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# “One Place for All the Ways We Play”: The Corporate Sociotechnical Imaginary of Cloud Game Streaming

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# “One Place for All the Ways We Play”: The Corporate Sociotechnical Imaginary of Cloud Game Streaming

by

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# Abstract

Labeled ‘the future of gaming’ by platform owners and members of the enthusiast press, cloud game streaming is an emerging technology that is drawing investment from companies such as Google, Amazon, and Microsoft. While cloud gaming would benefit these companies by giving them more control over their platforms, the technology has a vulnerability to infrastructure failure that is absent in traditional methods of playing digital games. This thesis uses the concept of the corporate sociotechnical imaginary — a co-produced ordering of social life that ties an emancipatory vision of the future to a corporate product or service — in order to understand the way platform owners are attempting to transcend that vulnerability to infrastructural failure and position cloud gaming within the cultural hegemony. This is done by conducting close readings of press conferences made by three platform owners with cloud gaming services (OnLive, Nvidia, and Google) along with articles written by members of the enthusiast press. The corporate sociotechnical imaginary surrounding cloud streaming services associates this technology with a future where playing digital games is more convenient, more financially accessible, and free of platform-based restrictions — without any sacrifices to the authenticity of the gameplay experience. By contextualizing this imaginary within a political economic framework, this thesis argues this sociotechnical imaginary is being used to obfuscate the economic and infrastructural consequences of cloud gaming, and calls for scholars to imagine alternate futures for the digital game industry.

# Preface

This thesis is the original, independent work of the author, S. Willett. Portions of the Theory chapter have been separately published as S. Willett, “When Infrastructure Becomes Failure: A material analysis of the limitations of cloud gaming services.” *Culture Machine*, vol. 18. The remainder of this thesis is unpublished work.

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# Introduction

In early 2019, Google made headlines when they announced Google Stadia — a forthcoming digital game streaming service that runs on the cloud. This technology, referred to in this thesis as 'cloud gaming' allows for users to (as described by Google) "take a sophisticated, graphically intense AAA game, and stream it to a chrome browser on a simple laptop, without any sacrifice to the quality or vision of the game developer" (Google, 2019). Similar to the way Netflix allows users to stream television shows and how Spotify allows users to stream songs, Stadia allows users to access games on a remote graphics processing unit (GPU) housed in a data center, which means that the video output of these games can then be streamed to any personal computer (PC) with player inputs sent back to the data center over the internet.

While online gaming services like Steam and Playstation Plus have already made use of the cloud for storing saved games and transferring user accounts, a remote cloud streaming service has yet to become a mainstream reality in the world of digital gaming. For people with PC gaming experience (also referred to as 'gamers'), a service like Stadia is a liberatory promise — liberation from the large, expensive devices needed to run most modern day, big-budget games. A high-end gaming PC can cost as much as $2000 CAD to build, with additional costs stemming from constant upgrades and maintenance needed to keep the machine from breaking or becoming obsolete. This price has always been a barrier for entry to people hoping to play most new, graphically intensive games. The high degree of technical knowledge needed to build and

maintain a PC has only further cemented this particular sphere of digital games as the realm of hobbyists and obsessives — myself included.

In this light, Google Stadia can be seen as an equalizing force. No longer do people need thousands of dollars and a familiarity with computer hardware to enjoy a graphically-intense PC game. Neither do they need a gaming console such as an Xbox One or Playstation 4, both of which cost several hundred dollars and can only run games designed for their specific platform. Instead, users simply need a functioning laptop and a subscription to Google Stadia to obtain (what is marketed as) a near identical experience to playing games on a high-end PC. Members of the tech and gaming press readily adopted this image of cloud gaming when reporting on the service's early beta period (in which the service was referred to as 'Project Stream'), publishing headlines such as "Google's Project Stream is a working preview of the future of game streaming" (Etienne, 2018) and "Google's Project Stream: That's really a full Assassin's Creed in my browser" (Machkovek, 2018). As stated earlier, Google is also not the only company making moves to establish a cloud gaming service; PC hardware manufacturer Nvidia has already launched a beta for their cloud service GeForce Now, and smaller companies such as Shadow and LiquidSky have also launched similar betas. Other massive tech companies have expressed interest in remote game streaming, with both Amazon and Microsoft currently developing cloud streaming platforms (Hollister, 2019).

To an interested observer outside the industry, this move away from home hardware and towards the cloud may seem like a natural progression for digital games. Considering the growing ubiquity of other streaming media services, why should games be left out of the cloud revolution that has already found success in tv, film, music, and more? For anyone who has been following PC gaming news over the last decade, however, Google's new service is far from

novel. Ten years ago, in a press conference that in many ways mirrored the presentation Google used to announce Stadia, the first cloud gaming service was announced. Named OnLive, this service was also met with a wave of positive press, with one tech journalist declaring that the service could "revolutionise the way we play games in the future" (Reynolds, 2011, para. 1). Another headline described OnLive as "the easy path to instant gratification gaming" (Takahashi, 2010). Notably, these reviewers praised the service for its lack of expected technical problems such as high input latency or image compression. Users did not agree. OnLive struggled to grow its user base despite the positive press, with user reviews citing high latency and poor picture quality as major deterrents to regular use (Leadbetter, 2010). After laying off all of its employees, the company behind OnLive dissolved in 2012 — only two years after the launch of the service (Hollister, 2012).

When I learned about Google's new cloud gaming service, and read the positive impressions its beta test received from the press, my first thoughts turned to OnLive and the positive press that service received at the time of its launch. Why, I thought, was the language and tone used by the press covering Google Stadia so similar to that used by the press covering OnLive? Why were the technical problems that eventually brought down OnLive dismissed by the press? Would these problems also affect Stadia and, if so, why is Google investing in a technology that already tried and failed?

These questions led me to choose cloud gaming services as the topic for my thesis. I wanted to understand the material reasons behind cloud gaming's technical problems, along with the economic motivations behind the re-emergence of this seemingly failed technology. To do so, I needed to take a multi-dimensional view of cloud gaming, conceiving of this technology as both something that is experienced by users and as a private infrastructure being built by large

platform owners (here defined as corporations that control large, multi-service platforms such as Google, Microsoft, Sony, Amazon, and others). This approach necessitated a scholarly triangulation between three disciplines within communications studies — critical media infrastructure studies, digital game studies, and critical theory. Though Evan Conaway (2017) has previously touched upon the intersection between infrastructure and digital games, there had yet to be a serious application of the material focus taken by scholars working in critical media infrastructure studies on the structures and systems used to support online digital games. By bringing together this infrastructural focus with the elements of digital game studies that focus on the way games are experienced by people who play them, I hoped to investigate the ways that the material, infrastructural elements of cloud-streamed games actually impact the games themselves. With elements of critical theory also introduced into this investigation, I would also be able to explore the political economy of cloud gaming, and how these new services stand to economically benefit the platform owners investing in this new technology.

After researching cloud gaming using these three subfields as guide posts, I came to two conclusions supported by literature drawn from critical media infrastructure studies, digital game studies, and critical theory — 1) that cloud gaming has an inherent vulnerability to infrastructural failure due to the nature of digital games, and 2) that cloud gaming would give platform owners increased control over the digital game industry while allowing for the large-scale harvest of valuable user data. Because of cloud gaming's reliance on a connection to a remote server, there is a potential for infrastructural failure to interrupt or delay the continuous stream. These failures manifest as problems such as input lag and image compression which, when combined with the fast-paced, reflex-dependent nature of most popular modern games, can result in player failure when this infrastructural breakdown occurs at an inopportune time. These problems are what

caused OnLive to shut down, as the frustration generated by these unexpected and uncontrollable failures drove users back to traditional methods of playing digital games. Despite these problems, Google, Microsoft and other platform owners are still investing in cloud streaming, primarily because of the economic benefit these companies would receive if people were to switch to cloud gaming over traditional PCs and consoles. Cloud gaming would centralize platform owners' control over the digital game industry, and would allow for the collection of valuable, untapped data from users interacting with the service. In an era where data is fought over due to its potential to increase the efficacy of individually targeted content and attract advertisers, cloud gaming is a heretofore unconquered source of this precious resource — even if the technology is prone to infrastructural failure.

After making these two assertions, I was left with a new question: if cloud gaming has problems with infrastructural failure that drive away users, and platform owners want to invest in this technology regardless of this potential for failure, how are platform owners like Google, Microsoft, and others going to sell this technology to consumers? My thoughts once again turned to the similarities between the press coverage of Google Stadia and OnLive. There seemed to be a consistent, utopian image both the digital games press and the platform owners themselves were attempting to construct around game streaming, one that positioned this technology as a futuristic panacea to the problems facing people who play digital games. While the problems that have affected cloud streaming since the inception of this technology are rarely mentioned, the potentially positive aspects of cloud streaming — its low up-front cost, its convenience, and its lack of platform restrictions — seemed to always be placed in the spotlight.

I decided to investigate the image being constructed around cloud game streaming by using the methodological framework of the sociotechnical imaginary. This framework, which

was developed by Sheila Jasanoff and Sang-Hyun Kim (2009), calls attention to the ways in which powerful actors seek to shape the hegemony by constructing imaginaries around technologies they wish to see accepted into the collective consciousness of the wider population. These imaginaries tie the technology in question with an optimistic and appealing vision of the future, one that can only be achieved via the widespread adoption of said technology. Specifically, I wanted to use a concept I called the 'corporate sociotechnical imaginary,' which specifically seeks to interrogate the imaginaries built by private corporations with the intention of selling their products and services to consumers. By using this methodological framework, I sketch out the vision of the future that was being proposed by Google, Nvidia, and even OnLive, and how cloud gaming (and these platform owners) are being positioned as key elements in bringing this future to bear.

Adopting the framework of the corporate sociotechnical imaginary is what brought me to the central question of my thesis: what is the corporate sociotechnical imaginary platform owners and the enthusiast press are constructing around the technology of cloud gaming? In addition to this primary question, I also ask two sub-questions: how are the platform owners constructing this imaginary? And what political or economic purpose does the construction of this imaginary serve? By answering these questions, I intended to better understand the way that platform owners attach their products and services to utopian visions of the future, and how these futuristic imaginaries serve to cloak the problematic elements of the technologies they are meant to valorize.

I start with a literature review, which positions my research between the subfields of critical media infrastructure studies, digital games studies, and critical theory. This triangulation is done in two parts. In the first half of the Literature Review chapter, I follow the development

of critical media infrastructure studies as an emerging subfield, highlighting the contributions of key scholars such as Susan Leigh Star, Geoff Bowker, Lisa Parks, Nicole Starosielski, and others. Then, I demonstrate the ways in which critical media infrastructure studies can interact with digital games, arguing that — while digital games studies is an emerging subfield of its own — digital games themselves are better conceptualized as a "boundary object" (Star & Griesemer, 1989) that connects disparate fields of inquiry around a central, plastic object of study. In the second part of the literature review chapter I argue for the necessity of a political economy approach to studying the re-emergence of cloud gaming services, as the form infrastructure takes is shaped and constrained by the economic and political systems in which that infrastructure operates. I then identify scholars from the critical theory tradition who have already applied a political economy approach to the study of infrastructure and digital games, as well as scholars who have used critical theory to interrogate the way public opinion is shaped and controlled by political and economic forces.

The second chapter of this thesis, entitled Theory, is where I explain and justify two assertions that are foundational to my central questions — that cloud gaming is inherently vulnerable to infrastructural failure in a way that other streaming media isn't, and that cloud gaming would be an economic boon to any platform owner that managed to successfully draw in a large number of users to one of these services. First, I use work from the field of critical media infrastructure studies to explain the material problems that affect all streaming media, and how these problems stem from infrequent yet unavoidable infrastructural failure. Then, I synthesize this idea with concepts from digital games studies to demonstrate how these problems affect cloud gaming more profoundly than other forms of streaming media, identifying the way that infrastructural failure impugns upon the "magic circle" (Huizinga, 1949, p. 11) separating games

from the outside world, and how this imposition can result in non-consensual, unavoidable in-game failure for users playing the game. In the second half of this chapter I seek to justify the second of my two assertions, this time by using the work of scholars who have applied a political economy approach to the study of platforms to help determine the economic justification for the recent resurgence in cloud gaming. By using the concept of the "project of control" (p. 124) created by David Nieborg (2011) to explain the actions of platform owners in the console games industry, I explore how cloud gaming can give companies like Google, Microsoft, and Amazon more control over their platforms while simultaneously transforming a commodity that is traditionally bought and sold (digital games and game consoles) into a commodity that is rented from platform owners indefinitely. I also use the work of Nick Srnicek (2017) to interrogate how cloud gaming may also serve as the next big frontier for the collection and analysis of user-generated data — a valuable resource for platform owners in today's economy.

The third chapter, Methodology, is where I explain my use of the sociotechnical imaginary as a guiding methodological framework for answering the central questions of my thesis. I begin by explaining and contextualizing the sociotechnical imaginary, as well as demonstrating examples of how this methodological framework has been used by other scholars. The concept of the corporate sociotechnical imaginary is then introduced, providing a more specific methodological lens through which the imaginary building done by private corporations can be interrogated and explored. I then proceed to justify my use of the corporate sociotechnical imaginary in my analysis of cloud gaming, comparing and contrasting this framework to other, similar methodological approaches. This chapter is concluded with an overview of the methods and materials I used in my analysis, which includes a brief summary of the press conferences and press articles used in my research along with my initial findings.

The final chapter of the thesis is the Analysis and Discussion, in which I explore the findings of my research by piecing together the shape and structure of the corporate sociotechnical imaginary that platform owners have constructed around cloud gaming. As discussed further in the Analysis and Discussion chapter, I found that platform owners have sought to associate cloud gaming with a utopian, emancipatory vision of the future, one where playing digital games is more accessible, more convenient, and free of platform restrictions — without any sacrifices to the quality of the actual gameplay experience. I argue that this imaginary — which is co-constructed by the online gaming press in part due to the economic influence exerted by platform owners — is deployed by the platform owners in service of obfuscating some of the more troubling or potentially negative aspects of cloud gaming, such as the lack of user control, the need for users to pay an indefinite rent to access games, the perpetuation of platform-exclusive games, and the prevalence of infrastructural failure. The corporate sociotechnical imaginary surrounding cloud gaming also serves to claim ownership over the future on behalf of platform owners, simultaneously positioning cloud gaming as an inevitable next step in the digital games industry while also serving to deny the existence of other potential futures for the medium.

The thesis concludes with a brief exploration of these other, potential futures. By identifying the future that platform owners want for the digital games industry — and articulating how this future will both benefit these companies' bottom lines while negatively impacting people who play digital games — my hope that scholars, developers, and gamers will be able to resist this future, working instead towards building a medium that is collective, democratic, and outside the exclusive control of Google, Amazon, Microsoft, and other corporate behemoths.

# Literature Review

## Introduction

When a player of an online digital game interacts with another player in the game, a series of interconnected systems ensures both players experience this event as intended by the developers. First, the game's base-level software recognizes that this action occurred, and decides that this action needs to be communicated to other players. The game then packages this information and sends it off to either a centralized server or directly to other players, depending on the type of network architecture chosen by the game's developers. This data packet must then travel through wifi signal or ethernet cable to a router, which then sends the packet through a system of fibre optic and broadband cables to its final destination. At this point, depending on the network protocols used by the game, the opponent player's device may have to send back a signal confirming the arrival of the data packet. Only then will the virtual interaction actually take place. Without this dense system of signals and information transfers, that interaction — whether it is an attack, a healing spell, or a friendly message — will have never meaningfully happened. The attack will not land, the heal will not find its target, and the message will be lost in the ether.

For most online games, this entire process happens within fewer than 100 milliseconds. This is quickly enough to appear instantaneous, which is a necessity for digital games — beyond 200 milliseconds, the disconnect between player-input and in-game response becomes too noticeable to ignore and the game becomes difficult to play (Andrés, López, José, Parra & Torres, 2017, p. 102). Because of this, online games rely on a vast array of digital and physical

systems to invisibly send information between players, systems which compose a distinct set of media infrastructures. Without this infrastructure, players could not send information between each other, and online games as a medium could not exist. So why are digital games absent from scholarly discussions of media infrastructure? This question is even more pressing, now that corporations such as Google, Nvidia Microsoft, and Sony are developing cloud streaming platforms for digital games — all of which will necessitate a new layer of infrastructure in order to facilitate this nascent technology.

In this chapter I position my research within a nexus of intersecting academic fields — those of critical media infrastructure studies, digital game studies, and critical theory focusing on political economy. To do this, I first demonstrate that a gap in the communications literature exists between critical media infrastructure studies and game studies, and explain how this gap could be filled. I begin by giving an overview of critical media infrastructure studies as a subfield, describing how it builds off of literature from science and technology studies and evolved into a distinct set of methodological and theoretical approaches. I also discuss how different authors in critical media infrastructure studies approach the idea of materiality. Then I move to an outline of digital games as a research area, in which I highlight the diversity of disciplinary approaches that have been applied to the analysis of this medium. Due to this variety, I propose that digital games serve as an interdisciplinary "boundary object" (Star & Griesemer, 1989) between a variety of subfields, and that the plasticity of the medium allows for exciting instances of disciplinary overlap. All games, not just digital games, can function as a nexus by which disparate theoretical and methodological approaches can engage and build off of one another, in part because of the multitude of approaches games allow through their interactive and networked designs.

I propose a method of linking critical media infrastructure studies to digital games by focusing on the way digital game players interact with infrastructure, using existing research in the field of computer science along with digital games literature focusing on cheating and counter-gaming. A critical media infrastructure framework applied to digital games provides a new form of human-infrastructure relationship for the subfield to explore, while also adding a new dimension to the analysis of digital games.

