2001/29.'

[163] CJEU, *Nintendo v PC Box* (2014) Case C-355/12, at [23]. In the literature, there is some discussion as to whether, following the CJEU's ruling, videogames should be seen as protected by only the InfoSoc Directive, or by the InfoSoc and Software Directives. See Alina Trapova and Emanuele Fava, 'Aren't we all exhausted already? EU copyright exhaustion and video game resales in the Games-as-a-Service era', (2020) IELR 1:1, 80-81; Tito Rendas, 'Lex Specialis(sima): Videogames and Technological Protection Measures in EU Copyright Law' (2015) 37(1) EIPR; Andy Ramos et al., 'The Legal Status of Video Games: Comparative Analysis in National Approaches' (2013), https://www.wipo.int/edocs/pubdocs/en/wipo_report_cr_vg.pdf accessed 23 July 2021.

[164] WIPO Copyright Treaty, Art. 8. See, generally: Gaetano Dimita, 'The Making Available Right' in: Torremans (ed), *Research Handbook on Copyright Law* (2nd edn, Edward Elgar, 2017).

[165] Directive 2001/29/EC of 22 May 2001 on the harmonisation of certain aspects of copyright and related rights in the information society, OJ L 167, art 3(1) ('Information Society Directive'). See also: Directive 2009/24/EC of the European Parliament and of the Council of 23 April

national laws.[166] This right covers all forms of communication where the public is not present at the place where the communication originates.[167] It includes two distinct forms of making works available, namely: (1) the right to broadcast the work to the public and (2) the right to make the work available from a place and at a time individually chosen by members of the public.[168] The US recognizes this same right through a combination of the Copyright Act's exclusive rights of distribution, public performance, and public display.[169] To simplify, we use the neutral term 'making available' when referring to this activity.

The right of reproduction grants authors exclusive control over where, when, and how their works are copied. The Berne Convention provides that "[a]uthors of literary and artistic works … shall have the exclusive right of authorizing the reproduction of these works, in any manner or form."[170] National copyright laws typically recognize a reproduction right in similar terms.[171]

2009 on the legal protection of computer programs, OJ L 111, art 4(1)(c). As videogames are often protected as composite works with some elements registered as computer programs, this directive will also apply.

[166] For example, in the UK the Right of Communication to the Public is covered in Section 20 of the Copyright, Designs and Patents Act of 1988.

[167] Directive 2001/29/EC of 22 May 2001 on the harmonisation of certain aspects of copyright and related rights in the information society, OJ L 167, Art 3(1) ('Information Society Directive').

[168] For example, the corresponding provision of the UK Copyright Act reads: 'Reference in this Part to communication to the public are to communication to the public by electronic transmission, and in relation to a work include (a) the broadcasting of the work; (b) the making available to the public of the work by electronic transmission in such a way that the members of the public may access it from a place and at a time individually chosen by them.' See Copyright, Designs and Patents Act 1988, s 20(2).

[169] US Copyright Office, 'The Making Available Right in The United States,' (Feb 2016) https://www.copyright.gov/docs/making_available/making-available-right.pdf accessed 23 July 2021; *Perfect 10, Inc. v. Amazon.com, Inc.*, 508 F.3d 1146, 1161 (9th Cir. 2007); Cheryl Foong, 'Making Copyright Content Available in the Cloud vs the Making of Copies: Revisiting Optus TV and Aereo,' (2015) 41 Monash U. L. REV. 583, 599.; Dimita (2017) n.164

[170] Berne Convention, 1971 Paris Text, Art. 9(1).

[171] Paul Goldstein and Bernt Hugenholtz, *International Copyright: Principles, Law, and Practice*, (OUP, 2010) 301; Copyright Designs and Patents Act 1988 s 16(1)(a).

The advent of cloud gaming will lead to significant disruption to established models for managing and monetizing these rights. First, GaaS-services within both the Layered and Integrated models implicate the right of making available (including communication to the public and distribution). The purpose of a GaaS-service is to make the videogame (a copyright-protected work) available to customers, that is: to allow an indeterminate number of people ('a public') remote access to a work.[172] The provider is therefore engaged in a communication to the public. The gamers are recipients of this communication – they do not themselves make the work available to others.

However, the same does not apply to the 'Consumer IaaS Model'. In this case, the provider merely gives the gamer remote access to a VM. The gamer then installs and runs the videogame software and the provider streams the audio-video feed back to the gamer. In doing so, the provider supports the gamer's remote access to the videogame and transmits the audio-visual elements. Yet it is unclear that this would constitute a communication to the public on behalf of the provider. First, there is no 'public' – only a single gamer would typically access the game on a VM.[173] Second, there is a question in the case of cloud services as to who is making the videogame available: the gamer or the provider? The CJEU recently ruled on a similar question relating to two cloud services: video-sharing service YouTube and storage service Uploaded.[174] In such cases, as the AG put it: 'the question is who — the user uploading the work concerned, the platform operator or both of them together — carries out that 'communication".[175]

The CJEU answered this question by stating plainly that it is, ordinarily, the users who carry out the act of communication to the public. Hosting-platforms 'used as an intermediary for making content available' may also make a communication to the public

[172] See e.g. CJEU, *Nederlands Uitgeversverbond and Groep Algemene Uitgevers v Tom Kabinet Internet BV et al* (2019) Case C-263/18 at [41-44, 63, 66] and case law cited there.

[173] Or possibly a small number of gamers, in the case of a multiplayer game – with several players playing on a single VM.

[174] CJEU, *Frank Peterson v Google, LLC and Elsevier Inc. v Cyando AG* (2021) Joined Cases C-682/18 and C-683/18 (hereafter 'Youtube and Cyando')

[175] AG Saugmandsgaard Øe, *YouTube and Cyando*, Joined Cases C-682/18 and C-683/18 (2020), at [62].

depending on how they intervene with the users' activity.[176] On determining the platform's role, the Court opined:

> "If the mere fact that the use of a platform is necessary in order for the public to be able actually to enjoy the work, or the fact that it merely facilitated the enjoyment of that work, automatically resulted in the intervention of the platform operator being classified as an 'act of communication', any 'provision of physical facilities for enabling or making a communication' would constitute such an act, which is, however, what recital 27 of the Copyright Directive […] expressly precludes.
>
> Accordingly, the importance of both the role that such intervention by the platform operator plays in the communication made by the platform user and of the deliberate nature of that intervention must guide the assessment of whether, given the specific context, that intervention must be classified as an act of communication."[177]

Accordingly, when it comes to infringing content: "the operator of a video-sharing platform or a file-hosting and -sharing platform, on which users can illegally make protected content available to the public, does not make a 'communication to the public' of that content […] unless it contributes, beyond merely making that platform available, to giving access to such content to the public in breach of copyright."[178] Courts must therefore consider on a case-by-case basis whether the hosting platform intervenes in such a way that the intervention may be considered a communication. The CJEU offers a set of factors for courts to consider when making this determination. These factors include whether the operator (i) participates in selecting protected content, provides tools specifically intended for the illegal sharing of such content, or knowingly promotes such sharing; (ii) had specific knowledge of protected content available illegally on its platform and refrained from expeditiously deleting it or blocking access to it; or (iii) had general knowledge of protected content available illegally on its platform, but failed to put in place appropriate technical measures to counter such infringement.[179] This

[176] *YouTube and Cyando,* n 174 at [75].

[177] *YouTube and Cyando,* n 174 at [79, 80].

[178] *YouTube and Cyando,* n 174 at [102].

[179] *YouTube and Cyando,* n 174 at [84, 103].

ruling is consistent with the AG's Opinion in *VCAST*, as discussed below.[180]

In the consumer IaaS context, this would mean that, absent sufficient intervention, the gamer, rather than the provider, should be considered as carrying out the communication. This approach is also supported by the WIPO Records of the Diplomatic Conference on Certain Copyright and Neighboring Rights Questions which led up to the 1999 WIPO treaty. These conference documents state that the mere provision of computing resources or infrastructure is not enough to trigger the right of making available.[181]

The US Supreme Court followed a similar logic in *American Broadcasting v. Aereo, Inc.* holding that "Aereo is not *simply an equipment provider*. Rather, Aereo, and not just its subscribers, 'perform[s]' (or 'transmit[s]')."[182] In this case, Aereo built a business around receiving and retransmitting television broadcasts to its users over the internet. It did so without a license. While this case sets an example of the kind of technological function that *will* constitute a public performance in an audiovisual work, there are important takeaways about what factors contributed to that finding. First, the Court relied heavily on the notion that Aereo, itself, performs, and does not simply provide the equipment for end users to do so.[183] Second, the Court noted that the relationship between the recipients and the transmitted work was also important in determining whether the recipients constituted a public. The fact that there was no evidence that the recipients were 'owners or possessors of the underlying works' supported the finding that they constituted a public. The Court concluded that:

> "an entity that transmits a performance to individuals in their capacities as owners or possessors does not perform to 'the public,' whereas an entity like Aereo that transmits to large

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[180] AG Spzunar, *VCAST Limited v RTI SpA* (2017) Case C-265/16 at [25].

[181] 'What counts is the initial act of making the work available, not the mere provision of server space, communication connections, or facilities for the carriage and routing of signals.' International Bureau of WIPO, 'Records of the Diplomatic Conference on Certain Copyright and Neighboring Rights Questions' (WIPO Publication No 348 (E), Geneva, December 1999) 204, cited in Mihily Ficsor, *The Law of Copyright and the Internet: The 1996 WIPO Treaties, their Interpretation and Implementation* (OUP, 2002) 243.

[182] *American Broadcasting v Aereo, Inc.* 134 S. Ct. 2498, 2507 (2014) emphasis added.

[183] *American Broadcasting v Aereo, Inc.* (2014) n 182 at 2506-7.

> numbers of paying subscribers who lack any prior relationship to the works does so perform."[184]

In Consumer IaaS models, the cloud gaming service provider likely only supplies the equipment, in the form of virtual computing infrastructure, for end users to perform the works. Moreover, all recipients of the transmissions in a Consumer IaaS gaming context should already have a copyright license from the relevant game developer/publisher which would distinguish them from the 'public' found in Aereo.

Reproduction

The right of reproduction is implicated whenever a copy of a game is made. Identifying relevant acts of copying was fairly straightforward in the past, when gamers played videogames on local devices. For example, a gamer might install the videogame software on their PC, thereby creating a copy on their local device. Doing so typically required a license. However, the transition to cloud gaming raises both complications and simplifications to the existing paradigm

When the GaaS-provider installs copies of the videogame on its servers, it engages in a relevant act of copying. But what about the gamer who uses the GaaS service? They do not install a copy of the software code of the videogame on their local device. As a result, they do not copy the computer program as a protected work. Instead, they only receive a 'livestream'[185] or temporary copy of the audiovisual elements of the game. These elements may be protected as copyright works in themselves. However, the transient copy made on the gamer's local device should fall under exceptions to the right of reproduction for 'transient or incidental' copies which are part of a technological process.[186] For example, the CJEU has held that this

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[184] *American Broadcasting v Aereo, Inc.* (2014) n 182 at 2510.

