Article

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The streaming network: Conceptualizing distribution economy, technology, and power in streaming media services

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Abstract

Despite there being more than a decade since the introductions of Netflix' and Spotify's online services, few attempts have been made to thoroughly examine and conceptualize streaming and streaming services across culture and media industries. The argument proposed here is that streaming constitutes a distinct form of digital media distribution network, what I refer to as the streaming network. The article asks what constitutes the parts or nodes of such a streaming network, and further what the power relationships between the various parts are. The analysis uses Spotify, Apple Music, Netflix, and Kindle Unlimited as examples, building on a wide array of primary and secondary document sources. The analysis contains a stepwise discussion and visualization of how human and nonhuman actors in this streaming network are connected by way of flows of content, data, and money, as well as by relationships of control, access, and exposure. The argument draws on theories of network power, platform power, and algorithmic power. The analysis highlights the asymmetrical relationships between, on the one hand, users and content providers, and on the other, streaming providers and device and software makers. No single actor in the network is able to exercise full control, but users and content originators are seen as particularly vulnerable. Streaming providers and device and software makers are able to maneuver the network to strengthen their relative position.

Keywords

Apple Music, distribution economy, distribution technology, Kindle Unlimited, Netflix, network, network power, Spotify, streaming

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Introduction

Business models and distribution models labelled as streaming are no longer a novelty in the media and culture industries. However, more than a decade after the introductions of Netflix' and Spotify's online services, few attempts have been made to thoroughly examine and conceptualize streaming and streaming services across culture and media industries. Across cases such as these, as well as others that will be discussed in this article, there are significant differences in applications and contexts. Nonetheless, there are, I argue, noteworthy points of resemblance and similarities in technology, business models, and user experience. Central to my understanding of 'streaming media services' is the all you can eat-offer, where a vast content buffet is made available to users under an access-based model.

Because we currently lack a model for understanding the logics of streaming as a form of media distribution, we may also fail to comprehend the relationships between actors and stakeholders involved in streaming media. Actors and relationships can be outlined in a network model, where the objective is not only to detail who is part of the network but also how they interact and what positions they take. Thus, the main task of this study has been to answer two broad research questions: What constitutes the parts or nodes of a streaming network; and what are the power relationships between the various parts?

The argument proposed here is that streaming services are part of a digital media distribution network, what I refer to as *the streaming network*. In the following, I will sketch out this network using Spotify, Apple Music, Netflix, and Kindle Unlimited (KU) as case examples. While these four constitute a set of high-profile actors embedded in specific corporate structures, they can serve to illustrate relationships and principles that are arguably central to understanding how streaming services in general are set up. The analysis contains a stepwise discussion and visualization of how human and nonhuman actors in the streaming network are connected by way of flows of content, data, and money, as well as by relationships of control, access, and exposure. More so than a value chain analysis (Porter, 1985), which specifies value-adding activities from producer to consumer, a network model can capture the different types of relationships and transfers that take place in digital media contexts. Importantly, the analysis of the streaming network will indicate some of the ways in which the configuration of the network has consequences for the power relations between actors: Who is allowed to do what, who decides, and who benefits? A conceptualization of the streaming network model thus enables an understanding of how the shift from ownership to access (Allen-Robertson, 2013; Beer, 2019; Lotz, 2017; Perzanowski and Schultz, 2016; Sinclair and Tinson, 2017) also involves a reconfiguration of power relationships, whether it be conceptualized as network power (Castells, 2011, 2013), platform power (Evens and Donders, 2018), or algorithmic power (Bucher, 2018).

The motivation for developing the streaming network model is to outline the relationships between various actors involved in streaming media in a coherent manner and applicable across different media and culture industries. By drawing up a model of the streaming network, I aim to clarify what is distinctive about streaming as a digital media distribution model and what the implications are for the relationships between producers, users, and technology providers. The article and the streaming network model may thus provide not just details on certain streaming media services but a starting point for further theoretical and empirical work on streaming and the power relationships of the streaming network.

In the following, I will first describe the approach and methodology, before moving on to the theoretical and conceptual basis for the analysis. The analysis of the streaming network takes place

in five steps, followed by a discussion of the network in relation to concepts of power and a coda where I look at the network in context and suggest further research.

Method

The article combines theoretical and empirical approaches. The theoretical approach results in the discussion and outline of the streaming network, a novel conceptualization of streaming employing network theory (Castells, 2013) to study relationships of power. Empirically, I draw on financial and other available information regarding four streaming services: Spotify, Apple Music, Netflix, and KU. These four cases will be discussed and compared.

For the analysis, a rather broad array of sources have been used, both primary and secondary. For the specifics of each of the select streaming services, I have relied on a combination of sources, including financial and investor information disclosed by the companies themselves. The documents, which include filings with the US Securities and Exchange Commission (SEC), have been treated as sources and subjected to a basic document analysis (Karppinen and Moe, 2012) by the author. In the analysis, I first identified relevant sections in the documents and then systematically searched for segments where the companies make statements on their relationship with other stakeholders, competitors, customers, partners, and so on, that is, their immediate 'network'. The SEC filings, available from the database EDGAR, include quarterly (10-Q) and annual (10-K) reports from US public companies as well as other official communication with potential and existing investors and financial authorities. For information on Amazon, Apple, and Netflix, the 2017–2019 annual and quarterly reports, including letters to shareholders, have been main sources of financial and business model information. For Spotify, the 2018 Direct Public Offering (DPO) filing document (Form S-1) and the 2018-2019 quarterly reports were the main sources of information.