However, for the purpose of this thesis, this overlap between critical media infrastructure studies and game studies is not sufficient to grapple with the implications and consequences of a new generation of cloud gaming services entering the market. To properly analyze this phenomena, I have found it necessary to step back and situate both the infrastructure being built to support these services and the games that they seek to distribute within a wider socioeconomic context. Thus, this chapter also introduces a third subfield of communications studies — critical theory rooted in political economy. In this final section, I explain how an approach that foregrounds the political economy of an object of study allows for investigations into questions of control, power, and inequality that are outside the reach of other theoretical approaches, and demonstrate how political economic analyses has already been used to great effect within the subfields of infrastructure studies and games studies. I then conclude with a brief overview of literature that seeks to understand how public opinion and the dominant hegemony can be shaped or transformed by political and economic forces, in order to lay the groundwork for the central question proposed by this thesis.

## Critical Media Infrastructure Studies

While critical media infrastructure studies is a relatively new subfield of communications studies, the study of digital infrastructures is not. The mid-1990s saw the emergence of a systems-based approach in the field of science studies, which began to explore the impact of infrastructures on knowledge creation communities. Susan Leigh Star and Geoff Bowker, two researchers in the field of informatics, became key proponents in this new infrastructure-focused research. Star worked with Karen Ruhleder on a 1996 paper entitled "Steps Toward an Ecology of Infrastructure: Design and Access for Large Information Spaces," which described an ethnographic study the pair conducted on biologists using a large genetics database to work on a collaborative project. Through semi-structured interviews and by spending time with these researchers, the authors realized that use of the database was hindered by infrastructural issues. To examine these issues the pair lay out qualities that define infrastructure, including embeddedness, invisibility, standardization, and a tendency to only be noticed upon breakdown (Star & Ruhleder, 1996, p. 113). Star and Ruhleder also argue that infrastructure should be considered a primarily relational concept, as what one person considers infrastructure could be a target object for another. This idea was built off of Bowker's concept of an "infrastructural inversion" (as cited in Star & Ruhleder, 1996, p. 113) which placed a new focus on the relational aspects of how infrastructure is adopted and naturalized by communities of practise.

Research into the infrastructure supporting knowledge creation communities continued through the late 1990s and into the 2000s, with researchers like Karen Baker, Florence Millerland, and David Ribes writing on how infrastructural practises are articulated to communities of practise, (Baker & Millerland, 2007; Ribes & Baker, 2007). In 2010, Bowker — along with Baker, Ribes, and Millerland — attempted to place this infrastructure-focused

approach to science studies within its own, distinct research area. Called 'information infrastructure studies,' the authors argue for the importance of a concerted, infrastructure-level analysis of how scientists and researchers create knowledge. They define infrastructure as "pervasive enabling resources in network form" (Bowker, Baker, Ribes & Millerland, 2010, p. 98) arguing that protocol, standards, and even social systems should be considered infrastructure along with more traditional physical structures. Notably, this definition explicitly defines infrastructure as both physical and non-physical systems, stating that "beyond bricks, mortar, pipes or wires, infrastructure also encompasses more abstract entities, such as protocols (human and computer), standards, and memory" (Bowker, Baker, Ribes & Millerland, 2010, p. 97). The authors also argue that the values and politics behind infrastructure should be actively interrogated, and that this interrogation is the only way to ensure just manifestations of network technology.

This information infrastructures framework forming within science studies strongly influenced the development of a new approach to media studies, which began to emerge during the mid-2010s. This new materiality-focused subfield has built off of the work of Star, Bowker and other researchers, extending their theories into the world of audiovisual media distribution. Now called 'critical media infrastructure studies,' this approach is described by Lisa Parks and Nicole Starosielski (2015) as an effort to "call attention to the media infrastructures that distribute audiovisual content, the ways industries and people imagine, organize, and use those infrastructures, and the varied scale at which they operate" (p. 1). Instead of analyzing media as texts, or even objects, critical media infrastructure studies analyzes media in terms of how it is physically distributed. Focus is shifted onto the material systems used to transport signals across

the world — along with the people and organizations that control these systems, and how these systems are understood and conceptualized by the people that use them (Peters, 2015).

Parks and Starosielski, both in their independent work and their projects together, have helped to form the foundation of this emerging subfield. In "'Stuff You Can Kick': Toward a Theory of Media Infrastructures," (2015) Parks builds off of her past work on communications satellites to lay out a critical methodology that allows for the analysis of media infrastructure and the ways it relates to broader economic, political, and social contexts. She defines media infrastructure as "the material sites and objects involved in the local, national, and/or global distribution of audiovisual signals and data," (p. 356), and argues for an analytical approach that breaks down larger systems of distribution into their component parts to to better understand the nature of the whole. To demonstrate this, she applies this methodology to three media representations of objects and people integral to media infrastructure: mail sorter employees, electrical poles, and satellite dishes. In doing so, Parks shows the layers of meaning that can be uncovered through foregrounding the material aspects of audiovisual media, a concept she would go on to explore further in later work.

Starosielski took a similar approach to media distribution in her 2015 book *The Undersea Network,* which documents the history, social positioning and material nature of undersea telecommunications cables in the Pacific Rim. Starosielski actively seeks to reorient media distribution away from the ephemeral and into the real, focusing on the environmental, financial, and cultural impacts of the cables' physical presence — in other words, a "physicality of the virtual" (p. 15). In particular, she chooses to focus on the people that contribute to the operation and construction of the undersea cable network, using a combination of ethnographic, archival, and artistic methods to do so. The book's chapters each focus on the ways the undersea cables

have manifested in cultural, political, or discursive environments, with Starosielski building the argument that a sense of place and topography is more useful for studying these infrastructures than a disconnected focus on only the information they help transport.

Both Park and Starosielski prioritized physical manifestations of infrastructure in these works, with both authors focusing on situated, brick-and-mortar structures in their analyses of media distribution. While useful, this limited scope overlooks the non-physical media infrastructures included in the definition used by Bowker, Baker, Ribes & Millerland (2010) — the "protocols, standards, and memory" (p. 97) that are also needed to operate these systems. A continuing absence of the non-physical would have restricted the space in which critical media infrastructure studies could explore, but this blindspot was soon addressed. In the introduction to *Signal Traffic*, Park and Satrosielski's (2015) edited collection of critical writing on media infrastructure, the authors expanded the definition of media infrastructure to "situated sociotechnical systems that are designed and configured to support the distribution of audiovisual signal traffic." (p. 4) For Parks and Starosielski, media infrastructure moved beyond the "tubes and wires" of cables and data centers, and into a broader world of social and technical systems. Under this definition, aspects of media technology that have not traditionally been conceived of as infrastructure — such as, for example, an algorithm in an online digital game meant to reduce perceived latency by predicting player movements — can now be framed as infrastructure due to their role in supporting the distribution of signal traffic.

However, this expanded definition does not mean that material analysis must be abandoned. One of *Signal Traffic*'s essays, "Protocols, Packets, and Proximity: The Materiality of Internet Routing" by Paul Dourish (2015), argues that non-physical infrastructures such as network protocols still have a material aspect. Dourish argues that these protocols — which are

used to route data between locations on the internet — should be seen "as things that are designed to serve applications, to run on computational platforms, and to control infrastructures, bound up with and contributing to the material realization of them all" (p. 185). While they may not be material in the same way a cable is, Dourish explains that protocols shape and are shaped by the materialities of the networks they travel over, and are just as vital to the distribution of digital media.

There has also been a concerted effort by some scholars to match an analysis of the material aspects of media infrastructure with an analysis the data they are transporting. This kind of balanced approach is used by Tung-Hui Hu in his 2017 book, *The Prehistory of the Cloud.* In it, Hu constructs a technological prehistory of the concept of 'the cloud,' while also examining the politics that unconsciously permeate digital culture. He argues that the cloud has become a way for power to be exerted onto individuals, as it has shifted a culture policed by a Foucauldian sense of control into one where people are constrained by the patterns of data they unconsciously create by acting within the cloud. Hu attempts to demonstrate how the cloud is often laid over top of older structures of power — in a particularly clear example, he describes cold war bunkers that have been converted into data centers, marking a transition from the need to protect territory into a need to protect information. Notably, Hu makes his argument by examining the material and ephemeral aspects of the cloud, placing importance on both the physical data centers and the information stored within and moved between them. Other authors have taken a similar approach, applying this type of analysis to data centers (Cubitt, Hassan & Volkmer, 2011) and network cables (Fish, 2014).

Critical media infrastructure studies, despite being a new subfield, has already expanded to cover a number of different topics — in *Signal Traffic* alone, there are analyses of internet

cafes, cell phone networks, and consumer electronics. In doing so, the material aspects of media distribution have been placed at the forefront, and new dimensions of control, power, and inequality have been explored. However, there is one realm of modern audiovisual media the subfield has yet to seriously engage with — digital games.

## Digital Games Studies

While digital games have existed since the 1960s, digital games scholarship within the humanities and social sciences is a relatively new phenomena. Since the early 2000s, the growing body of literature exploring digital games has coalesced into a distinct research area known as digital games studies. Here I intentionally use the term 'research area' instead of a 'subfield' due to the nature of the digital games studies literature. While subfields unite scholars using similar approaches to study their subjects, the digital games studies literature is composed of a many disparate approaches pulled from a variety of disciplines — ranging from literature studies, computer science, design studies, game studies, and communication studies

This disparity between disciplinary approaches becomes apparent when engaging with the digital games studies scholarship. Some works, for example, simply approach digital games as another type of game — albeit a kind that also portrays a fictional world. In his 2005 book, *Half Real*, Jesper Juul attempts to link theories from traditional games studies to digital games, while also exploring how digital games move beyond established definitions of what games can be. Juul argues that digital games are "the intersection between games as rules and games as fiction," (p. 197) and that a game's fiction and ruleset can interact with and supplement each other. This connection between a digital game's rules and fiction has been further explored in

research that seek to interrogate how games communicate values (Flanagan & Nissenbaum, 2014), emotions (Isbister, 2016), and ideas (Bogost, 2010) to their players.

Other works approach games as a form of literature — texts to be studied and broken apart in search of meaning. Ian Bogost took this approach in his 2006 book *Unit Operations*, in which he attempted to connect literary theory with computation. Bogost argues that all literary works "can be read as a configurable system, an arrangement of discrete, interlocking units of expressive meaning" (p. ix) and that doing so would allow for a more detailed analysis of video games and other cultural artifacts that exist as both art and technology. This use of literary theory is contrasted by the design-focused approach used by other authors writing on digital games. For example, *Rules of Play: Game Design Fundamentals* by Katie Salen Tekinbaş and Eric Zimmerman (2003) frames games as a matter of design, detailing tools and approaches intended to aid game designers in creating digital games.

While this variety within digital games studies has made classifying this literature within a single subfield a contentious proposition, it has also resulted in a diverse body of work unconstrained by disciplinary boundaries. In this way, digital games can be considered a "boundary object" (Star & Griesemer, 1989) between various disciplines. As with other boundary objects, digital games are "plastic enough to adapt to local needs and constraints of the several parties employing them, yet robust enough to maintain a common identity across sites" (p. 393). Using this conceptualization, the branching and decentralized scholarship can be seen not as a problem in need of solving, but instead as a natural outcome of digital games as a medium. Digital games are complex, multi-faceted objects, with narratives, rules, values, and technologies — all available for a variety of different methodological approaches. This plasticity

has continued to attract new approaches and methodologies under which digital games can be analyzed — and critical media infrastructure studies should be the next to enter the fold.

## The Media Infrastructure of Digital Games

Considering that online digital games rely on both physical and digital infrastructures to function, it is surprising that the framework of critical media infrastructure studies has yet to be applied to this medium. However, this does not mean that there is no literature on online digital game infrastructure — writing from the fields of computer science and human-computer interactions has covered this topic extensively. Researchers from these fields have explored the effects of different network protocols on digital games (Andrés et al., 2017), the types of data compression used to achieve responsive player-player connections (Saldana, Fernández-Navajas, Ruiz-Mas, Aznar, Viruete & Casadesus, 2011), and even player reactions to breakdowns in this architecture (Chung & Gardner, 2012).

While this literature is primarily technical and administrative in nature, it is still very useful for critical scholars in the humanities and social sciences for three reasons that I elaborate upon here. Firstly, these papers lay out how this technology works in a relatively accessible fashion. As long as a reader has sufficient background knowledge to navigate basic technical jargon, reading this research allows non-specialists in the humanities and social sciences to better grasp how these systems operate and interact with each other. Without this explanatory work technical information on digital games infrastructure would be difficult to access for non-specialists, and the ability of scholars to write about it in a meaningful way would be severely hamstrung.

Secondly, this literature helps demonstrate that the non-physical systems supporting digital games are, in fact, infrastructure. As mentioned earlier, non-physical systems are not always included in definitions of media infrastructure, and the inclusion of software-level network architecture within these definitions has the potential to be contentious. These papers show that structures such as memory management systems and network protocols function as "pervasive enabling resources" (Bowker, Baker, Ribes & Millerland, 2010, p. 98) for the ongoing operation of online games, making them as much a part of the infrastructure as physical cables or data centres. Like other media infrastructure, the systems that connect digital games are embedded, transparent, and rooted within a community of practise — even if some only exist as lines of code.

Lastly, this literature is useful in showing precisely how this infrastructure can be taken advantage of by digital game players, who have learned to exploit the strengths and weaknesses of these systems. An example of this can be found in Amir Yahyavi and Bettina Kemme's paper "Peer-to-Peer Architectures for Massively Multiplayer Online Games: A Survey" (2013), a highly technical article discusses the benefits and limitations of using peer-to-peer networks to connect players in online games. Yahyavi and Kemme spend a large portion of the paper discussing the methods players use to 'cheat' peer-to-peer networks, and techniques developers can use to try to stop these unwanted interventions. This cheating includes players using devices to slow their internet connection speed to hide their character's location, players intentionally disconnecting from other players to prevent a match from counting as a loss, and players tampering with the types of signals sent to their opponents (p. 33-4).

This last point is important because it shows a potential connection point between critical media infrastructure studies and the broader literature on digital games. There is already a body

of work on how digital game players cheat and exploit games, which can easily be applied to this type of "cheating the infrastructure." Most notably, Mia Consalvo's (2007) book *Cheating: Gaining Advantage in Videogames* analyzes the concept of cheating in digital games, with a particular focus on the power of player agency in shaping the way the games industry has developed. Consalvo traces a history of how cheating evolved alongside digital games, from the use of cheat codes as a debugging tool for developers to modern perceptions of cheating. This turns to a closer look at how players conceptualize cheating and what they believe does or does not constitute cheating, with a focus on massively-multiplayer online games. A similar approach was taken by Alexander Galloway (2006) in his writing on counter-gaming, in which he described ways in which players alter games in order to subvert their intended gameplay. In one example, Galloway describes a player-made modifications to popular shooter game that transforms the linear, corridor-like levels into "fits of abstract modernism" that serves to "usurp" the gameplay entirely (p. 107).

Both Consalvo and Galloway's works show players manipulating digital games in a way that runs counter to the intention of their creators, but both are also constrained to manipulations within the boundaries of the games themselves. A critical media infrastructure studies approach could extend this type of analysis into the material components of online digital game networks, and examine how players manipulate these networks to gain an advantage. This intersection would expand the possibility space in which digital games scholarship operates within, and would also serve as a novel addition to the critical media infrastructure studies literature. Widespread instances of digital game players tampering with network infrastructure implies a human-infrastructure relationship unlike those typically examined in critical media infrastructure studies, which usually explores the ways these systems are hidden and ignored by the general

populace (Parks & Starosielski, 2015, p. 6). By studying the networks of digital games — along with the people that play them — scholars in critical media infrastructure studies could gain a deeper understanding of what makes infrastructures invisible, and how this invisibility can be disrupted through human intervention. This potential intersection will only become more relevant as new forms of digital game infrastructure — such as the data centres and compression algorithms needed cloud streaming — continue to emerge.

## Political Economy

To answer the questions in this thesis, it is not enough to simply identify and interrogate the infrastructure being used to support digital games. The emergence of cloud-based digital game streaming raises a host of issues that go beyond the experience of using this infrastructure, or the way different groups conceptualize and interact with this infrastructure. Why are so many companies developing cloud streaming infrastructure? How are they going about establishing this infrastructure in a highly competitive field? And, perhaps most importantly, what do these companies stand to gain by introducing this new technology to the marketplace?

There is another layer to the study of media infrastructure, one which takes these technologies and places them within a wider socio-economic context. While much can be gained by studying technology in isolation — focusing instead on the experience of users or the impact of networks on the media they distribute — questions regarding power and ownership lurk under the surface of any exploration of infrastructure. This is true both in regards to this thesis and to the wider body of critical media infrastructure studies, much of which is concerned with questions of control and inequality.

The physical and digital structures that compose infrastructure networks are not naturally occuring phenomena. All infrastructure, from roads and sewage systems to fiber optic cabling and software-level network architecture, is built, maintained, and owned by institutions with a vested interest in the ongoing existence of the network these structures support (Burrington, 2016). The exact nature of this vested interest varies with the nature of the institution in question, along with the economic system in which these institutions operate. A government operating in a centrally planned economy, for example, would create infrastructure in order to promote continued economic expansion and development, while a corporation operating within a free-market economy would build infrastructure in the pursuit of capital accumulation. Accordingly, the infrastructure created by these two institutions would be as radically different as the economic systems in which they operate, as each institution would prioritize or minimize different aspects of these networks in order to accomplish their goal.

In this way, the economic and political context in which an infrastructure exists ultimately shapes and constrains the form that the infrastructure will take. This is by no means a new concept — Karl Marx identified the relationship between the base and superstructure of a society in 1859 in *A Contribution to the Critique of Political Economy*, arguing that the material relations between individuals form the basis by which other expressions of society, such as law or culture, are patterned. While this relationship is not a one-way street, as the superstructure can in turn shape and alter the base, Marx and his colleague Friedrich Engels still asserted that the economic reality of a society determined the structure of that society "in the last instance" (Engels, 1934).

This idea, that a society's culture, values, and institutions are inextricably tied to its economic base, has led to the development of political economy analysis within the social

sciences and humanities. Using a political economy approach allows for scholars to situate their analyses "within an understanding of the prevailing political and economic processes in society — specifically, the incentives, relationships, and distribution and contestation of power between different groups and individuals" (Mcloughlin, 2014). Under this lens the actions of corporations, governments and other institutions operating within a capitalist society are not taken at face value, but rather interrogated with the knowledge that the economic system under which they operate incentivizes capital accumulation, monopoly ownership, and control. In doing so, a political economy approach can expose and question lines of economic power that are embedded within industries in a way that other means of analysis are incapable of.