[185] Alain Strowel defines a stream as: 'From a technical point of view, streaming content is stored temporarily in the cache (or 'buffer') of the user's terminal device. The data is overwritten while the user is listening or watching. When consumption is complete, the data is no longer available on the terminal device and the user cannot store the content permanently.' Alain Strowel, 'Private Copying Levies do not Apply in the Case of Streaming' (31 March 2020) https://www.bitkom.org/sites/default/files/2020-04/expert-opinion_streaming-and-private-copying-levies_strowel.pdf accessed 22 July 2021.

[186] See Art. 5(1) InfoSoc Directive: "Temporary acts of reproduction … which are transient or incidental and an integral and essential part of a technological process and whose sole purpose is to enable: (a) a

exemption applies to the on-screen copies and cache copies made by an end user on their local device when viewing a website.[187] We would argue that the same reasoning applies by analogy to the gamer's transient copying when using a GaaS service. In an analysis of the application of this provision to music and film streams, Strowel concluded that a stream does not involve the making of an infringing reproduction.[188] Strowel noted that, with regard to streams, "their duration is limited to what is necessary for the proper completion of the technological process (streaming), the deletion is automatic at the end of the process and it happens without human intervention."[189] This reasoning can be applied directly to a game stream as the technological process is similar and suggests that, in the case of GaaS services, while the provider engages in acts of reproduction, the gamer does not.

The above analysis applies to two of the three models we set out above, namely the 'Layered Model' and the 'Integrated Model' of GaaS services. The situation is more complicated for the third, 'Consumer IaaS' model. In that case, the cloud provider merely gives the consumer remote access to a VM, on which the consumer can install any software they like on a BYOL basis. In this model, the consumer installs a copy of the videogame software on the remote machine. This is functionally similar to installing the game on a local device. As a result, the gamer arguably engages in a relevant act of copying. But what about the IaaS cloud provider? Similar to the 'making available analysis' above, it could be argued that the cloud provider does not itself engage in 'copying', but only passively makes a remote machine available to the gamer, who engages in the act of

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transmission in a network between third parties by an intermediary, or (b) a lawful use of a work or other subject matter to be made, and which have no independent economic significance". See also: §512(b) of the DMCA for a similar exception in the United States.

[187] CJEU, *Public Relations Consultants Association v Newspaper Licensing Agency* (2014) Case C-360/13, at [63]: "Article 5 of Directive 2001/29 must be interpreted as meaning that the on-screen copies and the cached copies made by an end-user in the course of viewing a website satisfy the conditions that those copies must be temporary, that they must be transient or incidental in nature and that they must constitute an integral and essential part of a technological process, as well as the conditions laid down in Article 5(5) of that directive, and that they may therefore be made without the authorisation of the copyright holders."

[188] Strowell, n 185.

[189] Strowell, n 185.

copying. Indeed, the IaaS provider may have no idea as to how the customer is using the VM.[190]

This is an area of uncertainty. The AG Opinion in *VCAST v RTI* suggested that it is the user, not the provider, who engages in the act of copying. In that case, the AG opined that the exception to the reproduction right for private copying should apply to copies of works stored in the cloud. He argued that it is 'the user who takes the initiative in respect of the reproduction'.[191] In the end, the CJEU did not explicitly follow the AG's opinion in this respect (but decided the case on other grounds).[192] Nonetheless, Quintas and Rendas argue that, with cloud services, the question of 'who is making the copy: the user or the service provider' depends on the details of the service in question, and particularly whether the user 'takes the initiative' in creating the copy.[193] Some US case law further indicates that, generally speaking, the act of providing only computing resources is not enough to implicate the right of reproduction.[194] This

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[190] We have referred to this elsewhere in the context of data protection as the 'cloud of unknowing', see W. Kuan Hon, C. Millard, and I. Walden, The Problem of 'Personal Data' in Cloud Computing - What Information is Regulated? The Cloud of Unknowing, Part 1' (2011) International Data Privacy Law 1 (4): 211-228.

[191] AG Spzunar, *VCAST Limited v RTI SpA* (2017) Case C-265/16 at [25]: "It is clear that the reproduction of a work […] and its recording in the cloud […] requires the intervention of a third party, whether the provider of that storage space or another person. The initialisation of the reproduction by the user triggers a number of processes, which are more or less automated, resulting in the creation of a copy of the work in question. I do not think that this form of reproduction should be excluded from the scope of the private copying exception simply by reason of the intervention of a third party which goes beyond simply making available media or equipment. As long as it is the user who takes the initiative in respect of the reproduction and defines its object and modalities, I cannot see a decisive difference between such an act and a reproduction made by the same user with the aid of equipment which he controls directly."

[192] CJEU, *VCAST Limited v RTI SpA* (2017) Case C-265/16. See further João Quintas and Tito Rendas, 'EU Copyright Law and the Cloud: VCAST and the Intersection of Private Copying and Communication to the Public' JIPLP 13:9 (2018).

[193] Quintas and Rendas (2018) n 192, at 9.

[194] 'Something more must be shown than mere ownership of a machine used by others to make illegal copies. There must be actual infringing conduct with a nexus sufficiently close and causal to the illegal copying that one could conclude that the machine owner himself trespassed on the exclusive domain of the copyright owner.' US Court of Appeals for the Fourth Circuit, *CoStar Group Inc v LoopNet Inc*. 373 F 3d 544 at 550 (4th Cir, 2004).

would suggest that, in the case of consumer IaaS services, the gamer engages in acts of reproduction, while the provider does not.

Yet in practice, providers of IaaS services typically require customers to grant a sub-license for the content they intend to store on the cloud servers in their terms of service ('ToS').[195] This is often accompanied by a clause indemnifying the cloud provider for any damages from third-party lawsuits based on IP infringements relating to customer content.[196] Such clauses suggest that IaaS providers see themselves as making reproductions of customer content. If providers did not engage in acts restricted to the copyright-holder (such as copying), they would not need such licenses.[197]

In sum, the above analysis suggests that in the case of GaaS services (such as the 'Layered' and 'Integrated' models), the provider engages in acts of reproduction, while the gamer does not. Conversely, in the case of consumer IaaS services, the gamer engages in acts of reproduction. It is unclear whether the provider does as well. The application of the rights of making available to the public and reproduction determines which actions in the cloud gaming technical process require a license from the rightsholder, and who should be responsible for obtaining the license. The next sections explore what this means for licensing requirements for both cloud gaming providers and customers.

3.1.3 Copyright Licensing : Providers' Perspectives

Layered and Integrated Models

In our view, a GaaS-provider both (i) reproduces the work on cloud servers and (ii) makes the work available to the public. As a result, the GaaS-provider would typically need a license to perform both of these activities. However, licensing requirements differ between the 'Layered' and the 'Integrated' models. In the Layered model, a gaming company builds a GaaS service on top of a cloud company's IaaS. The gaming company owns the copyright in its own

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[195] Johan David Michels, Christopher Millard, and Felicity Turnton, 'Contracts for Clouds Revisited: An Analysis of the Standard Contracts for 40 Cloud Computing Services' (2020), Queen Mary School of Law Legal Studies Research Paper No. 334/2020, Available at SSRN: https://ssrn.com/abstract=3624712, 59-62.

[196] Michels, Millard, and Turton (2020) n 195.

[197] Alternatively, given the legal uncertainty around 'who is copying', providers may simply be using their ToS to obtain licences from customers out of an abundance of caution.

videogames. If the gaming company also wanted to offer third-party videogame content through its GaaS-service, it would need to secure licenses from the right-holders to reproduce the videogame on the cloud servers and communicate it to users. In this model, it is unclear whether the cloud company offering an IaaS service would need a license as well. As argued above, the cloud provider does not 'take the initiative' to copy the videogame or make it available, but merely provides passive access to remote computing resources. As a result, the cloud company arguably does not need a license to communicate the work to the public as it is solely acting as a provider of infrastructure without any other significant intervention.[198] In any event, since the gaming company contracts directly with the cloud provider for use of its service, this contract will likely include copyright license terms. As noted above, cloud providers typically include such licensing arrangements for customer content as part of their standard ToS.

In the Integrated model, the cloud provider itself actively reproduces the videogame on its servers and makes it available to the public. In that case, the cloud provider clearly needs a license from the relevant right-holder (probably the publisher/developer). Alternatively, in the 'Fully Integrated Model', the cloud company offers a GaaS service using its own videogames, created in-house. In that case, depending on the corporate structure, the license matrix is simplified or even unnecessary, since the cloud provider takes on all three roles of the developer/publisher, the IaaS-operator, and the B2C GaaS-provider.[199]

Consumer IaaS Model

In our view, in the 'Consumer IaaS' model, the gamer actively reproduces the videogame, while the provider merely provides passive access to computing resources. Therefore users, not providers, would be responsible for securing appropriate licenses to access and store content.

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[198] *YouTube and Cyando*, n 174.

[199] This is a simplification since, in practice, as noted above, a videogame is a composite work made of different copyright-protected elements. The copyright in some of these elements may be owned by a third-party (such as, for instance, the music used in a game). In that case, the gaming company would have negotiated licences with the third-party right-holder to include the element in the game. There may be a question as to whether those licences allow the gaming company to store and distribute such elements through a cloud service. This would depend on the terms of those licensing agreements.

3.1.4 COPYRIGHT LICENSING : USERS' PERSPECTIVES

Layered and Integrated Models

In our view, in both the 'Layered' and 'Integrated' models, the gamer neither reproduces, nor communicates the game to the public. Instead, they are the recipient of a communication to the public. As Hugenholtz puts it: "[T]he mere reception or consumption of information by end-users has traditionally remained outside the scope of the copyright monopoly."[200] As a result, the gamer arguably does not need a copyright license at all. Tollen similarly argued with regard to SaaS generally, that customers do not need licenses, since SaaS customers do not copy software. Instead, as recipients of a service, they need service contracts which give them a right to access the provider's service.[201] This notion that end users, even when purchasing a videogame, do not need a license to play, is a fundamental shift in the application of copyright law to the gaming industry.

Yet this analysis differs from industry practice. Although in our view GaaS customers *do not need* a copyright license to access the videogames they play on a GaaS service, the industry currently acts as if they do. For example, in its EULA, Stadia states: 'The Content is licensed to you, not sold. Publisher grants you a limited, non-exclusive license to access and use the Content for which you have an entitlement for your personal, non-commercial use through Stadia.'[202] In our view, it would be more accurate to phrase such a right as a contractual right of access, than a copyright license. This would mirror the terms of video-streaming service Netflix, which

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[200] Bernt Hugenholtz, 'Caching and Copyright: The right of temporary copying' (2000) EIPR 22:10, 498.

[201] David Tollen, 'Don't Use License Agreements for Software-as-a-Service' (*TechContracts*, 1 June 2018) https://www.techcontracts.com/2018/06/01/dont-use-licenses-saas-contracts/ accessed 23 July 2021.