An example of a critical political economy analysis being applied to the study of infrastructure can be found in Keller Easterling's 2014 book *Extrastatecraft: The Power of Infrastructure Space.* Easterling explains that infrastructure makes up "the rules governing everyday life" (p. 11), and that our routine interactions with these rules compose an 'infrastructure space' that can be reduced and replicated to generate near-identical urban spaces throughout the world. Because these infrastructure spaces are so pervasive and invisible, Easterling argues that they have become an effective mechanism for nation states, international corporations, and other global powers to perpetuate systems of control in a way that makes them "immune to righteous declaration or prescription" (p. 23). To build this case, Easterling focuses on three examples of what she coins 'extrastatecraft' — special economic zones, broadband internet cabling, and international standards — illustrating how these separate "strata of infrastructure space" (p. 20) are used by institutions to escape regulation, expand their markets, and legitimize harmful business practises. In between these case studies, Easterling also explains how to read the overarching forms, or 'dispositions,' of various kinds of infrastructure, and

explores how the carefully manicured liberal histories of infrastructure serve to hide these dispositions.

While the topics she discusses have also been written about by other media infrastructure scholars (both broadband cabling and international standards, in particular), Easterling's focus on the political economy of these infrastructures is able to reveal the ways in which power manifests itself through invisible structures and systems in a way that other methodological approaches are incapable of. This is not to say that Easterling's approach is superior, or should be the only way infrastructure is studied. Other methodologies that take a more experiential or ethnographic focus, such as the work of Susan Leigh Star and Lisa Parks, are able to reveal aspects of infrastructures far outside the scope of political economy — such as the way people conceptualize infrastructure, or the way in which infrastructure impacts communities. However, an approach that foregrounds the political economy of an industry is still necessary for scholars who seek to actively confront the role that economic power takes in the development and dissemination of new technologies, as I do in this thesis.

The value of a political economy approach can also be found in the realm of game studies, particularly in the work of scholars who focus on how platforms (both physical platforms such as game consoles, and digital platforms such as Steam or the App Store) are used as a means of enforcing particular modes of distribution and corporate control. Early platform studies approaches taken by scholars like Ian Bogost and Nick Montfort (2009) established the importance of materiality and infrastructure in the study of digital games, but were lacking a political economy dimension. More recent platform studies work by scholars such as David Nieborg (2014) and Daniel Joseph (2017) have introduced a political economy analysis to platform studies in order to explore how platform holders establish de facto monopolies through

the use of standardization, continual innovation, and sheer economic force. Functional monopolies have allowed platform owners such as Microsoft and Valve the ability to enforce complete control over their digital marketplaces, dictating the rules that both game developers and consumers must follow. Additionally, with the emergence of platform-based commodity forms such as battle-passes, loot boxes, and downloadable content, this platform-based analysis has become increasingly relevant. Outside of the realm of game studies, authors such as Nick Srnicek (2017) have also written about the tendency of modern capital to consolidate into platforms as a means of economic capture and control, applying this same lens to companies such as Uber, Google and Facebook. This work on the political economy of platforms is particularly relevant to my thesis, as platforms are the interface by which consumers interact with both cloud infrastructure and digital game infrastructure as a whole, and thus will be discussed further in the next chapter.

In examining the ownership and economic power inherent in infrastructure, another question arises — how does infrastructure become infrastructure in the first place? As explained by Susan Leigh Star (1999) in her writing on infrastructure, a key aspect of any infrastructure is that it is "transparent to use in the sense that it does not have to be reinvented each time or assembled for each task, but invisibly supports those tasks." (p. 5) Transparency such as this does not occur automatically, however, and asking how exactly a new technology reaches the level of familiarity necessary for it to be considered infrastructure can reveal new dimensions to the way in which systems of organization are introduced and ingrained into the public imagination. This is especially pressing when discussing the advent of 'new' infrastructures, such as the data centres, algorithms, and platforms needed for digital game streaming.

For a new technology to reach the status of infrastructure, attaining a level of familiarity amongst users that renders the technology invisible upon use, the technology must first be adopted and accepted by the consumer public. To aid in understanding this transition as it applies to cloud gaming, I draw upon scholarship and research that seeks to understand how ideas, products, and ways of being are legitimized within western capitalist states. This includes using Antonio Gramsci's (1999) concept of hegemony, which theorizes the existence of a dominant ideology within society that serves to mask contradictions and difficulties experienced by living under a capitalist system. The dominant hegemony is constantly shifting and transforming due to societal and economic pressures attempting to either challenge or reaffirm the overarching status-quo. If a new technology was to be fully subsumed into the dominant hegemony, this would allow for that technology to escape past the novelty of its initial introduction into society and secure a place as a part of a wider infrastructure that is allowed to fade into the background of our consciousness and achieve the transparency Star (1999) spoke of. A prominent example of this process would be Facebook — what was once a niche website used by ivy league students to connect with their peers is now a multi-billion dollar enterprise that is in some ways a necessary service for individuals who seek to maintain a healthy and engaged social life. What was once a novel service is now on the level of infrastructure, completely and inextricably ingrained into the ways in which we live our daily lives.

This process of 'infrastructuralization' of course benefits private companies that have a vested interest in a technology's success, as a technology that has become part of the accepted status quo is one that can continue being profitable and relevant for far longer than a technology that is purely seen as a novelty. This leads to active efforts on behalf of the owners of new technologies to introduce their technology into the hegemony, either through monopolistic

business practises as described by authors such as Nieborg (2014) and Srnicek (2017), or through legitimization in the public consciousness.

Vincent Mosco (2014) explores this process as it relates to cloud technology, describing the different channels by which companies invested in cloud technology are able to advance positive images of their products to either other industry professionals or the general public. Similarly, Edward S. Herman and Noam Chomsky's 1988 book *Manufacturing Consent,* while concerned with how liberal governments exert soft-power on nominally private press outlets, offers a compelling exploration of the methods by which a large company such as Google or Microsoft would be able to establish a positive narrative surrounding their products through control over advertising, access, and even ownership of the enthusiast press. By exerting these forms of soft-power large technology companies are able to ensure positive coverage of their products in relevant media outlets, which aids in securing their place within the dominant hegemony — and in turn hastens the process of infrastructuralization.

## Conclusion

In analyzing the emergence of cloud gaming services onto the market, a number of different sub-fields of communications need to be brought into conversation with one another. The first of these are critical media infrastructure studies and digital game studies — online digital games could not operate without the infrastructure, both physical and digital, through which players are connected to a shared, simultaneous game world. Because of this, digital games are valuable area of research for critical media infrastructure studies — an emerging subfield that foregrounds issues of materiality in media distribution. By examining how digital game players interact with network infrastructure, new perspectives in both critical media infrastructure studies and digital

games studies can be reached. However, this is not the only possible connection point between digital games and critical media infrastructure studies. Digital games are a boundary object, a plastic medium that is usable in many different ways by many different disciplines. This includes another subfield of communications studies — critical theory that seeks to understand objects of study through the analysis of the political economy surrounding those objects. Through using the lens of political economy to study the nexus between media infrastructure and digital games, questions of power, control, and inequality can be confronted head on. This allows for investigations into how private companies consolidate power through platformization, and how these companies turn novel products and services into transparent infrastructure by seeking to ingratiate those products and services within the dominant hegemony.

In the next chapter, I take the concepts and analytical lenses introduced in this literature review and begin using them to establish a theoretical background that justifies the central question of this thesis. By drawing on scholarship from critical media infrastructure studies, game studies, and critical theory, I demonstrate the central problem that exists within cloud gaming as a technology, and explain why companies such as Google, Nvidia, Amazon and Microsoft are so invested in its future success.

# Theory

## Introduction

Before I begin to answer the central question of this thesis — i.e. what is the corporate sociotechnical imaginary platform owners and the enthusiast press are constructing around the technology of cloud gaming? — I first properly situate this it within its economic and social context. To do this, I discuss two things: the technology of game streaming itself, and the economic motivation behind its sudden emergence as a serious force in the digital games industry.

First, I build on work done by scholars in the fields of critical media infrastructure studies and game studies to establish the infrastructural limitations inherent to cloud game streaming. I argue that by adding a layer of infrastructure on top of the experience of playing digital games, cloud streaming introduces a new potential for that infrastructure to break down and become visible. Digital games, due to their dependence on a firm separation between the world of the game and the outside world, are uniquely vulnerable to the disruptive nature of infrastructure failure.

Then, I examine why large platform owners like Microsoft, Sony, and Amazon are investing large amounts of capital into a technology with this kind of inherent vulnerability. To do this I draw from the theoretical models developed by scholars of the political economy of platforms to show how the move to cloud streaming serves as an extension of the already established trajectory of the digital game industry. I also discuss

the role of data collection in the renewed interest in game streaming seen in large platform owners such as Google, Amazon, and Microsoft, connecting this emerging form of streaming media service to larger trends within modern platform-driven capitalism.

## Part One: The Wrong Kind of Failure

In the introduction to this thesis, I described the brief history of OnLive, a cloud gaming service that launched in 2010 — only to be discontinued in 2015 after years of financial and technical difficulties. With the collapse of OnLive, which was largely due to problems with latency, image compression, and other technical issues (Leadbetter, 2009), cloud gaming became a technology on the fringes, with few companies willing to risk an investment into a service that already has such a high-profile failure. As other media took to the clouds, gaming stayed firmly on the figurative ground.

This may never change. The cloud is a source of infrastructural failure, a sword that hangs unwaveringly over the streaming game, ready to sever the player from their experience at any moment. This severing generates failure in turn: an unavoidable, unpredictable, in-game failure that threatens to shatter the barrier separating games from the reality found offline.

In the following section, I describe the physical and technical limitations that cause infrastructure failure — moments in which infrastructure breaks down and is rendered visible (Star, 1999) — , and use evidence drawn from the fields of critical infrastructure studies and game studies to explain why this kind of externally introduced failure is so disruptive to digital games. Ultimately, I argue that infrastructural failure is an insurmountable obstacle for companies attempting to launch streaming services, and that unless the cloud — or mainstream

gaming — drastically changes, new attempts at launching a cloud gaming service will still feel more akin to OnLive than the experience of using Netflix or Spotify.

## Infrastructural Failure

The problems that prevented OnLive from reaching the same ubiquity as Netflix or Spotify remain, and new streaming services do not appear to have a strategy to fix them. Despite what Google and Nvidia's marketing appears to claim, high latency and subpar image quality in streaming cannot be eradicated with more powerful graphics processing units (GPUs).

These problems are consequences of infrastructure. No matter how powerful Google or Nvidia's computers may be, sheer graphical prowess cannot make up for the fact that light can only travel so fast, or the tendency of internet connection speeds to waver and fluctuate due to variable internet traffic (Li, 2015). The problems users face when streaming games are instead caused by the distance between players and data centers, the quality of players' internet connections, and other material factors — variables that the platform-owners running cloud streaming services unable to control. The marketing used to sell GeForce Now, Google Stadia and similar services masks this lack of control in order to hide the potential for infrastructural failure, which is an inescapable aspect of the cloud streaming experience. When the infrastructure supporting cloud gaming fails, that failure directly impacts the game being streamed. Visual and technical glitches can appear, altering the way players interact with the game world.

The most obvious of these potential glitches is input lag, which I define below. When using a cloud service such as GeForce Now, a player interacts with the streaming game by entering inputs using a controller or keyboard. These inputs must then be sent over the internet to

the remote GPU running the game, where they are translated into in-game actions such as moving, attacking, or otherwise interacting with the game world. The player sees the effect of their inputs after the GPU's video output travels back through the internet to be displayed on their PC. This entire process can only happen as fast as the network can allow, with factors like the distance between the player and the GPU or the quality of the player's internet connection dictating the speed at which this information can be exchanged. If this process happens slowly enough, it manifests as input lag: a noticeable delay between a player's input and the corresponding in-game action taking place on their screen. This delay can sever the already tenuous relationship between player action and perception, a relationship all gameplay is ultimately dependent on to preserve the cohesion of the intended experience. As described by Eugénie Shinkle (2008), "gameplay comprises a much more complex mesh of perceptual activity" than "vision, visuality, and rational decision-making" (p. 909). It is not enough that the player can still see what happens in the game world — they must be able to perceive in-game events as a direct consequence of their actions. If perception can no longer be relied on by the player, then gameplay itself can no longer exist as the player is not able to purposefully interface with the game.

Another problem for cloud gaming is video compression. As computer hardware becomes more powerful and games continue to strive for graphical fidelity, the amount of bandwidth needed to transmit a video feed from a big-budget game also grows accordingly. This is not much of a problem for people with access to high-end fibre-optic networks, but bandwidth limitations can result in people in rural or undeveloped areas being locked out of the service. Since cloud gaming providers do not own the infrastructure they use, and thus are incapable of upgrading internet cable networks to allow for higher bandwidth limits, they must instead use

encoding algorithms to compress their video output to an appropriate size. Ideally, this compressed version of the video output is then decoded and expanded by the player's PC. However, if the network speed drops, the player's PC will not have enough time to properly decode the compressed video output before it is shown to the player. This causes the video quality of the game to drop accordingly. Video streaming services like Netflix and Youtube must also deal with this problem, but have the crucial advantage of linearity — video progresses in a linear fashion, and can thus be preemptively loaded onto the user's PC. Games, on the other hand, are non-linear. As with live streaming platforms like Twitch, cloud gaming services are forced to decode video as it is received. Even for users with access to high-end network infrastructure, this can result in sudden and erratic drops in video quality (Vasquez, 2018).

But these difficulties are only a part of a larger narrative of failure. To understand why game streaming has not, and perhaps will not, become as popular as other forms of streaming media, we must go beyond identifying and describing the above-mentioned infrastructural limitations. We must also identify why these limitations appear as problems for users in the first place — the aspects of digital games, as a medium, that allow for these issues to manifest so intrusively. Infrastructural failure, after all, is not unique to games. In fact, failure could be considered a defining aspect of all transmitted media. Rosa Menkman (2011), in her exploration of glitch art and culture, declares that "what makes any medium specific is how it fails to disappear – as *techné*. To study media-specific artifacts is to take an interest in the failure of media to disappear, or in other words, in noise artifacts" (p. 14). For Menkman, *techné* in this case refers to the physical manifestations of the medium that are imposed upon the media being transmitted. These noise artifacts are the consequences of failure, manifesting when the infrastructure that is responsible for sending, carrying, and receiving electronic signals

noticeably alters the transmission of information. This is when infrastructure becomes visible — as further explained by Susan Leigh Star (1999) in her ethnography of infrastructure:

> The normally invisible quality of working infrastructure becomes visible when it breaks: the server is down, the bridge washes out, there is a power blackout. Even when there are back-up mechanisms or procedures, their existence further highlights the now-visible infrastructure. (p. 382)

All streaming media relies on infrastructure, and is thus susceptible to the noise artifacts that serve as a physical manifestation of infrastructural failure. Every time a Hulu video stops to load in the middle of a scene or an iTunes song refuses to play, infrastructure is failing and, through this failure, is being made visible. People who use streaming services will inevitably have to deal with these visible manifestations of failure — and the frustration that comes with them.

In the introduction to the book *Signal Traffic*, Lisa Parks and Nicole Starosielski (2015) explain that the experience of interacting with infrastructure "during instances of inaccessibility, breakdown, replacement, or reinvention" (p. 16) can change the affective response people have towards these systems. If the infrastructural disruption is intense enough, the apathy most people feel towards infrastructure can shift into annoyance or frustration. What was once merely visible (Star, 1999), turns into the affective. Digital games are particularly vulnerable to this affective shift, particularly those games that are built around skill. Almost all big-budget 'AAA' games require players to develop context-specific skills, such as aiming attacks, timing jumps, or dodging obstacles, to overcome rule-based challenges. This is an experience that is easily

disrupted by the infrastructural problems caused by game streaming. If this experience is disrupted heavily enough, either through high input latency, heavy image compression, or a hard disconnection, players may not have enough control over their experience be able to succeed in challenges within the game.

These are the cases of infrastructure failure that make cloud gaming such a difficult endeavour. Shots that should have landed instead miss their marks, trivial jumps between platforms become treacherous leaps of faith, and normally slow moving obstacles become impossible to avoid. When infrastructure becomes failure, the player fails as well.

## Generative Failure

One of the digital games used in the marketing for Nvidia's Geforce Now, *PLAYERUNKNOWN'S BATTLEGROUNDS* (*PUBG*) (2017), is a competition. 100 unarmed players drop into an island, where they must scavenge for equipment and weapons. The last surviving person wins. Players can be taken down with only a handful of shots, and the rush to claim limited resources regularly leads to panicked firefights. In these moments, players can only rely on their skill at the game: their ability to react to danger, to use the right equipment and, most importantly, to aim quickly and accurately. However, in order to rely on their skill, players must also rely on their PC's ability to receive and process their inputs — or, in the case of a cloud streaming service, for their remote GPU's ability to receive and process their inputs. As shown in the anecdote above, this is where input lag becomes a matter of virtual life or death. If too much time passes between the player pressing a button and the corresponding action appearing on-screen, a disconnect is formed between the player's intention and the player's

action. They become unable to act with purpose, and therefore unable to act skillfully. In fast, competitive game like *PUBG*, this disconnect is a death sentence.

The amount of time between input and action needed to cause this perceptual dissonance is around 200 ms for most people (Andres et al., 2016), but dedicated members of the PC gaming community consider input lag over 100 ms unacceptable (Display Lag, 2018). In some cases, this 100 ms threshold can be exceeded entirely due to the processing time required by the game itself. The remote nature of cloud GPUs only compounds this problem, since every dip in a player's network speed now comes with an increased delay between input and action that would not have occurred otherwise

Input lag is not the only potential source of frustration introduced by connecting to a remote GPU. Other problems caused by infrastructural failure, such as graphical errors or disconnections, can also contribute to a wrong move, an accidental death, or a lost match. Beyond being merely visible, cloud-streaming infrastructure turns into an affective force upon breakdown — or even an *effective* force. While infrastructure has been described by Lisa Parks (2015) as "stuff you can kick" (p. 355), a reference to the material nature of distribution systems, this is an example of infrastructure kicking back. Input lag and other network issues exert a material force upon people, creating a challenge that exists outside of the game-world and that cannot be overcome within the game. With cloud streaming, if the network fails, the player fails. Failure begets failure.

But failure itself is not the issue. As described by Jesper Juul (2013), competitive, skill-based games like *PUBG* are largely about failure. As Juul states, "video games are the art of failure, the singular art form that sets us up for failure and allows us to experience and experiment with failure" (p. 30). *PUBG* is a good example of this principle. Though 100 players

enter every match, only one can ever emerge the victor. The rest will fail, learn from their mistakes, and try again. Over time, players become more skilled at the game, and more likely to win any given match. But this process takes time. Most *PUBG* players will fail dozens, if not hundreds of matches before their first victory.

This cycle of failure is the primary draw of skill-based games. As Juul (2013) states, failure allows for a game where "we can continually improve our skills, and whenever we fail, we have a chance to reconsider our strategies, to calibrate and reconsider our toolset" (p. 74). Players submit willingly to this 'consensual failure' in order to improve themselves and, with enough play, to achieve a feeling of personal growth and achievement. Crucially, the ability for players to improve and succeed is contingent on failure being conquerable — the rules of the game must be consistent and comprehensible, allowing for players to develop a set of skills that allows for the successful navigation of these rules. If players are unable to do this, the skill-based game will not be considered "fair" (Juul, 2013, p. 79). Establishing 'fairness' in a game is contingent on the rules of the game remaining intact. Rules, in this case, constitute the limitations and affordances allowed to players within the game, functioning as both a restriction on player options while simultaneously acting to establish other potential actions (Juul, 2005, p. 58). As noted by Johan Huizinga (1949) in his theorizing of the "magic circle" (the idea that games create distinct 'worlds' for players to inhabit) a game's rules are what separates the play-space of game from the rest of reality:

> All play has its rules. They determine what "holds" in the temporary world circumscribed by play. The rules of a game are absolutely binding and allow no doubt… Indeed, as soon as the rules are transgressed the whole play-

> world collapses. The game is over. The umpire's whistle breaks the spell and sets 'real' life going again. (p. 11)

This is how infrastructural failure undermines skill-based digital-games. By transgressing the rules of the game — by introducing input lag, graphical errors, and other technical issues — the boundary between the game and 'real life' is also transgressed. Infrastructure, a material system firmly rooted in the real, infringes upon the virtual. In doing so, players become unable to work within a consistent, understandable set of game rules, and the promise of personal improvement is broken. The magic circle is shattered. What appears instead is merely a manifestation of failure, one that caused failure in turn. The failure that occurs when any digital gaming infrastructure fails is not the same as the failure that becomes visible when other media fails. Instead of merely being visible, it becomes affective and effective — a generative failure, creating more failure in its wake. This player failure, which is created through the failure of infrastructure, will be referred to using the term 'non-consensual failure' — failure that is not expected or sought out by the player while experiencing the game. As opposed to the consensual failure Juul identifies as an expected part of playing a skill-based game, this non-consensual failure can never be overcome by players from within the game.

Cloud-based gaming relies on a remote GPU, introducing a new source of potential infrastructural failure, and therefore a new way for reality to infringe upon the world of the game. The technical issues caused by this failure exist outside of the game's rules, and cannot be overcome by skill. They exist only to affect users, to be a source of frustration and annoyance that can appear at any time without warning or recourse. This is why cloud-based gaming has already been rejected by many players — if this failure happens often enough, or at the right

times, then frustration quickly turns to defeat. Players are ‘taken out of the game,’ affected by real-world intrusions they are incapable of affecting back. What point is there in struggling against forces outside of your control? For players that are forced to contend with the parameters of game streaming, these questions are often answered by a rejection of cloud gaming altogether, in favour of consoles, personal computers, and other devices that lack an additional layer of potentially disastrous infrastructure.

## The Future of Cloud Gaming

While the success and ubiquity of streaming media grows with every passing year, digital game streaming has yet to reach the cloud. Skill-based games, on a fundamental level, are too fragile of an experience to reliably operate from a distance. Dependence on a remote GPU introduces a potential source infrastructural failure, which in turn causes players to fail, disrupting the ability of digital games to offer skill-based challenges built on an immutable set of understandable rules. With game streaming, infrastructure becomes failure — and failure is a strong deterrent when the alternative (simply playing games on a PC or console) is already a valid option.

Any streaming company that wants to be accepted by players has to prevent infrastructural failure from causing player failure, to solve the problems that were first identified even before OnLive launched in 2010 (Leadbetter, 2009). OnLive was unable to solve these problems, and was unable to find success because of this. So can Nvidia’s GeForce Now and the other new attempts at cloud gaming avoid failure in a market that has been historically defined by failure?

Unless these companies plan on laying down fiber optic cables across the country, or on building data centres in every American city, then no. While the service may work smoothly

enough for users that find themselves close to cloud gaming data centers, or users that have access to high-speed internet, most people who regularly play digital games will likely still avoid cloud gaming. What's more, companies hoping to remotely stream games have to contend with the entities that actually control network infrastructure in North America: internet service providers. Broadband caps enforced by companies like Sprint and AT&T are another obstacle to fast, reliable game streaming, and would affect users regardless of their location or access to fiber-optic cabling.

Of course, there is another option — the games themselves could change. While I have established that competitive, skill-based games cannot work in a streaming environment, other types of games could be remotely streamed with little impact to the way the game operates. Turn based games — in which players input their actions in a defined order — avoid issues with input lag by not running in 'real time,' and role-playing games often move at a slow enough pace that mild latency would only have a negligible effect on game performance.

Some games avoid the problem entirely by removing skill as a barrier to progress, meaning that input lag and other infrastructure failures, while still annoying, are unable to generate failure within the game. These non-skill-based games, some of the most notable of which include The Fullbright Company's *Gone Home* (2016) and Cardboard Computer's *Kentucky Route Zero* (2013), often explore topics and themes outside of the narrow scope of mainstream video games, including queer issues, deindustrialization, and mental illness. By removing skill-based challenges and focusing instead on exploration, decision making, and player experiences, non-skill-based games actively challenge the violent, competition-oriented games that serve as the status-quo in the digital games industry. Cloud streaming could thus lead to an increase in the popularity of non-skill-based games — or, as Jack Halberstam explains in

*The Queer Art of Failure,* "failure allows us to escape the punishing norms that discipline behaviour and manage human development," (2011 p. 3) allowing for the emergence of new ways of doing and thinking. The failure of skill-based games to adapt to the cloud could be an opportunity to escape the heteronormative, masculine hegemony that dominates mainstream gaming, shifting a culture obsessed with skill and competition to one that prioritizes collaboration, creativity and critical thinking.

Unfortunately, the companies racing to legitimize cloud streaming are not doing so in order to shift the culture of mainstream gaming. Instead of helping to change games to better fit the cloud, Nvidia and their competitors are instead seeking to force the cloud onto currently popular games — as evidenced by their use of skill-based multiplayer games like *PUBG* in their promotional material (Nvidia, 2019). But skill-based digital games are about consensual failure — a failure agreed upon by the player that can realistically be overcome — which is in turn contingent on a coherent set of rules. Because infrastructural failure is generative, because it can lead to an insurmountable failure that shatters the rules that compose game worlds, skill-based digital games may never work in the cloud. If game streaming could work, then it would have to be in a very different 'cloud' from the one we have now. A cloud that is less about centralization and control, and one that is more concerned about experience and access. One that understands the game cannot simply be removed from the player, separated over hundreds of kilometers, and made vulnerable to the invasions of the real.

## Part Two: Why Cloud Gaming?

When discussing the potentially insurmountable obstacles that stand in the way of cloud streaming digital games, an important question emerges for scholars and gamers alike: if adapting digital games to the cloud is a potentially impossible task, as demonstrated in the last section of this chapter,  then why are so many multi-billion dollar companies launching streaming platforms?

To answer this question, I must remove myself from the discourse of digital games and critical infrastructure studies, and instead turn to a political economy analysis. The actions of monopolistic firms like Nvidia and Google can only make sense when these companies are thought of as economic and political actors, attempting to maximize profit and ensure their continued market domination.

I must also, however, think of these entities as platform-owners — controllers of large, ever-expanding networks of digital infrastructure designed to function as intermediaries between disparate individuals or groups of people (Srnicek, 2017). While the term 'platform' is loaded with egalitarian and functional connotations that can lead users to assume that these intermediary infrastructures are largely politically neutral (Gillespie, 2010), "they in fact embody a politics" (Srnicek, 2017, p 47) — all interactions that take place on a platform are subject to the rules and conditions set by the platform-owner, giving companies like Google, Amazon, and Microsoft far-reaching control over the way users view and interact with their infrastructure.

Platforms have also become a crucial tool in modern inter-corporate capitalist competition. Due to their intermediate status between users and thus their functioning as the "ground upon which their activities occur" (Srnicek 2017, p. 44), platforms allow for the

monitoring and harvesting of vast amounts of user generated data. This data, whether it is composed of search terms of Google, user destinations on Uber, or favourited songs on Spotify, is used to both streamline platforms in the service of competitive innovation, and to better deploy algorithms to predict and direct user behaviour. For many platform owners, such as Google and Facebook, data is also used to sell access to specific demographics to potential advertisers — 89.0 and 96.9 percent of Google and Facebook's revenues, respectively, come from this model of data extraction and repackaging (Srnicek 2017).

Cloud gaming services are themselves a type of platform (Gillespie, 2010) — though they are hardly the first platform to connect users to digital games. The platform as a business model has shaped the digital games industry for decades, with both game consoles (e.g. the Playstation and Xbox) and online PC marketplaces (e.g. Steam) serving as platforms that allow users to access and play digital games. In the console game industry specifically, these platforms have been used strategically by Microsoft and Sony to establish a functional duopoly, shutting out potential competitors by locking both users and publishers into a perpetually evolving, tightly controlled system.

In the remainder of this chapter I explain the renewed interest corporations have shown in cloud streaming by connecting the emergence of this new type of platform to the long-term strategy taken by platform owners in the digital game industry — a strategy described by David Nieborg (2011) as a "project of control." (p. 124) To do this, I build off of Nieborg's work on the console game industry, linking the development of "techno-economic logic" he describes to the emergence of cloud streaming. Cloud streaming, I argue, follows the twin logics of platforming and perpetual innovation described by Nieborg, and serves as a culmination of the centralizing tendencies of Microsoft and Sony's project of control. I also use Nick Srnicek's work, *Platform*

*Capitalism* (2017), as a means to explain the investment in cloud gaming being made by Google, Amazon, and other platform-owners outside of the game industry. These companies view cloud gaming as a relatively untapped source of potential data and, because of the tendency for platforms to form monopolies, platform-owners are now racing to see who can be the first to claim this valuable new resource.

## Project of Control

In 2011, digital games scholar and political economist David Nieborg published his PhD dissertation, entitled *Triple-A: the political economy of the blockbuster video game*. In his dissertation, Nieborg conceptualizes modern big-budget, 'Triple-A' console games as a distinct form of cultural commodity, one that has shaped and been shaped by the economic ambition of a small number of powerful industry actors. Specifically, Nieborg explores the political-economic landscape that constituted the "seventh generation console cycle" (p 9), the period between 2005 and 2010 in which Triple-A games were created for Sony's Playstation 3 and Microsoft's Xbox 360.

A significant portion of Nieborg's analysis is focused on the game consoles themselves. As the hardware platforms on which Triple-A games played, Nieborg argues that consoles are an integral part of the strategy used by Sony and Microsoft to maintain their economic dominance. He describes this strategy as a "project of control" (p. 124), one that relies on "the twin-logics of platforming and innovation" (p. 123) to ensure that games stay a commodified object in an era of digital information sharing while also keeping potential competitors from gaining a foothold in the market.

On one hand, through a strategy of platforming, Sony and Microsoft are able to use proprietary technology and a comprehensive set of legal protections to ensure "perfect enforcement" over how both game developers and consumers are able to use their consoles. As Nieborg explains, "playing an Xbox 360 game on any other platform than the Xbox 360 is impossible. Platform owners, then, exert absolute power over those who are able to develop and distribute games" (p 135). On the other hand, through a strategy of perpetual innovation, Sony and Microsoft "fence out" other firms by closing off potential points of access into the console market, while also ensuring any potential competitors would have to invest enormous amounts of capital to simply 'catch-up' to the technology used in the newest Xbox or Playstation. As stated by Nieborg:

> "Platform owners hold indirect power because of their ability to invest hundreds of millions of dollars, euros or yens in research and development of sophisticated hardware in a way few industrial actors are capable of. With the exception, arguably, of IT moguls as Google, Apple or Intel, there is only a small number of transglobal companies who have ready access to the institutional knowledge and the monetary flexibility to make such long term investments in, or one might say bets on, new dedicated console hardware." (p 169)

This perpetual innovation of hardware technology, coupled with the aforementioned strategy of platforming, makes up what Nieborg describes as the dominant "techno-economic logic" (p. 122)

of the Triple-A console game — a logic that ultimately defines both the game industry and the commodity form of Triple-A games themselves.

Nieborg's analysis is rooted in the late 2000s, when a shift from the more traditional game consoles and digital games to a "hybrid commodity" (p. 6) form was made possible by the Xbox 360 and other seventh-generation consoles. These new internet-connected consoles allowed for closed, in-platform marketplaces controlled by the platform owners, which Microsoft and Sony took advantage of by offering post-launch downloadable content (DLC) that could only be purchased through their respective online stores. This allowed platform owners to wrest a measure of control away from their customers and vendors — not only could you not purchase this content anywhere else but, since this DLC was entirely digital and proprietary, this content could not be shared or resold after purchase. Driven by the twin-logics of perpetual innovation and platforming, Sony and Microsoft were able to advance their project of control and further centralize their hold over the digital game industry.

Now, as we reach the final days of the eighth console generation (defined by consoles such as Microsoft's Xbox One, Sony's Playstation 4, and Nintendo's Switch), we have seen the trends Nieborg identified continuing unabated. Due to advances in internet infrastructure that have allowed for faster download speeds being accessible to a larger segment of the population, the closed, platform specific marketplaces accessed through game consoles are capable of selling players digital copies of Triple-A games. Third-party vendors have now been almost entirely shut out of the closed ecosystem established by platform owners, and publishers have even less of a choice in how they distribute their games to potential players. Players also have fewer options available after purchasing a game — since they are only paying for a digital license when buying a game on the Playstation 4 or Xbox One, they are unable to legally copy, share, or resell

their purchase as they see fit. This has given Microsoft and Sony unprecedented control over the platforms that they own, ensuring that anyone who wants to play a game on their consoles will have little choice but to buy that game directly from them.

Despite this, Nieborg's (2011) theorized "project of control" (p. 124) is not complete. Players, after all, still technically own their consoles and the games installed within. There is an element to the platform outside of the control of the platform owners, one that has allowed for the continuation of the secondary market of used game consoles as well as the community of hackers and modders that break into these consoles and install their own software and operating systems (despite the litigious methods employed by Microsoft and Sony to prevent this from happening). A truly centralized platform would remove all elements of ownership from the end-user, and instead consolidate that ownership entirely within the company. In such a system, the platform owner would not have to worry about users manipulating, reselling, or otherwise misappropriating their console and games, since the user would have almost no meaningful access to those aspects of the platform in the first place. Fortunately for platform owners (and perhaps unfortunately for consumers, publishers, developers, and every other stakeholder in the digital game industry), a solution to this problem can be found in cloud streaming.

Cloud streaming is the pinnacle of the project of control being enacted by platform owners in the digital games industry. A culmination of the twin logics of platforming and perpetual innovation, cloud gaming services allow for what is functionally a perfect platform, one that is completely within the control of the platform owner. With cloud gaming services, users do not own any part of the platform — instead of paying a larger upfront cost to purchase the console or games outright, the player pays a smaller, but recurring subscription fee to platform owner indefinitely in order to access the platform through a computer, phone, or smart

TV. This business model is described by Srnicek (2017) as a "product platform," a type of platform that uses other platforms as a means to "transform a traditional good into a service" and then earn revenue "by collecting rent or subscription fees" from these services (p. 49). As discovered by companies such as Netflix or Spotify, this approach has the potential to be extremely profitable. Lower upfront costs are appealing to consumers in an era of stagnating wages and shrinking savings accounts (Srincek, 2017), and the use of other platforms such as computers, phones and televisions as a means to access their service allows the platform owner to avoid the costs associated with developing, distributing, and servicing a device as expensive and complex as a game console. For a company like Microsoft or Sony, cloud gaming represents a future that would allow companies like them to reach more people with less of an investment on their end as platform owners, while also allowing an unprecedented level of control over how users, publishers, and developers are able to engage with their platform.

For users, publishers, and developers, on the other hand, the future promised by cloud streaming services may not be so bright. While lower upfront costs are appealing to consumers, the rental fee associated with these services can result in the user paying more money over time. Additionally, if the user stops paying the subscription fee, they are no longer able to access the platform, a problem that did not exist in an era where digital games, films, and music were thought of as consumer goods instead of a perpetual service. For the people actually making the content for cloud services — the developers and publishers in the case of the digital games industry — cloud services can result in lowered revenue and reduced control over their product. Spotify is likely the best example of this, with artists being paid out meager sums by Spotify while the platform owner itself profits (Plaugic, 2015). Of course, there are also the issues laid out in the first half of this chapter. The actual technology behind game streaming is unstable and

likely to cause frustration in users, as it did with OnLive and other cloud gaming services that failed in the past.