[202] Google, 'Stadia End User License Agreement for Content' (Google, 5 November 2019) https://support.google.com/product-documentation/answer/9567087?hl=en accessed 23 July 2021. Similarly, Amazon's ToS for its Luna service state: 'If the Digital Content does not include a Publisher EULA that specifies Digital Content license rights, Publisher grants you a limited, nontransferable license to access the Digital Content only for your personal and noncommercial purposes.' Amazon, 'Amazon Luna Terms of Use' (Amazon, 16 October 2020) https://www.amazon.com/gp/help/customer/display.html?nodeId=G5FYRVVJK7KFGQQN accessed 23 July 2021.

refer to a 'right to access the Netflix service'.[203] Using the copyright licensing terminology for GaaS services is somewhat confusing. That said, it's not immediately apparent that there are direct legal consequences to using either 'licensing' or 'service contract' terminology in the ToS. This might be a good area for further research. Moreover, it is highly unlikely that we will see complete abandonment of licensing systems for GaaS models as these licenses are used to govern other aspects of the videogame experience beyond access to the game. End user license agreements ('EULAs') are commonly used to impose community norms (such as cheating and harmful conduct standards), address virtual property rights, outline guidelines for player privacy, and govern rules for derivative content, esports and competitive gaming. These are all important to the gaming industry and its players but cannot be addressed adequately by the cloud gaming service provider alone. Thus, end user contracts will likely continue to be utilized as a tool of governance by game developers and publishers, whether phrased as EULAs or as service contracts.

Consumer IaaS Model

In our view, the user is required to obtain an appropriate software license to play a videogame using a Consumer IaaS service. The notion of 'appropriate' raises the question: is this kind of use covered by existing videogame licenses offered to end users? For example, if a gamer has already purchased a license to play a videogame on their PC through a digital distributor, would this license also allow them to play that game in the cloud via a 'Consumer IaaS' service? Existing licenses would ordinarily cover the user installing the videogame on their own local device. Using a 'Consumer IaaS' service is functionally similar to the gamer installing the videogame on a local physical device they have rented, an action that would be permitted by existing end user licenses. The difference is merely that the rented machine is virtual, rather than physical, and is accessed remotely over the internet, instead of being in the gamer's possession. This would suggest that an existing license could theoretically also cover use of the videogame on a 'Consumer IaaS' service.

However, in practice, some game companies have explicit license terms that rule out the use of cloud computing to access purchased games. For example, Blizzard's standard ToS forbids users from accessing its software "in connection with any unauthorized

[203] 'During your Netflix membership we grant you a limited, non-exclusive, non-transferable right to access the Netflix service and view Netflix content.' Netflix, 'Terms of Use,' section 4.2 https://help.netflix.com/legal/termsofuse accessed 23 July 2021.

third-party 'cloud computing' services, 'cloud gaming' services, or any software or service designed to enable the unauthorized streaming or transmission of Game content from a third-party server to any device."[204] In such cases, the license would not cover use of the videogame on a 'Consumer IaaS' service.

In theory, consumers could try to challenge such restrictive copyright licensing terms under consumer protection law, for instance by arguing that they constitute 'unfair terms'. However, there may be good reasons for game companies to prohibit such behavior. For example, allowing gamers to use 'Consumer IaaS' services could facilitate game sharing that undermines copyright protections. Sharing a physical device among friends is cumbersome. Yet these physical limitations do not apply when the machine is virtual. Even though videogames stored on a VM would only be accessible to one gamer at a time, multiple gamers could share a single 'Consumer IaaS' account and use it at different times. This would harm the copyright owner's potential to economically exploit its work. Nonetheless, this concern must be balanced against the benefits to consumers in accessing videogames via technologically innovative and economically more efficient means.

3.1.5 Cross-border Content Portability

As discussed above, GaaS providers need to obtain a license to make videogames available to their customers. However, such licenses typically come with territorial restrictions, for instance to make the game available in a particular jurisdiction, such as the US. What, then, happens when an American subscriber travels to Italy for a vacation and wants to access her cloud gaming library from her hotel? The copyright-protected works will now be communicated in Italy and such communication will require a separate license than that required to make the work available in the US.

This issue is partially solved for EU citizens travelling within the EU by Regulation 2017/1128 on Cross-Border Portability of Online Content Services. This regulation applies to portable online content services offering content such as music, games, films, entertainment programs, or sports events and requires that EU users

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[204] Blizzard, 'Blizzard End User License Agreement' (Blizzard, 9 October 2020) https://www.blizzard.com/en-gb/legal/fba4d00f-c7e4-4883-b8b9-1b4500a402ea/blizzard-end-user-license-agreement accessed 23 July 2021. Activision Blizzard provides in its software terms of service that users agree they will not '(5) use the Program in a network, multi-user arrangement, or remote access arrangement, including any online use except as included in the Program functionality.'

have access to the same content through these services that they would in their state of residence while temporarily traveling in any other Member State.[205] The Regulation simplifies this requirement by treating any relevant content transmissions, for legal purposes, as though they occur in the user's Member State of *residence*, not the Member State in which the user is located temporarily.[206] This removes the requirement for the provider to secure a new license to communicate the relevant works in a new jurisdiction.

While Europe has simplified portability for its single market, elsewhere issues may still arise regarding access to cloud gaming services by travelling customers. Cloud gaming service providers appear to be trying to negotiate licenses that allow users to access their videogames while travelling, though cannot guarantee that all purchased content will be but everywhere.[207] This issue is likely most efficiently addressed internally by such licensing arrangements, as previously done by VoD providers such as Netflix, rather than through legislation or treaty.[208]

3.1.6 Interim Conclusions

This section has established three main points. First, copyright analyses are potentially greatly simplified for GaaS services as the right of reproduction is no longer implicated for end users and no license is actually required. Second, the Consumer IaaS model operates on tenuous legal grounds, since it is unclear whether gamers have the right to copy and run games on remote servers, and videogame companies may seek to void it in future as a viable model altogether via license restrictions. Third, while content portability will be an issue, it is best solved by B2B IP licensing arrangements similar to those of VoD providers.

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[205] Regulation 2017/1128/EU 14 June 2017 on cross-border portability of online content services in the internal market, OJ L 168, 30.6.2017 ('Regulation on cross-border portability').

[206] Regulation on cross-border portability n 205 Art. 4.

[207] Stadia, 'FAQ,' https://support.google.com/stadia/answer/9338946?hl=en-GB 23 July 2021: 'Is Stadia region-locked, or can I access Stadia in any of the countries where it's available? We strive to make all games available in countries where Stadia is available. In some cases, publishers may elect not to make their games available in all countries.'

[208] Netflix explains how it licenses content for various regions here: Netflix, 'Help Center,' https://help.netflix.com/en/node/4976 accessed 23 July 2021.

There are also other copyright implications created by the cloud that merit further research. For example, the modding[209] community may suffer because, without any end user copies of the videogame code, modding will become impossible (unless cloud gaming providers support the practice). Second, the preservation of videogames becomes largely reliant on cloud providers, since no copies are stored on gamers' physical carriers nor are any physical copies distributed to end users. Finally, this new paradigm shift also has important implications when considering the rights in works included within a videogame (i.e. music) when the videogame is streamed/communicated to the public. Determining which party is responsible for obtaining the relevant licenses and the best way to do so on a global scale will be important considerations in the future. These issues, among others, merit further research.

3.2 CONTRACTUAL ISSUES

3.2.1 INTRODUCTION

This section analyzes various issues that are generally governed by contracts in the videogame industry. These include both issues arising in B2B contracts as well as those between developers, publishers, distributors, platforms, service providers, and end users in the form of EULAs and ToS.[210]

With the deployment of cloud services, a new player, the cloud gaming service provider, is inserted into an already complex contractual matrix. With the exception of the third model ('Consumer IaaS Model'), where the cloud gaming provider represents an extra player with a direct relationship with the gamer, the cloud gaming service provider will supplant, overlap with, or build upon two pre-

[209] 'Modding' refers to an amateur practice of modifying a videogame's code to alter the way the game plays. This can result in simple adjustments to the game's graphics, such as replacing enemy characters in a game with the Teletubbies, or drastic changes to the way a game is played. See: Rafi Letzer, 'Online communities are changing video games to make them better, weirder, and much more wonderful' (*Business Insider*, 20 July 2015) https://www.businessinsider.com/video-game-modding-2015-7?r=US&IR=T accessed 29 July 2021; Leonard Manson, 'Resident Evil 8 Village Mod Turns Teletubbies into Enemies' (*Somag News*, 24 May 2021) https://www.somagnews.com/resident-evil-8-village-mod-turns-teletubbies-into-enemies/ accessed 29 July 2021.

[210] See generally: David Greenspan and Gaetano Dimita, *Mastering the Game* (2nd edn, WIPO, forthcoming); Gregory Boyd, Brian Pyne, and Sean Kane, *Video Game Law* (Routledge, 2019).

existing roles in the videogame industry, namely those of digital distributors and console providers.

This section has two goals. First, we examine which of these roles will most likely form the mold for the cloud gaming service provider's responsibilities. Second, we analyze the implications of cloud gaming services on contractual offerings to end users. We focus on how the cloud will impact rights of access to purchased videogames and add-on content. We find that the actual bundle of rights offered to gamers changes only slightly in a cloud gaming environment compared to traditional digital distribution. However, gamers' perceptions and understanding (or 'misunderstanding') of their 'rights' are likely to evolve because of the increased detachment created by the way rights of access to videogames are offered and rights to terminate access are reserved.

3.2.2 Business to Business Contracts

The major contractual issues in business to business ('B2B') contexts are data protection roles and responsibilities, business terms, technical responsibilities, and issues of regulatory compliance, which are discussed in section 3.3 below.

'Data protection agreements' define the roles and responsibilities of varies parties in relation to the control, storage, and use of personal data. Allocating who has access to which types of data is important both from a business perspective, as customer data is a valuable asset, and from a legal perspective, since data protection law governs (inter alia) how personal data may be used, shared, and stored. These terms will likely resemble those of cloud privacy policies more generally.[211]

'Business terms' include revenue sharing agreements, marketing terms, statements and audits as well as rights of termination. With respect to contracts between cloud gaming service providers and developers/publishers, these terms may resemble those for digital distribution contracts.[212] Further, the terms of contracts between cloud infrastructure providers and cloud gaming

[211] Felicity Turton, Dimitra Kamarinou, Johan David Michels, and Christopher Millard, 'Privacy in the Clouds, Revisited: An Analysis of the Privacy Policies of 40 Cloud Computing Services' (2021) Queen Mary Law Research Paper No. 354/2021, https://ssrn.com/abstract=3823424.

[212] For an in-depth analysis of how these contracts work in a digital distribution context see: Greenspan and Dimita (forthcoming), n210.

service providers will likely resemble the terms of cloud contracts more generally.[213]

'Technical responsibilities' are a larger umbrella of responsibilities allocated to publishers, developers, and the service provider associated with maintaining the technical functionalities of gameplay. This may include things like service guarantees, delivery of materials, continuing obligations, and game patching responsibilities.[214] Generally speaking, parties will need to determine and define the relevant responsibilities and liabilities as well as to provide adequate support to customers when things go wrong. Many such B2B contracts between videogame companies and cloud service providers will not be in the public domain but would make an interesting area for further research based on interviews with industry participants.[215]

3.2.3 Business to Consumer Contracts

Video games are complex works that, in the case of digital distribution, are, legally speaking, licensed to end users, not sold. Under English property law, a digital copy of a videogame does not itself qualify as an object of property. Therefore, videogames are not 'owned' by those who purchase them and end users are generally unable to claim any property rights in the games they buy. In contrast, for videogames sold on physical carriers (such as discs or cartridges), the user will have a property right in the physical carrier which will, to a degree, extend to its contents.[216] Despite the fact that the videogame embedded in the physical carrier is still considered to be licensed, not owned, owners of games on discs or cartridges have certain property rights (such as the right to resell their games) that owners of purely digital games do not have.[217] When videogames are purchased in a purely digital format, regardless of whether they are

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[213] Johan David Michels, Christopher Millard, and Felicity Turton, 'Standard Contracts for Cloud Services' and W Kuan Hon, Christopher Millard, Ian Walden, and Conor Ward, 'Negotiated Contracts for Cloud Services', both in Christopher Millard (ed) *Cloud Computing Law* (2nd edn OUP 2021).

[214] Greenspan and Dimita (forthcoming), n 210.

[215] For literature on existing videogame industry contracts, see: Greenspan and Dimita, (forthcoming) n 210 and Boyd, Pyne, and Kane (2019) n 210.

[216] Johan David Michels and Christopher Millard, 'Mind the Gap: The Status of Digital Files Under Property Law' (2019), Queen Mary School of Law Legal Studies Research Paper No. 317/2019 https://ssrn.com/abstract=3387400, 7.

[217] See the discussion on digital exhaustion in n 96.

downloaded directly to the user's hard drive or accessed from a cloud gaming service provider, the content is licensed, not sold, to the end user.[218]

From one perspective, the transition to a cloud-based system of delivery or access to video games will not change this licensing/ownership paradigm. However, the impact that cloud computing has on the delivery of videogames, particularly the streaming to end users of audio-visual elements, may affect the way end users access the games they purchase. As GaaS services do not require end users to obtain licenses for the games they play, service contracts and rights of access may replace licensing as the tools to govern rights of access for this sort of digital content. When analyzed through the lens of 'ownership' of the videogame, the introduction of cloud elements will not feel like a change in most ways from the end user perspective. All property rights in videogames will continue to be retained by the publisher. End users purchasing a game will either be granted a license or a service contract. However, depending on the service model, the shift to cloud-based delivery services for game content may result in further detachment for end users from any semblance of ownership that they may associate with their digital purchases. This is because, first, in most cloud gaming service models all purchases made will be locked to a single GaaS provider. While this non-transferability of content replicates existing behavior in the console environment, there are certain aspects of the cloud gaming business model that result in a more constricted bundle of rights for users, as discussed below.

Cloud gaming models and access rights

When comparing the three models of cloud gaming services, there are some key differences in how users' rights to purchased content may be affected. The critical distinction here is from whom the end user is obtaining a license or a contractual right of access. In the Layered model, the user contracts with a game company for a GaaS-service, built on top of a cloud provider's IaaS service. In that case, the user will likely be licensing content directly from the IP right-holder.

In the Integrated model, the user will contract with a cloud provider for a GaaS-service. The cloud provider will negotiate licensing

[218] The terms of the license are typically covered in an End User License Agreement ('EULA'). An example of the EULA for the widely popular game Fortnite states: 'The Software is licensed, not sold, to you under the License. The License does not grant you any title or ownership in the Software.' Epic Games, 'Fortnite End User License Agreement,' https://www.epicgames.com/fortnite/en-US/eula accessed 22 July 2021.

arrangements with game companies (as IP right-holders). As a result, the end user would receive either a sub-license from the cloud provider or a contractual right of access, which will rely on the arrangements between the cloud provider and the game company. As a result, end user rights are inextricably tied to the relationship between the cloud provider and the game publisher. If the latter relationship breaks down, the user would no longer be able to access the game via the cloud service. In that case, the end user may be entitled to a refund for purchased content from the cloud provider under consumer protection law[219] – but would no longer have a valid right to play the game, whether via the cloud service or elsewhere. In addition, they might lose any saved game data they had stored on the cloud service.

Admittedly, the above would not directly apply to BYOL cloud services like Nvidia's GeForce Now. Nvidia does not act as a games distributor, but has instead formed a partnership with the existing market leaders in digital games distribution to allow its subscribers to access games purchased from these marketplaces on its cloud service.[220] Thus, end users secure licenses from the IP right-holder directly.[221] In that case, users are free to continue to play the games they have purchased on their PCs (or even potentially on other cloud services) outside of their GeForce Now subscription. Nonetheless, even in this model, users depend on Nvidia's relationship with game developers/publishers to play their games through the GeForce Now service. For example, in early 2020, a wave of AAA and indie developers began pulling their content from Geforce Now.[222] As a result, any end users who had purchased licenses with the aim of playing those games specifically through the GeForce Now service can no longer play them – and ended up with 'stranded licenses'. The

[219] See: Directive (EU) 2019/770 of the European Parliament and of the Council of 20 May 2019 on certain aspects concerning contracts for the supply of digital content and digital services, OJ L 136, art 10.

[220] GeForce Now has partnerships with Steam, Epic Games Store, Uplay, and GOG. For a full list of the games it currently supports and the associated distributors see: Nvidia, 'Your Games. Play them Anywhere,' https://www.nvidia.com/en-gb/geforce-now/games/ accessed 23 July 2021.

[221] 'With a GFN membership plan, NVIDIA is renting you a virtual PC for gaming, and it is your responsibility to have sufficient rights to use the content (i.e. third-party video games or DLC (downloadable content)).' Nvidia, 'Membership Terms,' https://www.nvidia.com/en-gb/geforce-now/membership-terms/ accessed 23 July 2021.

[222] Nick Statt, 'Nvidia's GeForce Now is becoming an important test for the future of cloud gaming,' (The Verge, 2 March 2020) https://www.theverge.com/2020/3/2/21161469/nvidia-geforce-now-cloud-gaming-service-developers-controversy-licensing accessed 23 July 2021.

problem is that it is unclear whether traditional end user licensing arrangements for digital games provide for the legal rights required to access them in the way GeForce Now offers.[223] Nvidia's service not only requires a partnership with digital distributors to facilitate access to content, but also necessitates additional licenses outside of the scope of the ones typically offered by these distributors for each piece of content it intends to make available. As publishers may be keen to continue exploiting the current model that requires users to repurchase any games they want to play in a new environment or on a new platform, Nvidia or any competitors offering similar services may struggle to secure appropriate licenses for a competitive library of games.

Shadow, on the other hand, offers a Consumer IaaS model of service whereby users (theoretically) may play *any* digitally-purchased PC game. Because users are free to bring previously purchased games with them to use on the service and likewise take them elsewhere if they leave, Shadow claims that the games users purchase to use on its service are '100% [theirs].'[224] Thus, in theory, the Consumer IaaS model adopted by Shadow offers flexibility and portability that create a broader right of access for users purchasing games. However, as discussed in the preceding copyright section, the relevant legal provisions that this model relies upon are untested and it appears to be relatively simple for game publishers to exclude gamers from using these types of services with specific terms in their EULAs.[225] Users who purchase games to be played on these types of services but do not own a computer capable of running the games locally may, one day, find themselves with a library of game licenses that they cannot play anywhere unless they invest in a high-powered gaming PC.

Rights of access and termination across cloud gaming providers

End user licenses and/or service contracts contain two important factors that can give gamers a sense of confidence in the purchases they make. These factors are (1) access, or the rights instilled by the agreement that permit and limit the end user to access the content they purchase, and (2) termination, or the ability of the right-holder (or other third party) to terminate the rights of access granted by the

[223] See: n 204 and the surrounding discussion.

[224] Shadow, 'GeForce Now: Nvidia's cloud service, the catalog system, and Shadow!' https://shadow.tech/en-gb/blog/insider/geforce-now-nvidia-cloud accessed 23 July 2021.

[225] See e.g.: Blizzard's EULA barring cloud-based access, n 204.

agreement. These rights will be governed largely by the ToS for the cloud gaming provider.

Access refers generally to an end user's ability to play the games she has paid for. Cloud gaming raises the following questions in relation to access:

- Is access dependent on a continued subscription or relationship between the end user and the cloud service provider?
- Is access dependent on a continued relationship between the cloud gaming service provider and the right-holder?
- Is access dependent on the viability of services offered by the cloud gaming provider or its service as a whole?
- Are multiple people allowed to access the same account containing the purchased game? Is concurrent access by more than one person on the same account allowed?

In nearly all situations, access to purchased games will likely be reliant on an active relationship between the cloud gaming service provider and the end user. This makes sense for subscription library services such as Xbox Games Pass Ultimate and Luna, since access to the library of games is part of the service. However, cloud gaming services that allow users to purchase individual games may also limit users to accessing those games exclusively on their service.[226] In this respect, access may be more limited in a cloud gaming environment than in a traditional one, since the gamer receives a more restricted right of access. While purchased games are typically only accessible on one type of device (e.g. Playstation, Xbox, Switch, or PC), access is

[226] Google states that: 'the purchase of Content means that you are granted an access right to the Purchased Content through the Service and does not include a transfer of a property right in the Purchased Content.' Google, 'Stadia End User License Agreement For Content' (5 November 2019) https://support.google.com/product-documentation/answer/9567087?hl=en&visit_id=637477851337585586-2108356297&rd=1 accessed 23 July 2021. Therefore, purchases made through Stadia will only be available to access within the Stadia service. However, Stadia has a free service with lower resolution rates where users will still be able to access their purchased games if they wish to end their (paid) Stadia Pro subscription. Google, 'Stadia FAQ,' https://support.google.com/stadia/answer/9338946?hl=en&ref_topic=9461109 accessed 23 July 2021.

not reliant on paying a recurring subscription fee to a service,[227] or facing the risk that a service might be discontinued at any time in the future.[228]

Access to purchased game content may also be dependent, to a degree, on a continued relationship between the cloud service provider and the rightsholder. This will likely, again, be determined by the business model of the cloud gaming service. For subscription library services, access to games will be dependent on the service provider's relationship with the right-holders, with games being rotated in and out of the library periodically. However, cloud gaming providers that offer individual game purchases will likely seek to ensure that purchased games remain available to those who purchase them even if the right-holder later removes the game from the service.[229] While Stadia has committed to continued support for purchased games even if the publisher removes them from the service, this may not be the case for other cloud gaming services. Nvidia even states that content purchased from a digital store on its GeForce Now platform may not be available to access at all via GeForce Now and that available content may later become unavailable.[230] However, in Nvidia's case, all purchased content will remain accessible on a suitably equipped gaming PC. Thus, users who purchase games on GaaS services within the Integrated or Layered models will be reliant on the service provider negotiating the right to continue to make purchased games available for use by end users indefinitely. In Consumer IaaS models, users will have the freedom to change cloud service providers at will because the license is not tied to this relationship. Users will also retain the right to play purchased games on a local PC indefinitely.