Despite this historical failure, more companies than ever seem determined to expand into cloud gaming services. This does not only include Microsoft and Sony, whose histories as platform owners in the digital games industry makes this transition a logical one, but also companies such as Nvidia, Amazon, Google, and a number of other, smaller start-ups. Moves toward cloud gaming services as a business model can partially be explained by the case I have made above, particularly in the case of Microsoft and Sony. As platform owners that already serve as a functional duopoly over the digital game console ecosystem, moving towards the centralized future of cloud gaming is in line with the twin-logics of platforming and perpetual innovation that have driven these companies for decades (Nieborg, 2011). Not only does transitioning to a product platform model serve as a way for Microsoft and Sony secure perfect enforcement over their platforms, but this move to the cloud also works as a way to keep less resource-rich firms who cannot afford the massive infrastructural investment required for cloud gaming from competing in the marketplace.

## A New Data Frontier

While Nieborg's model explains why pre-existing platform owners such as Microsoft and Sony would want to embrace cloud gaming, the same logic cannot necessarily be applied to other firms seeking to enter the cloud-gaming ecosystem. While Google and Amazon do own numerous platforms stretching across the realms of search engines, online stores, mobile devices, televisions, and more, neither of these companies have yet to extend their reach into digital games. So, then, why are these companies investing large amounts of capital into an industry in

which they have no prior involvement, through a service that has a well-detailed association with technological and economic failure?

To answer this question we must turn to a different model, one laid out by Nick Srnicek in his 2017 book *Platform Capitalism.* Srnicek posits that all new expansions of large platform-owners (i.e. companies such as Google, Amazon, and Microsoft) should be framed as ways to collect new stores of previously untapped data. Data, Srnicek argues, is the driving force behind modern capitalist expansion, as large platform owners rely on harvesting data from their users as a means to generate large quantities of revenue. Armed with troves of data gathered through platforms like Google's search engine, Amazon's web store, or Microsoft's email services, platform owner are able to better sell their products to their users — and to better sell their users to their advertisers. Srnicek argues that this has changed the nature of inter-corporate competition. Instead of competing over prices, firms like Google, Amazon and Microsoft now must "intensify their extraction, analysis, and control of data" (Srnicek 2017, p. 97) in order to stay ahead of other platform holders. Thus, high value is placed on new and untapped ways of harvesting data from users. As explained by Srnicek, who quotes from a MIT Technology review on "The Rise of Data Capital":

> "If collecting and analyzing this raw material [data] is the primary revenue source for these companies and gives them competitive advantages, there is an imperative to collect more and more. As one report notes, echoing colonialist ventures: 'From a data-production perspective, activities are like lands waiting to be discovered. Whoever gets there first and holds them gets their resources — in this case their data riches.' For many of these platforms, the quality of the data is of less interest than their quantity and diversity. Every action performed by a user,

> no matter how minute, is useful for reconfiguring algorithms and optimizing processes." (Srnicek 2017, p.98-99)

Under this lens, digital game streaming can be seen as a relatively untapped source of data, allowing Google, Amazon or Microsoft to easily track which games people play, how long they play them, and the ways they choose to play. While platform owners like Microsoft and Sony can already collect data on their users through their proprietary consoles, game streaming would allow other companies to access a wider user base across more devices, allowing for a larger (and more valuable) set of data to be generated.

Crucially, Srnicek also identifies a key reason as to why so many platform-owners are expanding into cloud gaming at the same time — the company that is first to establish a popular cloud gaming service will have access to the lion's share of the potential data. Because of what Srnicek (2017) describes as "network effects" (p 45) (i.e. platforms with high numbers of users to become more valuable to those users than smaller platforms), platforms generally trend towards monopolization, with the largest platforms attracting more users due to the value provided by their sheer size and popularity. This means that, as described by Srnicek, "early advantages become solidified as permanent positions of industry leadership" (p 95) and that there is a high potential benefit to companies like Google or Amazon in releasing a new type of service before other platform-owners have a chance to establish themselves within that new activity. Even if that potential new service has technical problems — such as in the case of cloud-based game streaming — the platform owners are still incentivized to act quickly to "grab market share and eventually dominate what is assumed to be a major new industry." (Srnicek 2017, p 21)

# Conclusion

Cloud gaming services, while superficially similar to other streaming services such as Netflix, Spotify, and countless other platforms that have come to dominate our media ecosystem, is subject to unique infrastructural pressures that materialize due to the intersection of infrastructural failure and the nature of digital games themselves. The conflict inherent to this intersection has already resulted in the downfall of at least one cloud gaming service, OnLive, and has resulted in the lacklustre popularity of many others (including Sony's own attempt at cloud streaming, Playstation Now, which recently began allowing users to install games directly onto their devices in order to avoid the complications that come from cloud streaming (Yin-Poole, 2018).

Yet despite these technical and infrastructural limitations, more platform owners than ever are investing heavily into cloud gaming, with companies such as Amazon, Nvidia, Microsoft, and Google all announcing their intention to launch their own cloud gaming services. For some of these platform owners, such as Microsoft and Sony, this move into cloud gaming is merely a continuation of the techno economic logics of platforming and perpetual innovation that have allowed these companies to form a functional duopoly over the console game industry. For other platform-owners, such as Google and Amazon, this expansion into cloud gaming is a race to claim a valuable resource — troves of untapped user data.

While these economic motivations may be a powerful incentive for platform owners to expand into cloud gaming, the infrastructural limitations inherent to this technology remain. The remainder of this thesis explores one of the ways in which these companies are seeking to resolve this contradiction, which is the creation of a utopian sociotechnical imaginary surrounding cloud gaming services. If cloud gaming is such a potentially lucrative source of data

and economic power, and if there is no time to resolve the technical issues associated with these services, than the best course of action for platform owners may be to convince consumers that those problems are immaterial, irrelevant, or simply non-existent in the first place.

# Methodology

## Introduction

In this chapter, I introduce the methodological framework by which I address the central question of my thesis — what is the corporate sociotechnical imaginary platform owners and the enthusiast press are constructing around the technology of cloud gaming? To do this, I begin by introducing and explaining the concept of the sociotechnical imaginary. I first explore the origins and applicability of the sociotechnical imaginary as a methodological framework, showing how the concept was created by Sheila Jasanoff and Sang-Hyun Kim (2009) in order to examine the ways in which governments construct visions of the future that serve to justify investment and expansion for technological programs that benefit the state. I then expand this concept to the idea of the *corporate* sociotechnical imaginary, in order to better understand the way in which private corporations seek to ingratiate their own visions of the future within the wider hegemony, in order to secure a place for their products and services within the public imaginary.

After explaining what the corporate sociotechnical imaginary is and how this concept can be used to analyze how platform-owners seek to position their products within the social consciousness, I detail how this methodological framework is applicable to the topic and central questions of this thesis. I discuss how the sociotechnical imaginary is a more suitable lens for the line of inquiry I am taking than similar methodological frameworks, such as the master narrative framework or discourse analysis, particularly due to its focus on the future and the use of the concept of co-production (Jasanoff, 2004) as a central methodological tenant. I then conclude

this chapter by detailing the materials I gathered for my analysis — which include both corporate press releases and articles from the enthusiast press — along with my justification for gathering the materials that I did, a description of the process I undertook to analyze this material, and a brief summary of the core themes that I found within.

## The Sociotechnical Imaginary

So far, in the Theory chapter of this thesis, I have established that platform owners such as Microsoft, Google, and Nvidia are seeking to popularize a technology that, due to a number of physical and ludic limitations, does not quite work as intended. These corporations are pursuing this technology due to its ability to carry forward the techno-economic logics of platforming and perpetual innovation that have defined the digital games industry for the last two decades, in a race to secure a platform monopoly over the future distribution of digital games (and the valuable data that would come along with such a monopoly). Within these two observations surrounding digital game streaming — 1) the flawed nature of the technology and 2) the reason for its popularity in the eyes of platform owners — lies a glaring contradiction. The contradiction is this: if cloud gaming technology is inherently incompatible with the way consumers play digital games, then how do the corporations investing in this technology expect cloud gaming to become a widely adopted method of playing digital games?

There are several potential solutions to this problem facing platform holders. One could be that a pre-existing platform holder in digital games could simply stop offering any sort of alternative, phasing out physical consoles and exclusively focusing on streaming services. Another could be that a new platform holder in the digital game space could take the approach that Uber has used to undercut the taxi industry, offering discounted pricing to attract consumers

away from traditional consoles with an appealing value proposition. But either way, a core problem remains — if people who play digital games are uninterested in this technology, as they were with OnLive in 2010, adoption to this new status quo will be slow and difficult.

It is here that issues of communication become relevant. As with any new consumer technology (whether functioning or not), platform owners will have to convince the public that digital game streaming is a viable and beneficial service that is worth buying into. Consumers will need to be persuaded that the potential benefits of digital game streaming outweigh the apparent limitations of the technology, with this persuasion taking the form of traditional advertising, consumer expos, and coverage through the enthusiast press. By using these outlets corporations are able to shape the way in which the public conceives of technologies like digital game streaming, in order to affect how favourably consumers view this technology by emphasizing its benefits and downplaying its shortcomings. This takes us to the central questions of my thesis: what is the corporate sociotechnical imaginary platform owners and the enthusiast press are constructing around the technology of cloud gaming? How are the platform owners seeking to construct this imaginary? And what political or economic purpose does the construction of this imaginary serve?

In order to answer these questions, I combined my analysis of the political economy of game streaming with the methodological framework of the sociotechnical imaginary. Using the sociotechnical imaginary is a methodological approach developed by Sheila Jasanoff and Sang-Hyun Kim (2009), introduced in a paper comparing the ways in which nuclear power is conceived of and framed in the USA and South Korea. In this paper, Jasanoff and Kim focus on "national sociotechnical imaginaries," defined as "collectively imagined forms of social life and social order reflected in the design and fulfillment of nation-specific scientific and/or

technological projects" (p. 120). By using these imaginaries, nations are able to connect the development of certain technologies to idealized visions of the future held by the general population, linking the two concepts together so that they seem inseparable.

Imaginaries in this context are referring to the collective imagination of societies, the "sense of the normal expectations we have of each other, the kind of common understanding that enables us to carry out the collective practises that make up social life" (Taylor, 2004, p. 24). Science and technology are not exempt from these imaginaries, despite outdated notions of these fields existing separate from the social and cultural elements of society. Imaginaries surrounding possible futures are not only inherently embedded in the production of science and technology, but are in part constructed through "collective visions of the good society" (Jasanoff & Kim 2009, p. 123) formed through the expectations the general public has surrounding the ideal function of science and technology in their lives. Sociotechnical imaginaries are not simply set in stone by a society's premier scientific minds, nor are they entirely the domain of the society at large — rather, sociotechnical imaginaries are an example of co-production (Jasnoff, 2004), subject both to structural and cognitive forces, created simultaneously by those in power and those that power acts upon.

This structural and cognitive duality can be seen in national sociotechnical imaginaries, which are shared and recreated amongst the collective populace of a nation state while also being dictated and guided by the state itself. In one way, these national sociotechnical imaginaries serve as visions of attainable futures, embodying the lofty and vaguely utopian end goals of scientific and technological projects that are desired by the general public. However, they are also prescribed futures — these are the futures that "states believe ought to be obtained"

(Jasanoff & Kim, 2009) due to the political or economic benefits they would offer to these nation states.

In this way, national sociotechnical imaginaries function as both "the ends of policy and as instruments of legitimation" (Harvard Kennedy School, 2019a, para. 2). They are presented as the final goal of the scientific and technological projects embarked on by nation states, while also serving to justify these projects as being worth any apparent risks or drawbacks. For example, Warigia Bowman's (2015) analysis of the implementation of Information and Computer Technologies (ICTs) in post-genocide Rwanda found that ICTs were a large part of the sociotechnical imaginary being built by the Kagame government in the mid-2000s. In a nation with a recent history of bloodshed and civil war, the newly formed government wanted to project an image of a "modern, technologically advanced, middle-income country" (p 83). One of the primary tools in achieving this image was the top-down implementation of ICTs by the government, supported by the imaginaries that "ICTs will improve productivity and lead to economic growth and that ICTs will improve social and developmental outcomes" (p 91). These imaginaries were primarily constructed through government messaging, particularly in Kagame's speeches evangelising the potential of ICTs to bring Rwanda into the modern world. However, these imaginaries largely masked the realities of ICT implementation in Rwanda. Due to a lack of funding, insufficient infrastructural capacity, and literacy challenges for rural Rwandans, most of the country's initial telecom centres collapsed due to their inability to cover their own costs. As Bowman writes, "Rwanda's ICT policy presumed more capacity and more unity than actually existed" (p 98) — a presumption driven by the sociotechnical imaginaries the government built around ICTs, instead of the reality facing the people of Rwanda.

Yet despite the focus Jasanoff, Kim, Bowman and other scholars using this framework have placed upon national sociotechnical imaginaries, states (and the governments that control them) are not the only entities capable of constructing imaginaries. Corporations also have the power to create and propagate their own utopian visions of what the future should look like — visions that are unsurprisingly contingent on the widespread adoption of a corporation's products and services.

## The [Corporate] Sociotechnical Imaginary

For my thesis, the concept of the sociotechnical imaginary is taken outside the bounds of the nation state, and applied to another type of entity that develops science and technology — the private-sector corporation. The private-sector serves a large role in the creation of new technologies in a capitalist society, as well as in constructing the way in which the general public views these technologies. If a technology is created as a product or service intended to be sold for profit, then the corporation that owns the technology needs to convince the consumer public that their technology is worth buying. With most modern consumer technology (and most consumer goods in general) this means creating false needs — manufacturing reasons for why people would 'need' to purchase your technology in order to solve some previously unidentified problem in their lives (Marcuse, 2002).

This process remains vital in the era of big data and corporate platforms, as new services offered by Google, Microsoft, and other corporations can only serve their intended function (i.e. to collect user data in order to more effectively sell advertisements and optimize business practises, as explained in the previous chapter) if these services draw large numbers of dedicated users willing to regularly generate data. Accordingly, the consequences of failing to create a

strong desire for a product or service can be disastrous for both the corporation's bottom line and their public image — an image of competence, authority, and infallibility. Google and Microsoft have both had numerous examples of these failures, including the little-used (and now defunct) network Google Plus (Schachinger, 2018) and the similarly unpopular Windows Phone, (Segarra, 2019) both of which failed due to low numbers of users in the face of more established and better-liked competitors. Thus, private corporations are incentivized through the market to play a part in constructing their own sociotechnical imaginaries — visions of the future in which their products and services improve lives, reduce suffering, and create a more just and fair society.

So what, then, is a corporate sociotechnical imaginary? By modifying the definition of the national sociotechnical imaginary used by Jasanoff and Kim (2009), a corporate sociotechnical imaginary would be the "collectively imagined forms of social life and social order reflected in the design and fulfillment of (corporation)-specific scientific and/or technological projects." Rather than being a radically different concept from the national sociotechnical imaginary, the corporate sociotechnical imaginary is the same co-produced construction of an attainable future, but set to work for a different end — profit. A corporate sociotechnical imaginary can still be used to secure political power or advance specific policy agendas, but this is done in the service of maximizing the corporation's profit above any other goal. As discussed in previous chapters, corporations are entities that primarily exist to generate profits for their shareholders, meaning that all of their actions — including the construction of a sociotechnical imaginary — must be placed within that context in order for a cogent analysis.

The use of corporate sociotechnical imaginaries to increase profits can take many forms. Most obviously, a corporation can use the sociotechnical imaginaries surrounding its technology

to convince the public to buy into their products or services, increasing their user base and directly generating revenue. However, the use of a corporate sociotechnical imaginary can also be more indirect, concerned more with securing for the corporation a long-term, foundational place within society and the benefits that come with that ubiquitousness. By doing so, these companies are not necessarily attempting to 'predict' the future — instead, they are working to position their ideal version of the future within the social imagination of the general populace. An example of this can be found in Jathan Sadowski and Roy Bendor's (2018) analysis of IBM and Cisco's 'smart city' technology. By constructing a sociotechnical imaginary around the smart city's potential to solve problems like urban crime, pollution, and inefficient urban transportation, corporations like IBM and Cisco (as well as other smart city developers like Google and Tesla) are able to position themselves and their products as being natural next steps in the evolution of the modern city. If successful in disseminating this corporate vision of urbanism these corporations can change the hegemony surrounding the public's conception of the future, making IBM and Cisco designed smart cities seem like the 'common sense' approach to designing urban spaces. This, of course, comes as a great benefit to IBM and Cisco, who are both able to then sell more products and operate with a more permissive social licence due to their apparent irreplaceability.

To construct these corporate sociotechnical imaginaries, companies rely on a number of different outlets and strategies. Some of these strategies — such as press releases, advertisements, and interviews with the press — are similar to those that are used by governments in constructing national sociotechnical imaginaries. However, there are also manifestations of corporate imaginaries that go beyond these methods. These include industry

conventions and the enthusiast press, both of which are used extensively by corporations involved in media and technology.

As described by Vincent Mosco (2014) in his book *To the Cloud: Big Data in a Turbulent World*, technology industry conventions and trade shows are events in which representatives from across a specific industry gather to socialize and present new products. These events are used as a way to evangelize the benefits of a specific technology to industry insiders, while also building a sense of a shared community around said technology. This shared community is built on a purposefully optimistic, simplified version of the technology, one that avoids addressing any of the negative aspects associated with its widespread adoption. For Mosco, who attended trade shows and conventions surrounding cloud technology, this entailed an avoidance of any discussion centred around "the pressures that the cloud imposes on the built environment and on the electrical grid, the tendency to concentrate power in a few large companies, and the challenge to employment arising from big changes in the international division of labor." (p. 122). These events may ultimately be informative to visitors seeking to learn more about the industry in question, but the promotional nature of technology trade shows and conventions serves to cloak the material reality of emerging technologies in order to present a more idealistic imaginary to potential adopters or investors. As described by Mosco: "it is only a slight exaggeration to say that trade shows are similar to religious events that bring together believers in a magical setting full of icons and symbols that affirm their mutual faith" (p. 118-119).