The notion that access to purchased content will ultimately be reliant on the continued availability of the cloud gaming service seems obvious; if Google shuts down Stadia, those who purchased games to be used exclusively on Stadia will be left with no way to play

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[227] Except with respect to online multiplayer games where users are typically required to pay additional fees for use of the online multiplayer service discussed above in Section 2.4.1.

[228] For a list of discontinued Google services, products, devices and apps, see: https://killedbygoogle.com.

[229] Google states that purchased games will remain available to users to play on Stadia even if the game publisher stops supporting Stadia in the future. 'Stadia FAQ,' n 226.

[230] Nvidia, 'Membership Terms,' https://www.nvidia.com/en-gb/geforce-now/membership-terms/ accessed 23 July 2021.

their games.[231] However, this is a new concept in the gaming industry. In the console environment, console manufacturers will eventually stop offering games for older consoles.[232] However, the outdated consoles will continue to remain viable gaming machines for both digitally-purchased and carrier-based games for as long as the console works. Even Sega's long-ago abandoned console project, Dreamcast, will still run any games purchased for it in the past. The notion that purchasing a game represents a wager on the longevity of a service which a provider may withdraw at will is completely new.

The limitations on how many users may access the same account both separately and concurrently differ per provider. It is likely that providers decide whether to allow multiple users to access the same account, based in part on the business model of the cloud gaming service. Providers offering a subscription to a games library may be more open to allowing multiple users to access the same account, possibly including for concurrent access.[233] Services that rely more heavily on individual game sales instead of subscription

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[231] Google, in fact, has a reputation for abandoning its less successful products and services. Avery Hartmans, 'Google's music streaming service is about to shut down for good. Here are 20 other Google products that bombed, died, or disappeared.' (*Business Insider*, 5 August 2020) https://www.businessinsider.com/discontinued-google-products-2016-8?r=US&IR=T accessed 23 July 2021; See also: https://killedbygoogle.com for a list of products and services that Google has cancelled.

[232] Liana Ruppert, 'PlayStation Store Will No Longer Offer PS3, PS Vita, And PSP Games Online And Mobile,' (*Game Informer*, 16 October 2020) https://www.gameinformer.com/2020/10/16/playstation-store-will-no-longer-offer-ps3-ps-vita-and-psp-games-online-and-mobile 23 July 2021; see also: Matt Wales, 'Sony's PS3, PSP, and Vita digital stores reportedly closing for good this summer,' (*Eurogamer*, 23 March 2021) https://www.eurogamer.net/articles/2021-03-22-sonys-ps3-psp-and-vita-digital-stores-reportedly-closing-for-good-this-summer accessed 23 July 2021.

[233] Amazon Luna's terms of service do not limit the number of devices from which a user may access their account but Amazon does state that users may create up to 6 'profiles' for their account, each with their own individual game progress settings. Amazon, 'What are Amazon Luna Profiles?' https://www.amazon.com/gp/help/customer/display.html?nodeId=GRHDWR6ZCMMT24MP accessed 23 July 2021; Microsoft provides for users to access the content they subscribe to on a 'reasonable number' of devices, allowing users to sign in on multiple devices, some of which may not be their own. Microsoft, 'Usage Rules for Digital Goods' https://support.microsoft.com/en-gb/windows/usage-rules-for-digital-goods-rules-83812b1f-1ecd-9a46-d3a7-ad1eadce49d1 accessed 23 July 2021.

libraries may be less likely to allow account sharing or concurrent access.[234]

3.2.4 Accessing In-Game Items and Currencies

Many publishers today offer additional, optional game content to users for an extra price. This content may take the form of expansion packs that add new ways to play the game and extend its playable lifetime, cosmetic items that allow players to customize their gameplay experience, or in-game currency to spend within the game. Some videogame companies rely heavily on the additional revenue streams generated by additional in-game content sales.[235] While the nature of the way users gain access to this additional content (paying real money for it) may instill a sense of ownership, this additional content is, again, typically licensed, not owned. The licenses that govern access to this content establish limitations. For example, it is common for providers to reserve a right to cancel or eliminate in-game purchases, meaning they could disappear with little or no notice.[236] Despite any gut feelings of 'I bought it so it is mine,' it is not

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[234] Stadia does not permit concurrent access through a single account nor allow account information sharing. 'Stadia FAQ,' n 226. Stadia does, however, permit 'Family Sharing' which allows *certain* content and subscriptions to be shared with family members in the user's household. Google, 'Stadia Terms of Service,' (Stadia, 1 December 2020) https://stadia.google.com/tos?hl=en-US accessed 23 July 2021; Nvidia states that users 'may not copy, sell, rent, sublicense, transfer or distribute any portion of GFN…' Nvidia, 'Terms of Use,' https://www.nvidia.com/en-gb/geforce-now/terms-of-use/ accessed23 Jul 2021. However, because NVIDIA does not directly distribute any content, it may be subject to content-sharing licenses such as Steam's Family Sharing. Steam, 'Steam Family Sharing,' https://store.steampowered.com/promotion/familysharing accessed 23 July 2021.

[235] For example, Activision-Blizzard made $3.36 billion from in-game additional content purchases in 2019. Activision Blizzard, 'Activision Blizzard Announces Fourth-Quarter and 2019 Financial Results,' (6 February 2020) https://investor.activision.com/static-files/cefd71d2-d21f-4976-80ae-d8e8bacaff8d accessed 23 July 2021.

[236] 'Except as otherwise prohibited by applicable law, Epic, in its sole discretion, has the absolute right to manage, modify, substitute, replace, suspend, cancel or eliminate Game Currency or Content, including your ability to access or use Game Currency or Content, without notice or liability to you. You may not transfer, sell, gift, exchange, trade, lease, sublicense, or rent Game Currency or Content except within the Software and as expressly permitted by Epic.' Epic Games, 'Fortnite End User License Agreement,' https://www.epicgames.com/fortnite/en-US/eula accessed 22 July 2021.

clear that users have a property right in the additional content they purchase within a videogame, as opposed to a contractual right to access and use the in-game content. The issues surrounding virtual property are complex, controversial, and go beyond the scope of this paper.[237]

As with access to the game itself, a gamer's access to in-game content purchased through a cloud service will depend on a range of factors. For example, what happens if a gamer buys in-game content, but the game is subsequently removed from the cloud gaming service? In some cases, continued access to purchased add-on content will not be guaranteed at all.[238] In contrast, some game development companies have opted to create their own systems to store user data which allow in-game purchased content to be accessed through their proprietary user accounts instead of the distributor's user account system.[239] This method allows users to access their in-game purchases across environments. Systems like these may be the most efficient way to ensure users' in-game purchases are secure, should they decide to switch to a new gaming service provider or gaming environment altogether.

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[237] See e.g. generally: Edward Castranova, 'On Virtual Economies' (2002), https://ssrn.com/abstract=338500.

[238] Amazon offers a weak assurance that purchased add-on content will remain available as long as the user has access to the applicable streaming game through the Luna+ service. Amazon does not *guarantee* that access to this content will be available as long as the game is offered on its platform and the user has an active account. It states that access to add-on content may become unavailable due to licensing restrictions, discontinuation of the game on the service, or 'other reasons.' Amazon, 'Amazon Luna Terms of Use,' https://www.amazon.com/gp/help/customer/display.html?nodeId=G5FYRVVJK7KFGQQN accessed 23 July 2021.

[239] Blizzard, 'Blizzard End User License Agreement,' (Blizzard, 9 October 2020) https://www.blizzard.com/en-gb/legal/08b946df-660a-40e4-a072-1fbde65173b1/blizzard-end-user-license-agreement accessed 23 July 2021; Epic Games also allowed players to merge multiple accounts from different consoles or consoles and PCs so that users could have all of their purchases and progress unified on a single account in every environment in which they wanted to play. Epic Games, 'Can I merge my Epic Games accounts?,' https://www.epicgames.com/help/en-US/epic-accounts-c74/connect-accounts-c110/can-i-merge-my-epic-games-accounts-a4659 accessed 23 July 2020.

Rights of withdrawal

The cloud should not have any effect on EU consumers' right of withdrawal for online transactions.[240] Currently, digital videogame distributors require European customers to waive their right of withdrawal before allowing a purchase to go through.[241] The addition of cloud technology will not change this established practice in the videogame industry.[242]

3.2.5 Termination of Access

Cloud gaming service providers typically reserve the right to terminate, block, or suspend users' accounts, and users may also terminate their accounts. Microsoft and Amazon provide access to catalogues on a subscription basis and no presumed 'purchases' of games are made. Loss of access to a game on termination of a subscription is therefore to be expected, though termination may also affect access to add-on content which has been 'purchased'. Moreover, many GaaS services rely on users purchasing content specifically to be used within the service. Therefore, the termination of a user's account will also result in the nullification of the licenses or contracts to access games for which she has paid. Common causes for termination include non-payment,[243] code of conduct violations,[244]

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[240] Directive EU 2011/83/ on Consumer Rights, OJ L 304 Art. 9(2)(c).

[241] See: Felix Hilgert, 'Withdrawal right waivers for in-game currency under EU law', (2019) Interactive Entertainment Law Review, 2:2.

[242] See e.g.: Stadia, 'Stadia Return Policy' https://support.google.com/stadia/answer/9598538?hl=en-GB#zippy=%2Ceuropean-economic-area-and-the-uk accessed 22 July 2021. 'However, when you purchase or subscribe to digital content with Stadia, you agree that the digital content will be available to you immediately, and you acknowledge that, as a result, you waive your automatic statutory right of withdrawal. Therefore, you will not be eligible for a refund (or any alternative remedy), except where digital content is defective, does not match its description, or where Google voluntarily offers refunds, as stated below.'

[243] Nvidia, 'Terms of Use,' https://www.nvidia.com/en-gb/geforce-now/terms-of-use/ accessed 23 July 2021; Shadow, 'Terms of Use,' https://shadow.tech/terms-of-use accessed 23 July 2021.

[244] Nvidia Terms of Use n 243; Shadow Terms of Use n 243; Amazon, 'Amazon Luna Terms of Use,' https://www.amazon.com/gp/help/customer/display.html?nodeId=G5FYRVVJK7KFGQQN accessed 23 July 2021; Microsoft, 'Community Standards for Xbox,' https://www.xbox.com/en-GB/legal/community-standards accessed 23 July 2021; and Microsoft, 'Microsoft Services Agreement,'

and terms of service violations.[245] However, cloud gaming providers may also reserve the right to terminate a user's service at their discretion.[246]

Thus, the already more-narrow rights of access that users enjoy for purchased cloud gaming content are further tempered by clauses that may revoke their access completely. While, in other gaming environments, users are already subject to codes of conduct and ToS for online play, a violation can, at most, result in loss of access to online components of a game. However, with GaaS services, code of conduct and ToS violations will implicate, potentially, access rights to a user's entire library of games, in-game purchases, and saved game data, since termination of a user's account will result in the loss of ability to access any content purchased for that account.

3.2.6 Interim Conclusions

To some extent, cloud gaming presents a continuation of trends towards dematerialization and intermediation. With digital distribution, the gamer moved from receiving a physical copy of the game to receiving a digital copy - accompanied by a license to copy. With cloud gaming, the gamer no longer receives a digital copy, but receives a right to access a copy of the game run by the GaaS provider on a remote server. As a result, the gamer's access to the game depends on their relationship with this intermediary. The model of service offered by the cloud gaming provider plays a significant role in determining how rights, responsibilities, and liabilities are asserted/assigned. ToS specific to each cloud gaming service provider dictate the gamer's rights of access and termination. Further research comparing these agreements would be helpful to better understand variance in the scope of rights offered to users across different services and within each of the three models we have outlined. At the same time, users may feel a sense of further detachment from the purchases they make in cloud gaming contexts compared to other gaming environments, as they move from purchasing a (virtual) product, to paying for an ongoing service.

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https://www.microsoft.com/en-gb/servicesagreement/ accessed 23 July 2021.

[245] Nvidia Terms of Use n 243; Amazon Luna Terms of Use n 243; Microsoft Services Agreement n 244.

[246] Amazon Luna Terms of Use n 244.

3.3 REGULATORY ISSUES

3.3.1 INTRODUCTION

The video game industry currently faces multiple regulatory challenges. For instance, the last few years have been marked by an ongoing international debate over whether in-game loot boxes constitute gambling and should be prohibited.[247] More recently, issues have been raised about the use of video game currencies to facilitate money laundering enterprises.[248] The rise in popularity of game live streams and the 'influencers' who are most popular on these streaming sites has created a need for transparency about relationships between these streamers and those who sponsor them.[249] Finally, the World Health Organization ('WHO') added 'gaming disorder' to the International Classification of Diseases (the 'ICD-11'), the organization's official diagnostic manual.[250] This highlights concerns about harmful content in games and raises issues of how to regulate the gaming industry in a way that makes it safer for children. These issues apply to the entire gaming industry, not specifically to cloud gaming services. Yet the transition to cloud-based delivery of gaming content further complicates this already-complex regulatory landscape. Complications include:

- Age verification and rating;
- Navigating a regulatory framework that is not harmonized while operating a global cloud-based service; and
- The interaction of competing acceptable use policies from multiple companies involved in the cloud gaming supply chain and how these will be used to address harmful content.

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[247] Daniel Cermak, 'Micro-Transactions, Massive Headaches: International Regulation of Video Game Loot Boxes,' (2020) Michigan State International Law Review, 28: 2, 273.

[248] Rafat Kuchta, 'Video Games, Virtual Currencies, and Money Laundering' (*Newtech.Law*, 25 June 2020) https://newtech.law/en/video-games-virtual-currencies-and-money-laundering/ accessed 23 July 2021.

[249] Matt Peckham, 'Twitch Takes a Step Toward Greater Broadcast Transparency' (*Time*, 3 October 2014) https://time.com/3462250/twitch-transparency/ accessed 23 July 2021.

[250] Characterized as a disorder due to addictive behaviours. WHO, 'ICD-11 for Mortality and Morbidity Statistics' (*WHO*, May 2021) https://icd.who.int/browse11/l-m/en#/http://id.who.int/icd/entity/1448597234 accessed 23 July 2021.

In the following sections we analyse the implications for gaming services of these cloud-specific issues.

3.3.2 Age Verification and Rating

Two issues at the forefront of the videogaming regulations discussion are age-appropriate content, and age verification. The industry has largely self-regulated in this sphere with independent bodies serving to rate games such as PEGI[251] in Europe and ESRB[252] in North America. Games distributors, including both PC storefronts and console distribution platforms, use these rating systems so that buyers and parents know what sort of content is included in a game before purchase. Console providers refuse to support videogames given 'Adult Only' ratings (typically pornographic content) altogether.[253] Console providers also offer parental control options to allow parents to prevent their children from accessing content they deem inappropriate. Digital distributors of PC games do not typically have these parental controls, and Valve's Steam marketplace has a notoriously weak system of age verification.[254] Moreover, these marketplaces also offer access to videogames with adult-only content.

Thus, there are two existing models for the treatment of age-appropriate content on which cloud gaming service providers may base their policies. With respect to age verification and age-appropriate content, we expect cloud gaming service providers to function more like console providers than digital distributors. For example, Stadia has announced that it will not support adult-only content and will use 'standard industry practice' for curating games.[255] This may be a reference to the standard practice for console providers rather than the gaming industry as a whole, because of the

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[251] Pegi, 'Pegi Helps Parents Make Informed Decisions when Buying Video Games' https://pegi.info accessed 6 July 2021.

[252] ESRB Home, https://www.esrb.org accessed 6 July 2021.

[253] PlayStation, 'About Ratings and Parental Controls' https://www.playstation.com/en-us/legal/ratings/ accessed 6 July 2021.

[254] 'The current age verification system in place on Steam simply involves players entering their date of birth when signing up. This system is not sufficient to prevent minors from accessing the adult-only content that is available on Steam.' Agechecked, 'Adult-Only Games in Germany Blocked by Steam' https://www.agechecked.com/adult-only-games-in-germany-blocked-by-steam/ accessed 6 July 2021.

[255] Ali Jones, 'Google Stadia 'Won't Allow' Adult Games' (*PC Games SN*, 21 March 2019) https://www.pcgamesn.com/google-stadia-adult-games accessed 6 July 2021.

vast discrepancies between supported content across digital distributors and compared to console digital storefronts.

3.3.3 Regulating Across Jurisdictions

For many relevant regulatory issues, neither the regulations nor applicable laws are harmonized. For example, Valve's Steam has been forced to prevent German residents from accessing all games with adult content (pornography) including some with a rating of USK18+ (adult but non-pornographic content), because its age verification system is insufficient to comply with German pornography laws.[256] This lack of harmonization poses a difficulty for cloud gaming services that cater to international markets.[257] One of the key regulatory issues for cloud gaming services will be finding a way to ensure compliance with regulations within every jurisdiction they serve. Regulation of loot boxes and gambling provides an interesting case study since gambling laws vary from territory to territory. For example:

- Belgium has placed an outright ban on all loot boxes in video games.[258]

- In the UK, only in-game items acquired 'via a game of chance' that may be considered money or money's worth will be considered gambling.[259]

[256] Agechecked (2021) n 254.

[257] As of July 2021, Google Stadia is available in 22 countries. Stadia, 'Stadia availability in your country' https://support.google.com/stadia/answer/9566513?hl=en-GB accessed 23 July 2021; Nvidia's GeForce Now is available in 76 countries. Nvidia, 'What are the supported locations of GeForce Now?' https://nvidia.custhelp.com/app/answers/detail/a_id/5023/~/what-are-the-supported-countries-for-geforce-now%3F accessed 23 July 2021.

[258] Tom Gerken, 'Video Game Loot Boxes Declared Illegal Under Belgium Gambling Laws,' (*BBC*, 26 April 2018) https://www.bbc.com/news/technology-43906306 accessed 23 July 2021.

[259] Gambling Commission, UK, 'Loot Boxes within Video Games' (24 November 2017) https://www.gamblingcommission.gov.uk/news-action-and-statistics/News/loot-boxes-within-video-games accessed 22 July 2021.

- The Netherlands likewise only views loot boxes with prizes that may be sold outside of the game as contravening gambling laws.[260]

- The US has not regulated loot boxes though some examples, including those that offer items exchangeable for real money, may contravene State gambling laws.[261]

- China has chosen to regulate loot boxes by requiring games to publish the odds of winning various prizes and requiring that all items available in loot boxes must also be available for individual purchase via real money or virtual in-game currency.[262]

Navigating this jurisdictional minefield is already difficult for game companies with international distribution arrangements. Loot boxes can be a massive revenue generator and game companies are unlikely to remove these features from games in any jurisdiction where they do not have to.[263] Thus, it is unlikely that content developers will standardize their products to satisfy the strictest jurisdiction's standards. Instead, developers may well prefer to remove the banned mechanics in countries with harsher treatment like Belgium, but continue to sell versions including loot boxes where permitted.[264]

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[260] Dutch Gaming Association, 'Press Release, A study by the Netherlands Gaming Authority has shown: Certain loot boxes contravene gaming laws' (*Dutch Gaming Association*, 19 April 2018) https://dutchgamesassociation.nl/wp-content/uploads/2018/04/Press-release-Certain-loot-boxes-contravene-gaming-laws.pdf accessed 22 July 2021.

[261] See e.g. *Soto v. Sky Union*, 159 F. Supp. 3d 871, 880–881 (N.D. Ill. 2016).

[262] Tracey Tang, 'A Middle-Ground Approach: How China Regulates Loot Boxes and Gambling Features in Online Games,' (*Mondaq*, 16 May 2018) https://www.mondaq.com/china/gaming/672860/a-middle-ground-approach-how-china-regulates-loot-boxes-and-gambling-features-in-online-games accessed 22 July 2021.

[263] Loot boxes generated almost $30b for the gaming industry in 2018, predicted to grow to 50b in 2022. Juniper Research. 'In-Game Gambling ~ The Next Cash Cow for Publishers,' https://www.juniperresearch.com/document-library/white-papers/in-game-gambling-~-the-next-cash-cow accessed 30 July 2021.

[264] Multiple game developers adjusted loot box mechanics in their games for Belgian players. Joseph Knoop, 'Overwatch, NBA 2K, and more ditch loot boxes in Belgium amid crackdown' (*Dailydot*, 27 August 2018) https://www.dailydot.com/parsec/loot-box-ban/ accessed 6 July 2021.

Moving to the cloud is likely to exacerbate the problems created by this already difficult-to-navigate landscape of regulations. With different versions of the same game being released to comply with various jurisdictions' regulations, cloud gaming providers will have to mimic game developers' and publishers' choices of distribution in their delivery methods to avoid regulatory penalties. This will likely be done via geo-blocking.