Mosco also notes that trade shows and conventions "provide opportunities for widespread coverage in mainstream and social media that amounts to free advertising of new products" (p. 119). In the world of media and technology, this type of positive coverage is often done by

outlets known as the 'enthusiast press.' These enthusiast press outlets most often take the form of online news blogs, and include websites such as The Verge, CNET, Tom's Guide, and PC Magazine. While different websites may vary slightly in their approach to covering digital games (for example, the Verge may take a more political approach to some issues, while a more conservative website such as CNET may opt for a more 'neutral' approach), they are united in their almost unerringly positive and optimistic coverage of the technology industry. These outlets adopt this position without explicit interference on behalf of the companies they are promoting and, outside of certain exceptions, are also not owned or operated by those companies. As Mosco explains, media outlets like the enthusiast press are independent entities, which "enables them to enjoy a sense of objectivity even as they advance a partisan view" (p. 91). This sense of objectivity allows enthusiast press outlets to sidestep accusations of bias or collusion, even when their coverage falls in line with the hegemonic imaginaries being constructed around emergent technologies. However, this is not to say that large technology and media companies exert no influence over the enthusiast press. As explored by Edward S. Herman and Noam Chomsky (2008) in their book *Manufacturing Consent*, there are a number of ways that a corporation can exert a type of indirect control over the press, including advertising pressure, threats to revoke access to valuable sources, and the creation of flak. This soft censorship exerted by corporations onto the enthusiast press is explored in more detail in the Analysis and Discussion chapter of this thesis.

## Why the Imaginary?

So far in this chapter, I have established the concept of the sociotechnical imaginary as a methodological framework that seeks to understand the way that visions of the future are co-

constructed around emerging technologies, and demonstrated the way in which this approach can be applied to the analysis of private corporations. Now, I proceed to discuss why this approach is relevant to my thesis, and how this concept will be used to analyze the growing imaginary surrounding digital game streaming. To do this, I again turn to Jasanoff and Kim (2009). In the paper in which they first proposed the concept of the sociotechnical imaginary, Jasanoff and Kim outlined the ways in which this approach is distinct from similar frameworks concerned with the way technology is viewed and constructed within the public eye. By outlining these distinctions, I demonstrate why the sociotechnical imaginary is the most relevant methodological framework for the question I am answering in this thesis.

Most crucially, the framework of the corporate sociotechnical imaginary allows me to examine the ways in which platform owners are able to shape the way people view their products and services while still positioning these platform owners as economic actors motivated by profit. Corporations acting to shape the sociotechnical imaginary are not doing so as nebulous entities devoid of agency — instead, they are framed as economically motivated rational actors, with a clear goal that they are pursuing through their manipulation of the imaginary. This focus on these goals (and in turn, the future) is of the utmost importance. These platform owners are actively shaping a future within the public imagination, and as scholars we must be cognizant of what they want to achieve by doing so. In this case, we must be aware of how these corporations are competing to sell the consumer public on a technology that has a history of economic and infrastructural failure, in order to establish themselves as the dominant, monopolistic platform for this emerging technology.

Other methodological approaches, while similar to the sociotechnical imaginary, lack some aspects of what makes this specific framework a logical fit for analyzing the public image

surrounding cloud game streaming. For example, as stated by Jasanoff and Kim (2009), the master narrative framework is more concerned with searching for patterns in the past that justify actions in the present and future — imaginaries, conversely, "are instrumental and futuristic: they project visions of what is good, desirable, and worth attaining for a political community" (p. 123). Imaginaries embody a goal for society to strive towards, one that is bound up with the mainstream success of the technology that the imaginary is built around. Master narratives, due to their explanatory and historical nature, are not deployed in the service of leading society towards a goal. While master narratives may be a useful frame for examining the way governments and corporations use history to lend legitimacy to their actions today, viewing the rise in game streaming through the sociotechnical imaginary instead allows for a focus on the collective image of the future being used to create the "public resolve" (Jasanoff & Kim, 2009, p. 123) to incorporate this new technology into the hegemony.

Similarly, focusing solely on discourse and discursive frames is also insufficient for this thesis. This is not to say that the study of discourse is not key to this thesis — the central analysis described below is primarily concerned with the way language is being deployed to construct the dominant public image surrounding game streaming. However, because discourse analysis is "mainly focused on language" and lacks the "normative/prescriptive dimension of sociotechnical imaginaries" (Harvard Kennedy School, 2019b, para. 5), using this methodological framework without the added dimension of the sociotechnical imaginary would avoid grappling with the way that new concepts and technologies are incorporated into the hegemony. Since an important part of this thesis is examining the way in which platform owners are pushing their vision of the future onto the public consciousness, limiting this study to purely the realm of discourse would be insufficient. Instead, drawing on the concept of the sociotechnical imaginary allows for an

exploration of how the "multiplicity of possible discursive framings or narratives circulating in society are filtered and repackaged into dominant targets of public action and associated public reasoning." (Jasanoff & Kim, 2009, p. 124) The use of language is but one piece of the puzzle — to understand how platform-owners are attempting to shift the hegemony, I must also grapple with the way in which this discourse is being deployed in the service of constructing a dominant sociotechnical imaginary.

On the other end of the methodological spectrum is the lens of ideology. While viewing the actions of platform-holders as ideologically motivated would allow for an interrogation of questions of power and structure — an important part of understanding the motivations and political goals of platform owners — a purely ideological frame is also lacking in key areas. Ideologies are generally "lacking the connotations of reaching and striving" (Harvard Kennedy School, 2019b, para. 5). that are embedded within imaginaries, meaning that a focus on a purely ideological struggle would neglect the future-building being done by companies like Google, Nvidia, and Microsoft in their push for the widespread adoption of cloud streaming. An ideological framework would also overlook the material components of this issue. The technology of game streaming itself, the benefits its success would bring to the corporations, and the limitations that the corporations must work around to achieve this success would be left to the wayside. The question of what kind of public image platform owners are attempting to construct around cloud gaming requires the technology itself to be foregrounded, which the framework of the sociotechnical imaginary enables me to do.

The framework of the sociotechnical imaginary is also useful in this instance because cloud streaming technology is currently in a moment of co-production. As described by Sheila Jasanoff (2004), "co-production is shorthand for the proposition that the ways in which we know

and represent the world (both nature and society) are inseparable from the ways in which we choose to live in it" (p. 2). In other words, co-production accounts for the tension between the way that people view the world (for example, through the lens of the hegemonic ideology) and the concrete, material ways in which people interact with the world in their day-to-day lives. Knowledge, as theorized by Jasanoff, is not restricted to just one of these two domains. Instead, "the ways in which we take note of new phenomena in the world are tied at all points — like the muscles on a skeleton or the springs on a cot frame — to the ways in which we have already chosen to live in it" (Jasanoff, 2004, p. 16). This means that the introduction of a new technology into society is rarely seen as a truly disruptive event — rather, people tend to fit new technologies into pre-existing frameworks or narratives they are already using to comprehend the world. Because of this, moments of co-production occur in times of emergence, contestation, and stabilization (Harvard Kennedy School, 2019b), when world leaders, scholars, journalists, and ordinary people struggle to fit a new technology into their deeply ingrained conceptions of the world.

These moments of emergence and contestation are also moments when imaginaries are constructed and propagated, as new technologies not only have to be placed within pre-existing narratives and discursive frames, but also pre-existing visions of the future. It is in these moments of co-production that competing visions of possible futures are challenged, rejected, and fought over, with dominant imaginaries eventually stabilizing and taking hold over the hegemony. Cloud game streaming is currently going through this period of emergence and contestation, as the way people conceive of digital game streaming and its future potential has yet to solidify into a single cohesive imaginary. This has given the platform-owners investing in cloud game streaming an opportunity to actively work to construct an imaginary that is

favourable to them and their desire to ingratiate this technology to the wider public. By using the framework of the sociotechnical imaginary to analyze this moment of co-production, I am able to engage with the ways this imaginary is being constructed and what this imaginary will eventually look like.

However, the sociotechnical imaginary is not without its limitations. The most pressing of these is that the framework of the sociotechnical imaginary does not seriously engage with the experience of using the technology itself — which is, in this case, cloud-based game streaming. Scholarly work concerned with the sociotechnical imaginary, while grounded in its capacity to understand the material realities of the technologies being studied, often neglects the (phenomenological) experience users have when interacting with the technology on a day-to-day basis. For example, while Bowman's (2015) exploration of the sociotechnical imaginary surrounding Rwanda's ICT infrastructure took into account the material roadblocks (safety, distance, lack of spare time) keeping Rwandans away from the country's newly built telecenters, there is no effort made to engage with the experience of using one of these telecenters. This avoidance of the phenomenological dimension of technology, while often not detrimental to the analysis being done by scholars using the sociotechnical imaginary, can limit the way in which the technologies themselves are understood to be conceived by those using the technology. In order to account for this limitation, I chose to focus on this experiential dimension in the first half of the theory chapter of this thesis. By doing so, I hope to give a more complete picture of the reality of cloud game streaming and to contextualize the necessity of the imaginary-building work being undertaken by platform-owners such as Google, Microsoft, and Nvidia.

## Methods

Having established what the sociotechnical imaginary is, how it works as a methodological framework, and why this particular approach suits the analysis of cloud game streaming as an emerging technology, I explain how I used the concept of the corporate sociotechnical imaginary to answer the central question of this thesis — what is the corporate sociotechnical imaginary platform owners and the enthusiast press are constructing around the technology of cloud gaming? Also important are the sub-questions: how are the platform owners seeking to construct this imaginary? What political or economic purpose does the construction of this imaginary serve?

To understand the imaginary that is emerging around cloud game streaming, I analyze two different types of imaginary-building discursive sources — industry convention press conferences and enthusiast press articles. I made this choice for a number of reasons. Firstly, "verbal texts" such as articles, speeches, and promotional videos "provide some of the most accessible and ubiquitous resources for analyzing sociotechnical imaginaries" (Harvard Kennedy School, 2019c, para. 3) Choosing sources that communicate through discourse allowed for a wide selection of clear, easy to access material for me to analyze for themes and imagery that may constitute the sociotechnical imaginary surrounding cloud game streaming. Additionally, I chose both press conferences and enthusiast press articles because I wanted both direct corporate sources of imaginary building, as well as nominally independent sources that are still aligned to the interests of capital. Having both gives me a wider, more multi-dimensional view of the imaginary being constructed. Imaginaries, after all, are not simply dictated by one powerful entity. As stated earlier in this chapter, imaginaries are co-produced, with new visions of the future needing to find purchase on pre-existing values and understanding of the world held by

the wider population. By analyzing enthusiast press articles in addition to corporate press conferences, I was able to better understand the values and preconceptions the cloud-gaming imaginary is building on.

I did not, however, choose to include the perspective of users and digital game players in this analysis. Sources that detail the way in which people unaligned with platform-owners conceive of cloud streaming technology would have been useful in further understanding how the imaginary being constructed by companies like Google, Nvidia, and Microsoft are building off of pre-existing conceptions of the world held by their target demographics, as well as potentially giving an insight on how the dominant imaginary is being contested and opposed. While exploring the perspective of users in regards to cloud streaming would have fallen outside of the intended scope of my thesis, an analysis of this kind could serve as a potential extension to this thesis in the future. For now, in order to focus on the main questions of this thesis — that is, how platform owners are trying to position a vision of the future that directly benefits their economic interests — I chose to exclude the perspective of the user and focus on the ideal imaginary being constructed by platform owners.

In service of this central question, I examine the marketing and press surrounding three different cloud streaming services. This includes a service that has already launched and failed (OnLive), a service that are currently in operation (Nvidia's Geforce Now) and a service that has yet to launch (Google Stadia). I chose to include all three of these services in order to determine the aspects of cloud game streaming that are part of the wider imaginary, instead of being specific to one platform at one point of time. Conversely, I also wanted to see how the differences in the three services resulted in different aspects of the cloud gaming imaginary being

emphasized or deemphasized, and how the imaginary has changed or shifted within the span of ten years. Because of this, the three platforms chosen are relatively distinct from one another.

The first of these services, OnLive, was announced in 2009, launched in 2010, and collapsed in 2012. After a brief attempt to relaunch the company, OnLive was bought out by Sony and the service made defunct in 2015. While it was active, OnLive was a cloud-gaming platform that could be accessed through either a desktop computer or a proprietary 'console,' with the platform allowing players to directly purchase and rent games to stream for an upfront cost, create a user profile, and share videos with friends. Unlike OnLive, Nvidia's Geforce Now instead serves as a platform for users to connect to other platforms, with the service allowing users to remotely access services such as Steam, EA Origins, or the Epic Game Store in order to play games and connect with other users. While the service was announced in early 2017 and released as a beta later that year, Geforce Now has stayed in beta since its initial release, with only a limited number of users allowed to access the service. Google Stadia, which was originally known in early testing as Project Stream, was initially debuted in its beta version in 2018 and formally announced in early 2019. Like OnLive, Google Stadia will be a platform through which users can directly access games, connect with friends, and share videos and images. However, unlike OnLive, Stadia will operate more akin to a service such as Netflix, with users paying a monthly fee to access a library of pre-selected games. This is also divergent from the business model of GeForce Now, which charges players according to the number of hours spent accessing the service.

For each of these three services, I gathered six sources — the industry press conference in which these services were announced, as well as five enthusiast press articles detailing hands-on impressions with these services. The press conferences were found on Youtube, while the

enthusiast press articles were found through Google searches using the keyword 'impression' combined with a platform names. The word 'impression' was chosen due to its use in the entusiast press to denote hands-on experience with a game or platform. Articles were chosen from popular, mid-to-large scale enthusiast press outlets, including Venturebeat, Gizmodo, The Verge, Engadget, PC World, and others. Articles that did not include hands-on impressions, as well as articles from smaller outlets and personal blogs, were not included. I chose only articles that dealt with hands-on impressions in order to ensure a measure of consistency across the articles being studied, as this would ensure that all of the articles involved the author engaging with and offering opinions on the technology itself. A detailed list of these sources can be found in the Materials section at the end of this thesis.

After obtaining the 18 sources to be used for this analysis, I proceeded to conduct a close reading/watching of all of the material. This was done via extensive note taking, in which I noted any instance of the author or speaker referencing the future in any way, including comments about how a cloud game streaming platform might 'change' or 'revolutionize' the digital games industry. I then took notes on all of the justifications being offered for why cloud game streaming was considered a 'futuristic' technology, noting any recurring themes identified across the disparate sources. During this process, I focused less at specific language and more at how the authors and speakers were attempting to position cloud game streaming in their conception of the future. I asked myself: according to these texts, what does the future look like? What does the future feel like? How will this future be better than the world we have now? What are the aspects of cloud game streaming that would make this future possible? These were the questions that guided my eventual understanding of the corporate sociotechnical imaginary surrounding cloud game streaming.

In conducting a close reading of my chosen sources and asking myself those guiding questions, I was able to identify four key themes present in all of the sources I examined. Those themes were: 1) the promise of accessibility, 2) the appeal of convenience, 3) the illusion of no platforms, and 4) the authenticity of the experience provided by game streaming. These themes, along with the way in which they were used to theorize the corporate sociotechnical imaginary being constructed around cloud streaming digital games, will be expanded upon in the next chapter.

## Conclusion

The sociotechnical imaginary, a methodological framework created by Sheila Jasanoff and Sang-Hyun Kim (2009), allows scholars to interrogate the ways in which governments, corporations, and other powerful entities attempt to position their own visions of the future within the collective consciousness of the general populace. More specifically, the concept of the corporate sociotechnical imaginary can be used to examine how private corporations use advertising, industry conferences, the enthusiast press, and other outlets to advance visions of the future in which their products and services play a central, emancipatory role.

In this chapter I have demonstrated how the sociotechnical imaginary differs from similar methodological frameworks and theoretical lenses — including discourse analysis, master narratives, and ideology — and explained how the elements that make the sociotechnical imaginary distinct also made it the logical choice for the analysis done in this thesis. By using the corporate sociotechnical imaginary as a methodological guide to my central question and associated subquestions, I have been able to closely analyze my chosen material and identify four key themes around which the sociotechnical imaginary of cloud game streaming is being

constructed. In the following chapter, I use these themes to theorize the sociotechnical imaginary surrounding this emerging technology, the way this imaginary is being constructed and propagated by platform owners, and the economic purpose this imaginary is meant to serve.

# Analysis and Discussion

## Introduction

In this chapter, I discuss the four recurring themes I found in the press conferences and enthusiast press articles on game streaming technology. These themes included 1) the appeal of convenience, 2) the promise of accessibility, 3) the illusion of no platforms, and 4) the authenticity of the experience provided by game streaming. I then demonstrate how these themes come together to construct a sociotechnical imaginary around cloud-based game streaming — exploring both the future that is presented by this imaginary, and how this vision of the future serves the interests of the platform owners investing in game streaming while also serving to appeal to the genuine desires and aspirations of people who play digital games. This description of the corporate sociotechnical imaginary surrounding cloud gaming is followed by an exploration of how platform owners and the enthusiast press work together to co-produce this imaginary, along with a critical examination of the vision of the future being constructed around cloud game streaming. I then conclude this chapter by reasserting the economic and infrastructural dimensions of cloud gaming and its sociotechnical imaginary, showing how platform owners like Google, Nvidia, Microsoft, and others are seeking to use sociotechnical imaginaries to justify the building of new private infrastructures.

## The Imaginary of Game Streaming

After analyzing articles by the enthusiast press about their impressions of game streaming services, along with press conferences presented by Onlive, Nvidia, and Google in 2009, 2017, and 2019 respectively, several recurring themes surrounding the way these actors discussed cloud gaming became apparent. Throughout all of this material, cloud gaming is positioned as a technology of convenience, able to bring digital games to consumers with fewer obstacles between them — problems such as installation times, game updates, and hardware maintenance would all be handled by the platform owner. The presenters and authors analyzed in this study repeatedly emphasized how "easy" (Etienne, 2018, para. 12; Google, 2019; Hardawar, 2018, para. 5; Takahashi, 2010) it is to connect to and use cloud services, with language such as "instant" (Gamespot, 2009; Google, 2019; Takahashi, 2010, para. 1), "simple" (Google, 2019; Knapp, 2019, para 7; Manchkovek, 2018, para. 4; Narcisse, 2010, p. 2), and "automatic" (Castle, 2018, para. 11) being used to describe the process of using these services. Conversely, traditional methods of playing digital games are made out by these authors and speakers as being slow, cumbersome, annoying, and archaic — clearly inferior to the speed and convenience offered by cloud gaming.

Similarly, cloud gaming was also positioned as a move forward for accessibility in digital games, as users of this technology would not be required to spend money up front on an expensive gaming PC or console, and would not need the technical acumen to maintain or upgrade such a device. These monetary and technical hurdles are framed as further "barriers for users" (Google, 2019) who want to play modern, graphically intensive digital games, with cloud gaming instead positioned as a way for "everyone" (Google, 2019) to play games. Many of the

speakers and authors analyzed in this study emphasized the fact that cloud gaming services are "cheap" (Narcisse, 2010, p. 1) "cost-effective" (Castle, 2018, para. 24), and "accessible" (Google, 2019; Reynolds, 2011, para. 12) contrasted against expensive and inaccessible consoles and gaming PCs.

Another common theme, especially when discussing Google Stadia, is that cloud gaming would transcend platforms, meaning that digital game players would no longer have to choose between consoles with different platform exclusive titles. Currently, a person with a game console is limited to only being able to play the games that are released for their console, with 'platform exclusives' being the games only released to a single platform. A gamer with an Xbox One, for example, would be unable to play a Playstation 4 exclusive game. With the advent of cloud gaming, Google claims, this problem would disappear. There would instead be one choice (in this case, Google Stadia) with all of the games consumers want to play. While the Google press conference was the most explicit example of this theme, with repeated mentions of how Stadia will be "one place" for "everyone you know and everyone they know" (Google, 2019), this theme was also present in the other material analyzed for this study, albeit in more subtle ways. The authors and speakers discussing OnLive and Geforce Now mention how these services are a "threat" (Birch, 2018, para. 8) to traditional consoles, how cloud gaming may become "ubiquitous" (Honorof, 2018, para. 13) and how these services might serve as a "panacea to the console loyalist fighting" (Narcisse, 2010, p. 2) that occurs between fans of different platforms.

Finally, one of the most prevalent themes from the press conferences and articles was that cloud gaming is 'just as good' as playing games on a high-end PC or a dedicated console, with any problems present in cloud gaming being inconsequential enough to be easily overlooked by

digital game players. Aside from convenience, this was the most ubiquitous theme I identified in the material analyzed for this study, with every author and speaker touching upon the idea that cloud streaming works as well as (or better than) traditional game consoles or gaming PCs. Authors and speakers described the experience of using cloud gaming services as "satisfying" (Birch, 2018, para. 4), "responsive" (Covert, 2009, para. 4; Hardawar, 2018, para. 7), and "just like the real thing" (Etienne, 2018, para. 3), with multiple direct comparisons made to the experience of playing consoles and gaming PCs. Conversely, any problems present in the experience were actively downplayed, with issues such as latency and image compression described as "imperceptible" (Narcisse, 2010, p. 1) or "unnoticeable" (Knapp, 2019, para. 40). When problems were identified, they were dismissed as being something that most people "wouldn't even notice" (Chacos, 2018, p. 2), or something that only "hardcore" (Smith, 2010, p. 2) gamers would care about.

While the articles and press conferences analyzed for this thesis were discussing cloud gaming as it existed in the present, these themes — convenience, accessibility, platform agnosticism, and authenticity — were bound up in language positioning cloud gaming as a technology of the future. By examining the aspects of this technology that are tied to the idea of cloud gaming being representative of 'the future of gaming' I intend to map out the shape and structure of this proposed future, and in doing so reveal the sociotechnical imaginary that has emerged alongside cloud gaming technology.

As discussed in the methodology chapter, it is important to remember that imaginaries are not master narratives set out by a single actor. Rather, they are co-produced, involving a melding of both the desires of powerful actors along with pre existing conceptions of the future embedded within the social imagination of the wider populace (Jasanoff, 2004). In the case of cloud-based

game streaming, the principle actor attempting to shape the sociotechnical imaginary are the companies that own these technologies — the platform owners. Other actors involved in constructing the sociotechnical imaginary, such as the enthusiast press, serve to bridge the gap between the vision of the future being proposed by platform owners and the pre existing visions of the future already entrenched within the hegemony. While individual digital game players have also played a role in the co-production of this imaginary, I have chosen to focus on the enthusiast press and the companies themselves, due to their relatively larger audiences and their capacity to influence public perception.

Fittingly, the aspects of cloud streaming that were focused on by the enthusiast press differed slightly from those discussed by the companies that own the cloud streaming services, with further differences also being observed across the three different cloud gaming services (OnLive, Geforce Now, and Stadia) and three different time periods (2009, 2017, and 2019, respectively) included in this analysis. In general, the enthusiast press was more focused on issues of authenticity, accessibility, and convenience, while the official press conferences were more likely to discuss platform agnosticism as an overarching benefit of cloud gaming. Even among the official press conferences, the presentations for Onlive and Google Stadia had much more of a focus on platform agnosticism than the presentation for Nvidia's Geforce Now. This is to be expected, considering that Onlive and Stadia were both positioned as service platforms themselves, whereas Geforce Now functions more akin to a traditional PC application.

However, these differences between the way the articles and press conferences discussed different cloud gaming services were overshadowed by the similarities — the focus on convenience, accessibility, the promise of no platforms, and the authenticity of the cloud gaming experience. Taken as a totality, the articles and press conferences analyzed in this thesis all

focused on similar justifications as to why cloud gaming is a technology of the future, and thus put forward a cohesive sociotechnical imaginary surrounding this technology. This imaginary can be best summarized by the words used in the articles and press conferences themselves. For example, Brad Chacos (2018), writing in PC World about Nvidia's Geforce Now, wrote: "The promise of cloud gaming holds clear appeal. High-end gaming on any Internet-connected PC, even crappy old laptops that couldn't dream of running games normally? Yes please!" (p. 1) Steve Perlman, when introducing OnLive during his talk at the 2009 Game Developers Conference, stated that with Onlive users "can play games instantly, hit the button and the game plays," and that in the future, a consumer won't "have to worry about not getting the right console your kids don't really want, or the console getting obsolete" (Gamespot, 2009). And, perhaps in the best example of this imaginary being constructed, Google's press conference at the 2019 GDC included a video that stated in a voiceover that Stadia would be "one place, where anything you dream can be built. Playgrounds of the imagination. One place where you, and everyone you know, and everyone they know will all play together. One place that never stops evolving, where everyone will play and watch and create. From any screen at any time. One place for all the ways we play" (Google, 2019).

As such, the imaginary that has been constructed around cloud gaming by platform owners is one of convenience, accessibility, and freedom. This imaginary posits a future in which the experience of playing digital games has completely changed — where anyone with an internet connected device can play any game, anywhere in the world, with a low financial and technical barrier to entry. In this imaginary, people who play digital games no longer have to purchase expensive gaming computers or consoles, and no longer need the technical acumen required to upgrade or repair these machines. Also gone is the inconvenience associated with

purchasing and updating games themselves — no longer do games have to go through a lengthy installation process before being played, and updates to these games are done without the need for manual patching and the subsequent wait times that were formerly the responsibility of the user.

In the case of Google's Stadia, this future even invalidates the need to purchase games in the first place, with users instead having access to a seemingly limitless library of instantly accessible games. The future conjured by this imaginary is also free of the 'platform wars' that have dominated the games industry in the past (Nieborg, 2011), with disparate platforms with console exclusive games replaced with a single point of access through which all games can be played. According to Google's ideal future, no longer will Playstation owners feel the frustration of wanting to play a game that is only released on the Xbox — in this future, all players have access to all games.

The lynchpin of this future, of course, is the implementation and widespread adoption of cloud gaming technology. Only cloud gaming (according to the enthusiast press and the companies backing this technology) can fulfill this imaginary, acting as the catalyst by which the convenience, accessibility, and platform agnosticism of this tantalizing future can come to pass. Crucially, the future promised by this imaginary can not simply be achieved through the launch of a cloud gaming service. As articulated by the imagery of "one place" used in the Stadia press conference (Google, 2019) this future can only come to pass if the entirety of the digital games community — including players, streamers, developers, and publishers — embraces cloud gaming technology and rejects older methods of playing and purchasing games. This full-scale adoption would mean that all games are played exclusively over cloud streaming services, and

that all games are developed exclusively for cloud streaming services. Complete subservience to the cloud is a necessity for this imaginary to be realized.

The appeal of this proposed imaginary is not difficult to understand. Gaming is very expensive hobby, with the hardware and network connection needed limiting digital games to "the upper percentiles of global wealth" (Dyer-Witheford & de Peuter 2009, p xii). The desire for a method of playing games that transcends this divide is firmly rooted in economic reality, and goes hand-in-hand with frustrations over the time required to update and download games and the barriers provided by platform exclusivity. Again, part of the reason why imaginaries are so powerful as a means of shifting the hegemony is because of their co-constructed nature — the vision of the future offered by cloud gaming platform owners is appealing precisely because it identifies and seeks to correct genuine problems in the lives of people who play digital games. As with the examples of the sociotechnical imaginary surrounding smart cities, which promises to solve urban inconveniences such as congested traffic and perceived threats to public safety (Sadowski & Bendor, 2018), this imaginary surrounding cloud gaming positions this technology as an emancipatory force, freeing digital game players from financial and temporal burdens placed on their favourite hobby.

However, this imaginary should not be accepted as objective truth. Imaginaries are inherently connected to the goals and desires of the actors that advance those imaginaries, and should not be viewed as objective representations of reality. Instead, this appeal to real frustrations facing digital game players serves to sanitize and even sensationalize cloud gaming in the eyes of consumers, and is why the platform owners backing this technology have been so eager to push this specific imaginary into the forefront. In order to demonstrate the ways in which this imaginary serves to glorify the potential benefits of cloud gaming while obscuring the

less appealing aspects of the technology, I will now examine the claims being made by the sociotechnical imaginary surrounding cloud gaming and contrast them to reality. What is the actual experience of using this technology? And what are the consequences of its widespread adoption?

## The Imaginary is a [Co-constructed] Lie

The imaginary surrounding cloud gaming promises a world in which games can be accessed with a push of a button, anywhere in the world, on any device, for next to nothing in cost paid by the user. But how capable is cloud gaming technology of actually delivering this promise? And what relevant aspects of cloud gaming are not included in this optimistic imaginary? Now that I have determined what the corporate sociotechnical imaginary surrounding cloud gaming looks like, I now examine both how this imaginary is formed, and how it serves to obfuscate the lived experience of using this technology.

In order to see past the ideological veil erected by the imaginary surrounding cloud gaming, it is useful to examine one of the themes found throughout the articles and press conferences analyzed by this thesis — the insistence that cloud gaming technology works just as well, or is just as authentic, as playing games on a traditional gaming PC or game console. Since traditional methods of playing digital games do not require a constant connection to a remote server for players to access and control the game, claims that cloud gaming services work 'just as well' as traditional methods are claims that the remote connection required for cloud gaming has no measurable effect on the experience of playing the game. This assertion is found throughout almost every enthusiast press article analyzed in this thesis, and is a central tenet of the pitches made by Onlive, Nvidia, and Google in their respective press conferences. For example,

Devindra Hardawar (2018) writing for Engadget, said that when playing on Geforce Now, he "almost forgot [he] was playing something that was running on a server hundreds of miles away" (para. 6). Matthew Reynolds (2011) writing for Digital Spy said that one of Onlive's "defining strengths" was its "low-latency stream that doesn't affect gameplay, which was one of its biggest concerns" (para. 12), while Austen Goslin (2018) of Polygon wrote that "playing a game as intensive as the new Assassin's Creed felt great" on Google Stadia, and even went as far to say that the experience "might even be the ideal way to play on PC" (para. 3).

These positive affirmations of the authenticity of the cloud gaming experience — combined with similar assertions made by the companies who own these services — gives the impression that cloud gaming services work exactly as advertised, running digital games from cloud servers with no technical issues or notable latency. This concept is crucial for the foundation of the cloud gaming imaginary. Cloud gaming cannot fulfill the promise of its own imaginary if the technology does not work as well as traditional methods — if one of these services is somehow seen as worse option than using a gaming PC or console, then its adoption appears as a compromise instead of a futuristic upgrade. Thus, the imaginary surrounding cloud gaming requires consumers to perceive any technological hurdles as a problem that has been solved, a sentiment that is directly echoed by Chacos (2018) when he claimed "Nvidia did it. Cloud gaming's promise has finally become reality" (p. 1). However, as made clear by multiple sources (including several of the articles analyzed for this thesis), cloud gaming services are far from being an answered promise. There are hundreds of users on Nvidia's official Geforce Now forums reporting cases high latency, image compression, and other technical issues (a post by martin131086 (2018) is one of many examples), and at least one journalist who tried Google Stadia wrote about how the latency caused by service resulted in in-game failure (Walton, 2019).

Even in the generally positive impressions analyzed for this study, some members of the enthusiast press identified noticeable latency and image compression during their time with OnLive, Geforce Now, and Stadia (even if these authors were quick to dismiss the severity of these problems).

These errors, caused by breakdown in the infrastructure needed to support cloud gaming, are not unexpected by those who remember the history of this technology. As I explained in the Theory chapter, the very nature of cloud streaming invites new sources of infrastructural failure that erode the barrier between digital games and the world outside the game. Even though the experience of using this technology may function without infrastructural failure in most cases, the frustration caused by intermittent disconnections and lag spikes can be enough to drive users away. The most blatant example of this is OnLive, which ultimately went bankrupt because of these infrastructural problems — the service was shut down in 2015, in part due to high latency and other technical issues that made using the service frustrating and difficult (Leadbetter, 2010). However, other, newer cloud gaming services are also struggling with infrastructural difficulties. While not explored in this thesis, there have been multiple cloud gaming companies that have started and stalled over the past decade, including services such as Shinra, LiquidSky, Snoost, and Gaikai. Other services, such as Shadow, Vortex, Playcloud, and Geforce Now are still in operation, yet have failed to become as ubiquitous or successful as any of the popular video or music streaming services. Despite the glowing impressions shared by members of the enthusiast press, user experiences with almost all of these services has ultimately revealed the chaotic and disruptive nature of cloud technology.

So why, then, do so many members of the enthusiast press claim that cloud gaming services work as well as traditional platforms, even after the collapse of Onlive and the limited success of other cloud streaming platforms? I put forward two potential explanations.

The first is straightforward: that for members of the enthusiast press, the cloud gaming services they tried worked without any severe errors during their initial, limited exposure to the technology. The articles examined in this thesis were primarily written as initial impressions, sharing the authors' reaction to the technology after a limited amount of playtime. This decreases the chances that these authors would have experienced any kind of catastrophic failure, or even particularly annoying cases of latency or image compression. Yet even when these problems were encountered, such as in the articles by Evan Narcisse (2010), Katherine Castle (2018), and VSG (2019), the authors in question still remained optimistic and positive about cloud gaming technology in general. This is why I offer a second explanation: that members of the enthusiast press are pressured through overt or discrete economic and social forces to contribute to the sociotechnical imaginaries put forward by companies like Onlive, Nvidia, and Google.

As discussed in Edward S. Herman and Noam Chomsky's book *Manufacturing Consent* (2008), indirect, economic forces have a major impact on the political reporting done by the mass media in free-market, liberal states such as Canada or the United States. Herman and Chomsky use what they call a propaganda model of mass media, describing five distinct "filters" (p. 2) that are applied to privately owned mass media that act as a type of soft censorship. The result of these filters is that the political reporting done by mass media outlets aligns with the ideological views of the state, without the need for direct censorship or state-ownership of the media. While originally applied to states exerting control over political reporting, as with the concept of sociotechnical imaginaries, the concept of the propaganda model can also be applied

to the pressures exerted by publishers, platform owners, and other large corporations onto the enthusiast press surrounding digital games. In particular, two of the filters described by Herman and Chomsky — a dependance on advertising as a major source of income and the reliance on resources provided by the entities the press are reporting on — have a direct relevance to the way in which the enthusiast press becomes aligned with the interests of large technology companies.

Examples of these filters being used by corporations to apply pressure to digital game-related publications are not difficult to find. A high-profile case was GameSpot writer Jeff Gerstmann, who was fired from his position as editorial director in 2007 after publishing a negative review of the game *Kane & Lynch: Dead Men* (2007) ( (Kain, 2012). Sony, the company that published *Kane & Lynch,* threatened to pull their advertising over the negative review, leading Gamespot to fire Gerstmann as a conciliatory gesture to one of their largest sources of advertising revenue. In another example, the enthusiast press outlet Kotaku revealed in 2015 that they had been blacklisted by two of the largest game-publishers, Bethesda and Ubisoft, after reporting on leaks revealing games from these publishers that had yet to be formally announced (Kain, 2015). Because of Kotaku's decision to report on stories Bethesda and Ubisoft did not approve of, they lost access to early review copies of those publisher's games, along with access to interviews, press releases, and other materials that make writing stories about these companies less demanding and time-intensive. Without this access, Kotaku was placed at a competitive disadvantage compared to other enthusiast press outlets that did have access to Bethesda and Ubisoft, potentially harming Kotaku's bottom line and discouraging other outlets from reporting on similar stories.

While large digital-game companies are not directly dictating what enthusiast press outlets such as Gamespot and Kotaku write about their games or business practises, the filters

created by the enthusiast press's dependence on advertising revenue and logistical support from major game companies allows for publishers and platform-owners to exert an indirect economic influence over the content these outlets publish. This indirect influence also extends to the coverage emerging technologies, such as cloud streaming, leading to the enthusiast press becoming co-producers of the sociotechnical imaginary that benefits the companies investing in these emerging technologies. With examples like Kotaku and Jeff Gerstmann serving as warnings to enthusiast press outlets about the dangers of negative coverage, it is unlikely that any reporters would want to risk raising the ire of a company like Google, which on its own controls the advertising being provided across a large swath of the internet (Srnicek, 2017).