Geo-blocking refers generally to commercial and technical practices whereby customers are treated differently based on geographic factors. In online contexts, it includes both the act of denying a customer from a certain geographic region access to a website or digital content and the act of rerouting the customer to a region-specific website or content.[265] In the context of cloud gaming, geo-blocking is a useful tool for offering an international service that may not be uniformly compliant in every jurisdiction in which it is offered. In fact, existing cloud gaming companies already geo-block some content for users.[266] The term 'geo-blocking' carries with it an anti-competitive connotation, especially in a gaming context where several of the largest videogame companies in Europe were recently fined for using geo-blocking to subvert rules governing trade within the European single market.[267] However, in the context of a tool to ensure that a product is legally compliant everywhere it is offered, geo-blocking may be useful. The EU regulation on geo-blocking specifically addresses and permits this practice under these circumstances, where the product or service offered violates the laws

[265] Peter Van Cleynenbreugel, 'The European Commission's Geo-Blocking Proposals and the Future of EU E-Commerce Regulation,' (2017) Masaryk University Journal of Law and Technology 11: 1, 39, 41.

[266] 'Why are some games available in other countries but I cannot play them?'…'GeForce NOW follows local content-rating agencies. We try to have all supported games available in all countries, but some games are prohibited in some countries. Visit our supported games page to see which titles are available.' Nvida, 'GeForce Now FAQs' https://www.nvidia.com/en-gb/geforce-now/faq/ accessed 23 July 2021; 'Content and features may vary between countries' Stadia, 'Stadia terms of service' (*Google*, 1 December 2020) https://stadia.google.com/tos?hl=en-US accessed 23 July 2021.

[267] European Commission, 'Antitrust: Commission fines Valve and five publishers of PC video games £7.8 million for 'geo-blocking' practices,' (*European Commision*, 20 January 2021) https://ec.europa.eu/commission/presscorner/detail/en/ip_21_170 accessed 23 July 2021.

of one Member State but not others.[268]

Questions will undoubtedly arise as to who is responsible, the cloud gaming service provider, the game developer/publisher, or both, if a game's mechanics breach a regulatory requirement. While, in the loot box context, fines have in the past been issued to game developers, not distributors,[269] a cloud gaming service provider may be exposed to liability in future.[270] Using Belgium's laws against loot boxes as a case study, liability will be shared by potentially every actor in the cloud gaming environment. Belgian law prohibits all activities that qualify as a game of chance unless the operator has a license issued by the Belgian Gaming Commission.[271] The relevant law also outlines who may be held accountable:

> "It is prohibited for anyone to participate in a game of chance".[272]

This suggests that individual gamers may face sanctions for playing games with loot box mechanisms (though Belgian authorities have not targeted end users up to this point). It is also illegal:

> "to facilitate the operation of a game of chance or gaming establishment, to advertise a game of chance or a gaming establishment".[273]

This provision implicates game publishers, cloud gaming service providers and potentially cloud service infrastructure providers

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[268] Regulation (EU) 2018/302 of 28 February 2018 on addressing unjustified geo-blocking and other forms of discrimination based on customers' nationality, place of residence or place of establishment within the internal market, OL J 60I, Art. 4(5).

[269] Andy Chalk, 'Electronic Arts faces £10 million fine over FIFA loot boxes in the Netherlands' (PC Gamer, 29 October 2020), https://www.pcgamer.com/uk/electronic-arts-faces-euro10-million-fine-over-fifa-loot-boxes-in-the-netherlands/ accessed 6 July 2021.

[270] Though the cloud gaming company would likely not be directly liable for the fine, if the violation occurred by fault of the cloud gaming company in a failure to deliver the correct version of a game to the appropriate users, the game developer might be able to recover damages resulting from the penalty under breach of contract, negligence, and/or copyright violations.

[271] Act of 7 May 1999 on Games of Chance (Belgium), Betting, Gaming Establishments and the Protection of Players as amended in 2010 and 2019, Art. 4(1) ('Belgian Act on Games of Chance').

[272] Belgian Act on Games of Chance, n 271 Art. 4(2).

[273] Belgian Act on Games of Chance, n 271 Art. 4(2).

depending on how courts interpret the term 'facilitate.' However, Belgian authorities have exclusively targeted and sought compliance from game publishers thus far.[274]

Penalties for violating these provisions can include both administrative and criminal sanctions.[275] The majority of internet service providers in Belgium have also agreed to cooperate with the Gaming Commission to block access to websites found to offer off-shore online gambling access to Belgian residents.[276] Thus, while up to this point, the Belgian Gaming Commission has only sanctioned game publishers, cloud gaming service providers will need to work in tandem with game publishers to ensure that no games with loot box mechanisms that are prohibited under Belgian law are offered to Belgian residents. Fines may be applicable to both parties and, in serious cases, the cloud gaming service provider may risk access to its service being blocked in Belgium. As laws and regulations develop in other jurisdictions, it is possible that cloud gaming service providers will face liability for the games they offer alongside the developers and publishers.

3.3.4 Whose Acceptable Use Policy is it Anyway?

The loot box issue illustrates how existing national legislative responses and legal interventions complicate the provision of international GaaS services. Many other regulatory issues game companies face are at an earlier, more speculative, stage with a

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[274] Minister of Justice, Belgium, 'Regarding EA's compliance with Belgian Gaming law', https://www.gamingcommission.be/opencms/export/sites/default/jhksweb_nl/documents/EA-Games-conforms-to-the-Belgian-gambling-legislation.pdf accessed 6 July 2021.

[275] Belgian Gaming Commission, 'Research Report on Loot Boxes' (April 2018) https://www.gamingcommission.be/opencms/export/sites/default/jhksweb_nl/documents/onderzoeksrapport-loot-boxen-Engels-publicatie.pdf accessed 6 July 2021:"the active operators risk a prison sentence of up to five years and fines of up to EUR 800,000 for a first violation. These penalties can double if the violation was perpetrated against a person younger than 18."

[276] Phillip Vlaemminck and Robbe Verbeke, 'The Gambling Law Review: Belgium' (*The Law Reviews*, 7 June 2021)https://thelawreviews.co.uk/title/the-gambling-law-review/belgium#footnote-027-backlink accessed 6 July 2021; Gaming Commission, Belgium, 'List of banned gaming websites' https://www.gamingcommission.be/opencms/opencms/jhksweb_en/establishments/Online/blacklist/index.html accessed 6 July 2021.

common solution largely being self-regulation by the industry. To date, the industry has largely addressed issues like harmful content and even money laundering internally without legislative intervention. For example, Valve addressed concerns that fraudsters were using a mechanism that allowed players to sell 'keys' to unlock loot boxes on its Steam marketplace as a way to launder money by simply barring all players from selling or transferring the 'keys' at all.[277] However, not all issues will have such a simple solution. In particular, issues of harmful content create complex questions around the applicable standards and duties of moderation. This applies both to whether the gaming content is itself harmful (including age-appropriate), and to whether any content gamers share with each other while using the service is harmful.

Harmful or age-appropriate content within games themselves is handled by international rating services.[278] The latter issues are often addressed in contractual agreements which include acceptable use policies ('AUPs') or codes of conduct that are tied to game licenses, online services, and, now in the cloud gaming context, service contracts as well. For example, the Google Stadia AUP prohibits harassment, bullying, and threatening behavior, in a number of ways.[279] However, the question of AUPs and enforcement will need to be managed by the various companies involved in the delivery of the game. There is a risk that the transition to the cloud may add a layer of complexity where gamers will now be responsible for adhering to multiple codes of conduct from the game developers, the cloud gaming service provider, and potentially even the IaaS cloud provider. For example, EA also has an AUP which also covers harassment, bullying and threatening behavior.[280] This AUP, along with Stadia's AUP, will apply to anyone who plays EA's FIFA football game on Stadia's service. This section provides a high-level look at these policies and how they may interact with each other.

Ultimately, there are, at most, three separate parties involved in a cloud gaming service who may set rules for acceptable behavior and use of the service by the end user. Among these parties, the game

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[277] BBC News, 'Valve shuts down money laundering via CS:GO game' (*BBC*, 1 November 2019) https://www.bbc.co.uk/news/technology-50262447 accessed 6 July 2021.

[278] See, e.g.: PEGI and ESRB in n 251 and 252.

[279]Stadia, 'Code of Conduct' https://stadia.google.com/conduct/ accessed 6 July 2021.

[280] Electronic Arts, 'User Agreement, 'https://tos.ea.com/legalapp/WEBTERMS/US/en/PC/#section6 accessed 6 July 2021, at Section 6.

developer/publisher and cloud gaming service provider are each likely to have separate AUPs. In the 'Integrated' and 'Consumer IaaS' models, the cloud infrastructure provider will likely also have an AUP which will apply to the customer (i.e. in the 'Layered' model, the GaaS provider) not the end users.[281] While users' behaviors will be regulated by all AUPs, either directly or indirectly, there will likely be little difference between what each policy requires. Moreover, ordinary users who play games on a cloud service without engaging in any illegal behavior, cheating, or harassing other players will likely never find themselves at odds with any AUP. Nonetheless, the way each party applies its AUP and who it enforces the policy against will illustrate how harmful content is self-regulated within the cloud gaming service industry. Each model for cloud gaming services will likely have its own enforcement chain where all parties involved are held accountable by each other.

Layered Model

In the 'Layered Model', the cloud infrastructure provider will typically not police actions of individual users subscribing to a cloud gaming service hosted on its infrastructure. However, it is likely that the cloud provider will hold the cloud gaming service provider accountable for failing to address large-scale issues and widespread harm associated with end user behavior. An example of this sort of high-level policing is Amazon's refusal to continue to host the alt-right social media app, Parler, on its AWS IaaS service, based on multiple violations of its AUP.[282]

Therefore, in a 'Layered' model GaaS, the role of policing individual user-behavior will largely fall to the cloud gaming service provider as the cloud infrastructure provider is just an IT provider. In cases involving a third party's game content, this analysis becomes more complicated. In these situations, policing harmful behavior may be performed in tandem with the relevant third-party game developers/publishers, where the cloud gaming service provider takes on a general policing role and the developers/publishers take responsibility for behavior within their games. Ultimately this will depend on the roles and responsibilities defined in the contracts between the cloud gaming service provider and the

[281] Amazon, 'AWS Acceptable Use Policy' https://aws.amazon.com/aup/?ascsubtag=[]vg[p]21986678[t]w[r]theverge.com/2021[d]D accessed 6 July 2021.

[282] Kim Lyons, 'Amazon is Kicking Parler Off its Web Hosting Service,' (*The Verge*, 9 January 2021) https://www.theverge.com/2021/1/9/22222637/amazon-workers-aws-stop-hosting-services-parler-capitol-violence accessed 6 July 2021.

developers/publishers. It is likely that this division of labor will mirror similar examples in the console environment. For example, Sony recently released a feature that allows it to record PlayStation users' voice conversations for the purposes of reporting harassment.[283] However, the system in place refers only to 'Party Chat' conversations which is the private chat system for Playstation users on the Playstation Network.[284] This chat function is distinct from public or 'game' voice chats for online multiplayer games. For example, a Playstation user may initiate or join a 'Party' chat with another Playstation user at any time regardless of which game each user is playing. Alternatively, in online multiplayer games, Playstation users will also be able to join the 'game chat' where they are able to communicate with the other players currently playing the game with them. Harmful content and harassing behavior occurring within this 'game chat' service is policed by the relevant game developer/publisher, not Sony, as the chat features are hosted by game developer/publisher's servers.[285] So just as in this example from the console environment where we see Sony policing its services and the game developer/publisher policing behavior that occurs within its games, we will likely see a similar division of labor between cloud gaming service providers and game developers/publishers when it comes to holding users accountable and ensuring a safe environment for players.

Ultimately, the chain of acceptable use enforcement in the 'Layered Model' will look like this:

- The game developer enforces behavior that occurs within the confines of its games on its servers, such as multiplayer game chat and messaging services.

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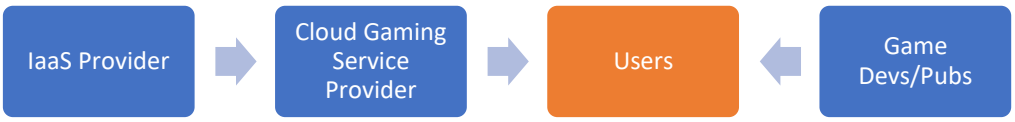
[283] PlayStation Blog, 'Details on new voice chat functionality coming to PS5' (*Sony*, 16 October 2020) https://blog.playstation.com/2020/10/16/details-on-new-voice-chat-functionality-coming-to-ps5/ accessed 6 July 2021.

[284] Andrew Griffin, 'PS4 Update: Sony Explains why Playstation Voice Chats May be Recorded- and It's to Do With PS5' (*Independent*, 15 October 2020) https://www.independent.co.uk/life-style/gadgets-and-tech/ps4-update-8-ps5-sony-voice-chats-may-be-recorded-moderation-b1041818.html accessed 6 July 2021.

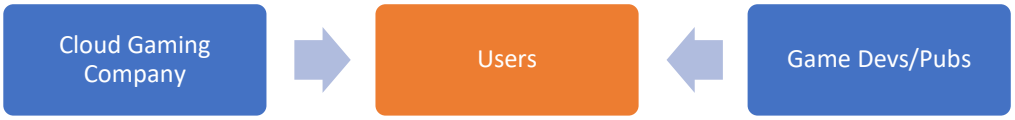
[285] For example, Activision Blizzard outlines how PlayStation and Xbox users may report harassment from other players for their game, Call of Duty: Modern Warfare, here: Blizzard, 'Reporting harassment in Call of Duty: Modern Warfare' https://us.battle.net/support/en/article/263778 accessed 6 July 2021.

- The cloud gaming service provider polices behavior by all of its users within its proprietary systems, such as its messaging and voice chat services.
- The cloud infrastructure provider's role will primarily be to ensure that the cloud gaming service provider is adequately fulfilling its own policing duties.



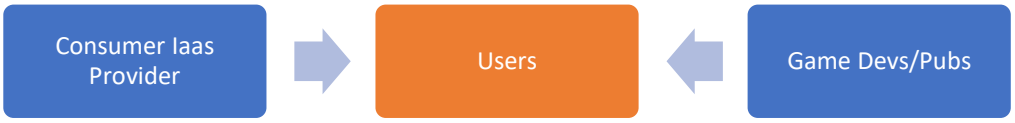
Integrated Model

The Integrated model will function in much the same way as the layered model with the key distinction that, in this case, the cloud infrastructure provider and the cloud gaming service provider will be the same company. Therefore, issues of large-scale policing with potentially large-scale repercussions such as the refusal to continue to host an entire game service no longer apply.



Consumer IaaS Model

The chain of accountability for the Consumer IaaS model is similar to the integrated model but with less oversight. Here the cloud gaming service provider is merely a small-scale infrastructure provider. Users of these services will still be subject to acceptable use policies.[286] However, as an infrastructure-only service, its policing duties will be limited to how that infrastructure is used. Thus, with no added services like voice and messaging, the burden of policing issues like harmful content will be lower for these types of providers. Users will still be subject to a code of conduct governing how they make use of the infrastructure leased.[287] Users will also continue to be subject to the relevant AUPs for the games they play through this service.



[286] Shadow, 'Terms of Use' https://shadow.tech/terms-of-use accessed 6 July 2021 see within: 'Code of Conduct'

[287] Shadow Terms of Use n 286.

3.3.5 INTERIM CONCLUSIONS

Ultimately, cloud gaming service providers are most likely to adopt a similar approach to that taken by console providers with respect to many regulatory issues such as age verification and policing of user behavior. However, solutions to regulatory hurdles created by international provision of services across jurisdictions with unharmonized legislation will be more similar to those employed by digital distributors. Geo-blocking will likely become the tool of choice for cloud gaming service providers in this context.

The chain of accountability for acceptable use and behavior is modified by the addition of cloud infrastructure providers as a new party. These providers, even when they have only a passive role in the service, may set standards by which to hold GaaS services accountable for their users' behavior. Moreover, the cloud gaming company represents a new party to police user behavior. The chain of accountability will differ across all three models for cloud gaming services but, in every instance, users will be subject to restrictions stipulated by multiple parties.

4. CONCLUDING REMARKS

In this paper, we have tried to 'demystify' cloud video gaming. The use of cloud services in the videogame supply chain can take many forms. For example, videogame companies can use existing cloud IaaS, PaaS, or SaaS services in developing or deploying videogames. In this paper, we have focused on 'cloud gaming' as a form of computing service that allows gamers to use powerful computing resources remotely to run videogame software and stream the resulting gameplay to the user's local device.

In our view, such cloud gaming can take three main forms. First, in the 'Layered Model', cloud providers act mainly as providers of IT services to game companies, who provide gamers a GaaS service. This is the model trialed by EA's Project Atlas, built on AWS's IaaS. Second, in the 'Integrated Model', cloud providers provide gamers a GaaS service directly, with gaming companies acting merely as content providers/licensors. This is the model of Google's Stadia and Amazon's Luna services. Finally, in the 'Consumer IaaS' model, the cloud provider provides gamers with access to a remote computing resource, on which gamers can install and run videogames themselves. These different models have different commercial implications, including in terms of which company contracts with the gamer, who can access and use the gamer's personal data, and how prices are set and revenues are distributed.

The different models also have different legal implications. First, in terms of intellectual property rights, copyright analyses are potentially greatly simplified for GaaS services as the right of reproduction is no longer implicated for end users. This would mean – strictly speaking – that end users do not require a copyright license. Instead, the GaaS service provider needs permission to communicate the relevant copyright works to the public. The end user needs a service contract with the GaaS service provider in order to access the service. In practice, GaaS-providers may continue to refer to their contracts with end-users as licenses. These contracts govern end user access to videogames in the cloud, as well as other aspects of the gaming experience (such as acceptable use policies). As a result, the impact of this finding on industry contracting practices may be limited. Nonetheless, the finding has implications for infringement. For example, imagine if gamer A manages to access provider B's GaaS service without B's permission, either by using the login details of paying customer C or by exploiting some other vulnerability in B's system. In that case, A's actions may fall foul of criminal offences related to computer misuse (such as the offence of unauthorized access to a computer system[288]), but it is not clear that A's actions would be a breach of copyright, since merely accessing a GaaS service does not require a copyright license. The full implications of how the right of reproduction will function in cloud gaming contexts merits further research.

In contrast, Consumer IaaS models for cloud gaming operate on a tenuous legal basis, since end users must ensure that they obtain appropriate licenses to install games on the provider's remote servers. Videogame companies may seek to prohibit such arrangements altogether via license restrictions, as illustrated by Blizzard's EULA (reviewed above). More research would be needed in this area if the market for such 'Consumer IaaS' services were to develop. A move to cloud gaming would also have other implications under IP law, such as for the activities of the modding community and preservation of games. These topics merit future research.

Second, in terms of contracts, the system of treating purchased game content as licensed, not sold, will not change with the implementation of cloud delivery technology. That said, as noted above, the lack of a need for an end user license for GaaS services may result in service contracts governing the rights of access for purchased content by end users, rather than software licenses. In many cases, the terms of service specific to each cloud gaming service provider will directly dictate rights of access and termination. This

[288] See e.g. the UK Computer Misuse Act 1990, s 1.

may result in a narrower and more restricted set of rights for gamers, compared to the current model of digital distribution. For example, gamers may obtain the right to access a certain game on a certain cloud service only and would lose this right of access in case of a general discontinuation of the service, or if their account is terminated. In that case, the gamer would lose access not just to the games themselves, but possibly also to any saved-game data and in-game items or currency they have purchased. To some extent, videogame companies can reduce the latter risk by building systems that allow users to access in-game purchases across different gaming environments. Further research comparing GaaS service agreements will be helpful to better understand variance in the scope of the rights offered to users across all providers.

Third, in terms of regulatory issues, cloud gaming service providers are likely to find themselves in a similar position to console providers. However, solutions to regulatory hurdles created by international provision of services across jurisdictions with unharmonized legislation will more closely resemble those employed by digital distributors. Geo-blocking will likely become the tool of choice for cloud gaming service providers in this context. Further, the chain of accountability for acceptable use and behavior is modified by the addition of cloud infrastructure providers as a new party. This chain of accountability will differ across all three models for cloud gaming services, but, in every instance, users will be subject to restrictions imposed by multiple parties.

Finally, cloud-based videogaming may give rise to other legal considerations, beyond those discussed in this paper. For example, there may be issues relating to concentration in digital distribution and the impact that may have on rates paid to developers and publishers.[289] These issues are still unresolved at the digital distribution level generally, so it is too early to predict how they will play out in cloud gaming. There are also potential issues concerning market power and anti-competitive practices, as several powerful companies enter the cloud gaming market, some of whom are vertically integrated in every layer of the stack. Yet, the market is

[289] See: *Epic Games, Inc v Apple, Inc.* (N.D. Cal.) ongoing; *Epic Games, Inc. v Google LLC* (N.D. Cal.) ongoing; UK investigation into the Apple App Store: Competition and Markets Authority, 'Investigation into Apple App Store' (2021) https://www.gov.uk/cma-cases/investigation-into-apple-appstore accessed 6 July 2021. As these cases and this investigation are resolved we will have a more tangible basis on which to predict treatment of cloud distributors from this competition perspective.

still in its infancy and lacks sufficient definition to be analyzed from a competition law or anti-trust perspective.

There are also data protection law implications of cloud gaming. Significant issues include the status and responsibilities of each actor in a cloud gaming ecosystem as a potential controller, joint-controller, processor, or sub-processor of personal data; rules applying to specific processing activities such as profiling and automated decision-making; and the impact of restrictions on the international transfer of personal data. These, and other complex data protection issues, merit further research.

Moving to the cloud will in some ways simplify, and in other ways complicate, the legal and regulatory situation for actors in the video game industry. This paper has provided an introduction to the underlying technologies, the relevant markets, and a preliminary analysis of key legal and regulatory issues. Only time will tell how these issues play out. In the meantime, cloud gaming provides fertile ground for further research.