As for the platform owners, it is more clearly apparent why the companies such as Onlive, Nvidia, and Google would want to propagate the utopian, emancipatory sociotechnical imaginary surrounding cloud streaming. This vision of the future, in which cloud gaming has solved many of the most pressing problems facing gaming as a hobby, portrays cloud gaming technology in a positive light while serving to downplay the drawbacks associated with these services. The imaginary positions the act of adopting this technology as purely an upgrade to existing methods of playing digital games, instead of as a tradeoff between one method with both positive and negative aspects and another method with similarly positive and negative aspects. Ultimately, the imaginary surrounding cloud gaming serves as a smokescreen — a distraction that obfuscates the material limitations and potential downsides of the technology while drawing attention to the purported benefits its adoption would bring to individual users and society at large. Any problems with the technology are framed by the enthusiast press and the companies who own these services as being either non-existent, as is the case with latency, or ultimately inconsequential in comparison to the positive aspects of cloud gaming.

This is why the imaginary surrounding cloud gaming is built on the promises of accessibility, convenience, and freedom from restrictive platforms — as mentioned earlier in this chapter, these aspects of the imaginary touch upon real frustrations felt by people who enjoy playing digital games. A future in which digital games are easier and more affordable to access is a future that could, in theory, be more equitable and just for the majority of people. However, these positive aspects of the technology are also being exaggerated and simplified in the service of creating a sociotechnical imaginary that positions cloud gaming as a positive force of social and technological change. By focusing on these positive aspects of the technology and ignoring the negative or controversial aspects of cloud gaming, the enthusiast press and the companies backing this technology are able to obfuscate the potential tradeoffs that would come with the large scale adoption of cloud gaming.

The emphasis on convenience within the cloud gaming imaginary, for example, serves to circumvent the aspects of the technology that enable this convenience in the first place — the abdication of personal ownership over both the hardware and software needed to play digital games. While cloud gaming would result in less time spent by digital game players upgrading their gaming PCs and patching their games, this is only because those digital game players would no longer own a gaming PC or, in the case of Google Stadia, they would no longer own their games. Using Onlive, Geforce Now or Google Stadia amounts to renting a gaming PC indefinitely, one that cannot be modified, customized, or accessed in any meaningful way by the user. What digital game players gain in convenience comes with a loss of control, a theme that is explored in more detail in the next section of this chapter.

Similarly, the aspect of the cloud gaming imaginary concerned with financial accessibility also ignores the potential for cloud gaming to also cost users large sums of money

— albeit over a longer time scale. While renting a gaming PC through a cloud gaming service would allow users to avoid the high upfront cost of buying a gaming PC of their own, a fact that appeals to consumers in an era of stagnating wages and rising costs of living (Srnicek 2017), the total cost paid by the user over time may actually be higher due to the indefinite nature of renting as a business model. In the case of Geforce Now, a user has to pay $25 for 20 hours of access to an Nvidia owned PC. For example, if this user plays digital games for 10 hours a week, this would add up to $50 a month, or $600 a year. While this is technically cheaper than a gaming PC, which can cost between $800-$1500, this price then has to be paid year after year, resulting in an overall higher cost to the user. Additionally, users of cloud gaming services may also have to 'pay' for their use of the service in other, less straightforward ways — Google and other large platform owners primarily operate through the collection and monetization of personal data, (Srnicek 2017) and it is likely that a service like Google Stadia would continue this trend.

For many reasons, the idea that cloud gaming will result in a platform-free, unified future for digital games is also difficult to square with the current instantiation of online gaming. Firstly, as stated earlier, there are already multiple cloud gaming services either in beta testing or in development, meaning that users will be forced to choose which platform to subscribe to and, more importantly, developers will have to choose which platforms to launch their games on. As with video streaming services, in which content is divided between platforms such as Netflix, Hulu, Amazon Prime, HBO Go, and Disney+, cloud gaming services will have their own exclusive releases that cannot be accessed on other services. Google has already announced that Stadia will play host to a number of exclusive, Google-developed games that cannot be accessed on other services, and Sony's Playstation Now features Playstation exclusive games that cannot be accessed anywhere else (Yin-Poole, 2018). Microsoft, another platform owner who recently

announced a cloud gaming service, will likely do the same with their own self-published games in order to maintain a competitive advantage. Despite the sociotechnical imaginary surrounding cloud gaming promising an end to the era of platform exclusive games, the future heralded by this imaginary threatens to be exactly the opposite — one of intense platformization that requires players to subscribe to multiple competing services in order to access every game on the market.

The future promised by the cloud gaming imaginary depicts a world in which gaming has become more convenient, more accessible, and free of platform-based divisions without any technical compromises, all because of cloud gaming and its widespread adoption by users and developers. Yet, as discussed above, these aspects of the imaginary are either obscuring a more complex reality (as with the promises of convenience and accessibility) or are complete fabrications (as with the promises of no platforms and authenticity). The sociotechnical imaginary that platform owners have constructed around cloud gaming, and which the enthusiast press has helped to propagate and co-produce, is a misrepresentation of the material and experiential nature of this technology, one that serves to portray cloud gaming in a positive, emancipatory light. In the concluding section of this chapter, I argue that this misrepresentation is deliberate — that the cloud gaming imaginary was constructed for the purpose of advancing the economic interests of platform-owners by convincing consumers that utopia lies behind a remote server.

## The Purpose of the Imaginary

The corporate sociotechnical imaginary constructed around cloud gaming emphasizes parts of the technology that appeal to consumers, while erasing the negative parts and the parts that appeal to the platform owners investing in this technology. In the previous section of this

chapter, I took the four themes I identified as key elements of the sociotechnical imaginary surrounding cloud streaming and paired them with a negative aspect of cloud streaming that theme was meant to disguise. The appeal to convenience hid a removal of user ownership and control, the promise of accessibility obscured potentially higher costs paid in indefinite rent, the illusion of no platforms hid an emerging future in which multiple platforms still compete using platform exclusive games, and the alleged authenticity of the cloud gaming experience served as cover for the potential for catastrophic infrastructural failure.

Two of these aspects — the potential for infrastructural failure and the perpetuation of platform exclusive games — are not necessarily beneficial to platform owners, but are unavoidable aspects of cloud gaming nonetheless. The inevitability of infrastructural failure and its effects on cloud gaming were discussed in the Theory chapter, and platform exclusive games are necessary for competing digital game platforms to draw in new users (Nieborg, 2011). For platform owners, constructing an imaginary surrounding cloud streaming that obscures these problems from the awareness of users is a far easier proposition than the potentially insurmountable task of solving these problems.

However, the other two aspects of cloud gaming I discussed above — the lack of user ownership and the potential for higher costs due to the need for users to rent indefinitely — are only negative from the perspective of the users. For platform owners, these aspects of cloud gaming are the reason why cloud gaming is an appealing investment in the first place. As discussed in the Theory chapter, cloud gaming serves as a continuation of the techno-economic logic that has guided the digital games industry for decades (Nieborg, 2011). By moving away from traditional consoles and towards cloud gaming, platform owners in the digital games industry are able to centralize the ownership and control over all elements of their platforms.

This control grants platform owners "perfect enforcement" (Nieborg, 2011, p. 135), meaning that they are able to ensure that users are unable to share, hack, or otherwise take advantage of cloud streaming platforms due to their inability to meaningfully interact with any of those platforms' elements. Without a console to hack or a physical disk to share with friends, a user is forced to comport to the platform owner's rules if they want to access the content on that platform — which, in this case means subscribing to a cloud gaming service.

The perfect enforcement granted by cloud gaming results in a situation in which users, unable to buy their games outright, are forced to pay rent to the platform owners that control the right to these games. This is a form of monopoly rent (David Harvey, 2002), which occurs when an entity controls exerts exclusive ownership over a desired resource. By altering the landscape of gaming so that users must pay a monopoly rent instead of directly buying games, platform owners will be able to use cloud gaming services to extract more money from users over a longer span of time, much in the same way a landlord does when they choose to rent their property instead of selling it outright. Along with cloud gaming being a potential source of data in an economy where data is a highly valuable resource (Srnicek, 2017), this is the primary economic motivation for the surge in cloud streaming services entering the market.

But cloud gaming, of course, is not an isolated case of platform owners seeking monopoly rent. Netflix, Spotify, and other streaming media services have been taking this same strategy for years, taking formerly physical media that was purchased and owned by users (in the case of Netflix, DVDs and DVD players, and in the case of Spotify, MP3s and MP3 players) and replacing them with digital platforms that charge recurring fees. In each of these cases, personal tools and hobbyist modes of enjoying media are being turned into privately owned infrastructures — inaccessible and transparent systems that dictate how users are able to interact

with their media. Infrastructure, after all, is relational (Star, 1999). What was once a formerly manual task (such as operating a game console and physical game disk, or a gaming PC with a game downloaded from a digital marketplace) can be converted into infrastructure if that process is made invisible to the user. By doing so, platform owners are able to gain control over a new positions in "the stack," a concept used by Nick Srnicek (2017, p. 106) to describe the key positions by which platform owners can assert monopolies, control user actions, and collect data. Google, Nvidia, Microsoft, and even OnLive when their service was first announced, are attempting to use cloud gaming as a way to build a new, foundational private infrastructure, in order to increase their profitability and competitiveness in the digital games industry.

However, there remains the problems of the user. Because this process of infrastructuralization takes control away from users, and because the result of this infrastructuralization is often services that charge rent, collect data, and are subject to infrastructural failure, users have a reason to be resistant to this process. In order to convince users that this infrastructuralization is beneficial, platform owners are required to shift the hegemony. They must wage what Gramsci (1999) describes as a "war of position" (p. 481), altering the values, standards, and expectations held by the wider population, convincing them that the convenience, accessibility, and perceived platform agnosticism offered by cloud services is worth any potential downsides when compared to traditional media practises. In the case of game streaming, where infrastructural failure poses a more foundational threat to the experience of engaging with the medium, this process also entails convincing potential users that there is no downside at all, or that whatever issues this new service may face are ultimately inconsequential.

This is where the corporate sociotechnical imaginary becomes useful to large platform owners. By building positive, utopian imaginaries surrounding the infrastructuralization of

physical media, platform owners are able to emphasize the positive parts of their services that appeal to genuine consumer desires while downplaying or completely erasing any potentially consequences that result in meeting these desires. This is done by explicitly positioning these new private infrastructures as being representative of the future, either directly or through proxies such as the enthusiast press — Google did this for cloud gaming multiple times during their Stadia press conference, referring to the service as the "future of games" (Google, 2019), while both Nathan Birch (2018) of WCCF Tech and Devindra Hardawar (2018) of Engadget refer to Nvidia's Geforce Now as "the future of gaming." In doing so, platform owners are hoping that the hegemony will shift. That the general populace will accept these new services (provided through newly created private infrastructures) as being inescapable parts of the future, both closing the door to potential alternatives while justifying the expansion of platforms in the present.

By claiming ownership over the future, cloud gaming providers want to make the complete ubiquity of their services seem inevitable. And there is no point resisting the inevitable.

## Conclusion

The corporate sociotechnical imaginary constructed around cloud gaming is one that promises convenience, accessibility, no platforms, and a completely authentic experience. These promises tap into real frustrations and problems that exist within gaming as a hobby, giving the vision of the future offered by this imaginary a strong appeal to people who are tired of the high prices and time commitments demanded from fans of digital games. However, this imaginary also serves to obscure the most pressing negative consequences of adopting cloud streaming technology, with some issues (such as the lack of user control and the need to pay indefinite rent) being pushed

out of the spotlight, and others (such as continuation of platform divisions and the potential for infrastructure failure) being covered up completely. By constructing an emancipatory, utopian imaginary surrounding cloud streaming, platform owners such as Google, Nvidia, and OnLive have been shifting the hegemony, attempting to secure public support for the construction of new, privately held infrastructures that allows these corporations complete control over their respective platforms. In propagating a vision of the future that can only be achieved through cloud gaming, these platform owners seek to make the large-scale adoption of their services seem like common sense — a part of the wider culture that is taken for granted as a natural extension of our prior values, beliefs, and ideals. Other visions of the future become crowded out of the public imaginary, replaced by the inevitable, monolithic rule of cloud gaming.

Yet just because the corporate sociotechnical imaginary surrounding cloud gaming positions this technology as inevitable, does not mean cloud gaming truly is inevitable. In the conclusion for this thesis I make a call for scholars and 'gamers' alike to advance potential alternate futures for digital games — despite the increasing financial push made by platform owners towards cloud gaming. As said by Ursula K. Le Guin (2014) when discussing the ubiquity of capitalism: "its power seems inescapable – but then, so did the divine right of kings" (para. 6). While platform owners want you to feel like cloud gaming is inevitable, the future has yet to be written.

# Conclusion

When beginning my work on this thesis, I set out to answer three key questions. What is the corporate sociotechnical imaginary platform owners and the enthusiast press are constructing around the technology of cloud gaming? How are the platform owners seeking to construct this imaginary? And what political or economic purpose does the construction of this imaginary serve? Now, after applying the framework of the corporate sociotechnical imaginary and building off of theory drawn from the subfields of critical media infrastructure studies, digital games studies, and critical theory, I have answers to these questions.

As with so many other imaginaries being used to stake a claim on the future, the corporate sociotechnical imaginary that has been constructed around cloud gaming is one that promises a utopian emancipatory future. In this future, gaming has become more convenient, more financially and technically accessible, and free of outdated platform-based restrictions, all without any sacrifice to the authenticity of the gaming experience. All someone living in this idealized future has to do to play the newest digital games is to sit down at their laptop and push a button, a feat made possible only thanks to the wonder of cloud gaming technology. To construct this imaginary, platform owners have used both direct channels of communication — such as the trade show press conferences analyzed in this thesis — along with indirect channels such as the digital games enthusiast press. By exerting economic and social pressure over the enthusiast press, platform owners are able to influence the coverage of cloud gaming and ensure the idealized imaginary surrounding cloud gaming is replicated within these market-driven press outlets. But while cloud gaming stands to be incredibly profitable for platform owners, allowing

companies to increase their control over platforms while also serving as a way to extract valuable data from users, there are many potential downsides to this technology that may drive away users and cause these emerging services to fail. Hence, the political and economic purpose of this corporate sociotechnical imaginary is to sell consumers on a technology that is vulnerable to infrastructural failure, takes control away from users, and requires users to pay rent for commodities that were previously bought and owned. By manipulating the corporate sociotechnical imaginary surrounding cloud gaming to position this technology as the key to a better future for the medium, platform owners are seeking to claim dominion over the future of digital games and secure cloud gaming's place within the cultural hegemony.

Yet this future is not written in stone. If OnLive's failure can teach us anything, it is that the sociotechnical imaginary constructed around cloud streaming is not all-powerful. Users still have the capacity to see through this ideological cover and reckon with the actual experience of using cloud gaming technology. Similarly, even platform owners as powerful as Google can have their attempts at imaginary building crash and fail — Google Glass, Google+ and Google Wave are some of the many products and services the tech giant has discontinued after being unable to build and sustain a large enough user base.

So while the future being proposed by platform owners can feel inevitable, people who are hesitant to accept this shallow utopia should not resign themselves to what seems like fate. Now that I have identified the sociotechnical imaginary platform owners are attempting to create for cloud gaming, I am hoping that other scholars — along with game developers and people who play digital games — will seek to outline possible alternative futures that fulfill the promise of the cloud gaming imaginary without the centralization of control that comes with it. After all, the promise made by the cloud gaming imaginary is insidious precisely because the vision of the

future it offers is genuinely utopian and desirable. A future where gaming is more affordable and easier to access for a wider range of people would be a future that is more just and equitable — but how can we attain that future without the need to pay rent to Google or Amazon to access one of their remote game servers?

One possibility may be a future where cloud gaming technology was owned publicly or collectively, instead of by large, private corporations. In such a situation cloud, gaming infrastructure would be removed from the profit motive that is currently driving its construction and deployment. Instead this technology would be treated more akin to a public service, with development focused on providing the best possible service to the largest number of people possible. In this context cloud gaming would not require users to pay rent indefinitely to a tech corporation, or to consent to having their data extracted and sold. However, the problem of infrastructural failure would still remain — unless these services were only used to play games that don't rely on precise movements or fast reaction times, the risk of non-consensual failure caused by the infrastructure will always be present. This future also wouldn't solve many other material problems with cloud gaming (and the cloud more generally) that I was unable to cover in this thesis. The foremost amongst these is the environmental impact of the server-filled data centres needed to run cloud gaming services — a topic other scholars are already exploring in relation to other types of data centres (Hogan, 2015; Peters, 2015; Ipsen, 2018).

With these irreconcilable issues in mind, what possible futures for digital games exist that go beyond the frame imposed by cloud gaming? What if, for example, modern digital games were made to be less graphically intensive, so that less costly devices would be able to run them? This would also have the effect of making digital games less costly to develop, and help to stem the perpetuation of unjust labour practises employed by large developers in order to efficiently

produce such complex, graphically demanding modern games. While this may sound far-fetched to someone who has been following the game industry's decades-long push for more complexity and increased graphical fidelity, these are the kinds of counter-imaginaries that are needed to begin theorizing a different kind of future — one that breaks the cycle of the project of control that has dominated digital games since the first consoles hit consumer markets. I encourage other scholars interested in all forms of media infrastructure to begin theorizing these counter-imaginaries, challenging the seemingly inevitable futures that are being positioned by platform owners by offering visions of just, compelling alternatives.

Until then, this thesis can serve as a first step to a different path. As the first long-form effort to bridge critical media infrastructure studies and digital games studies, as well as one of the first efforts to apply critical theory to cloud gaming services, I can only hope to open a floodgate of research into this emerging branch of the digital games industry. Whether or not Google, Nvidia, Amazon, and all of the other platform owners investing in cloud gaming are successful in convincing users to adopt their services, this technology represents a larger trend in the infrastructuralization and centralization of traditional commodities that will most likely be extended into even more aspects of our lives. By studying the emergence of cloud gaming, scholars will have an opportunity to see this process of infrastructuralization in real time — and have an opportunity to work with other scholars, developers, and 'gamers' to articulate a coherent intellectual resistance to this trend. In doing so, our collective vision for what the future should look like can be reclaimed from the hands of platform owners, and replaced with a vision of the future that is genuinely utopian, emancipatory, and just — instead of an imaginary that merely seems that way.

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