In general, already existing documents to be used by researchers as source information always serve a rhetorical function that needs to be offset or at least accounted for and contextualized (Karppinen and Moe, 2012). While the SEC filings provide useful and reasonably verified information on business model, financial health, risk factors, legal affairs, and management, they tend to lack in detail and remain the official – and thus potentially sanitized – version. Companies may exaggerate competitive advantages and downplay risks. To supplement the SEC filings, I have sought out sources that provide other perspectives and more detail. In this, analyses and reports from news outlets, trade press, and technology websites have been found useful, as well as existing research literature (research articles, case studies, handbook entries) on digital media and streaming. Finally, the company websites provide information on services, prices and benefits, number of users, content, and so on. In Amazon's case, the author guidelines on rights and pricing for Kindle Direct Publishing (KDP) was a helpful source of information. Naturally, all company-provided information, like the SEC documents, needs to be examined with caution and a critical eye.

Delimitations and definitions

Given the emergence of new and successful players such as Spotify and Netflix, the need for a conceptual understanding of the practices and processes of streaming has arisen (Lotz, 2017). However, despite the wide usage of the concept in the context of media and culture, there are few in-depth discussions of *streaming* as a concept that cuts across media industries. Part of the reason

may be that scholars emphasize the differences in streaming models for television, film, music, and various other digital media (see for instance Lobato, 2019 on this issue). Another reason may be that the streaming concept is deemed unsuited to capture the logics and dynamics in all the contexts in which it is applied. Herbert et al. (2018) suggest that streaming does not constitute a unified phenomenon and that consequently 'singular cross-industry claims about "streaming" cannot be made at this time' (Herbert et al., 2018: 14). As these authors also recognize, however, there are similarities such as in the shared consumer experience across streaming media (Herbert et al., 2018).

Adding to the elusiveness of the streaming concept, there are several notions in use that overlap with streaming, such as 'digital subscriptions', the complex digital television vernacular (SVOD/TVOD/AVOD), and the shorthand notion of 'on-demand' (Tryon, 2013). In addition, there is 'live streaming', which covers a related, but slightly different aspect than is the subject here (cf. Bingham, 2017; Spilker et al., 2018). For an article that sees on-demand and live streaming in conjunction, see Spilker and Colbjørnsen (2020).

Amanda Lotz is among the few who have attempted to theorize the access-based model in some detail, in her short treatise *Portals* (2017). Building on previous works that categorize media distribution and production models (Flichy, 1993; Lacroix and Tremblay, 1997; Miege, 1989), Lotz proposes 'a subscriber model of cultural production':

> At its most basic, the subscriber model is characterized by a user paying a fee for access to a collection of cultural goods. The subscriber, generally either an individual or household, typically enjoys unlimited access to the collection of goods held in the library for the duration of the subscription. Media operating within this model curate a collection of cultural goods according to a strategy based on providing a particular value proposition to subscribers. (Lotz, 2017: 39)

Lotz' definition captures many of the central characteristics of streaming media, but she mostly confines herself to the television industry. Moreover, her discussion bypasses the notion of streaming, by speaking rather of 'internet-distributed portals' and emphasizing 'subscription' as the keyword to understanding a service such as Netflix. Further, Lotz' definition does not account for the specific conditions of access in streaming (see also Fagerjord and Kueng, 2019).

I have opted here to proceed with the notion of 'streaming', despite some vagueness surrounding its usage. Not only does the streaming concept have a broad application across industrial contexts and beyond more or less specific industry or academic discourses, it is preferable over alternatives such as 'subscription' or 'on-demand' because it can capture the technical aspects, the business model aspects and the user experience. In the following, the streaming concept is briefly discussed from these three sides.

Technologically, 'streaming' denotes media that is simultaneously received by a user while delivered by a provider. Upon request, the provider sends files as data packets to the user's device that are then unpacked and deleted after consumption (cf. Küng's (2017) definition). This transfer, which takes place over the internet, relies on standardized file compression and transmission protocols. Users gain streaming access via an array of multimedia devices and software, highlighting the need for compatibility and convenient access points. The fact that streaming media files are not permanently available, but deleted after consumption sets streaming apart from the electronic sell through model where consumers pay a one-time fee to download a media file for permanent storage on a hard drive. While streaming media files are typically not downloaded, streaming providers may offer subsidiary capabilities that allow for pseudo-permanent access. Offline playlists in music services are an example. A similar type of pseudo-permanent access is

provided by e-book and audiobook streaming services where, typically, e-book files are not retrieved simultaneously but downloaded and stored in a 'digital bookshelf' connected to the user's account. KU, for instance, allows the user a maximum of 10 books checked out at once.

The business model of streaming is based on providing a vast bundle of content (Bakos and Brynjolfsson, 2000) brought together to form a coherent proposition to the user. This bundle is priced at a flat subscription fee, or the user is subject to advertising in the service. Nonprofit providers, such as public service institutions, also employ the streaming model under various financing models. For most streaming providers, content is delivered by others, prompting Vonderau (2015) to argue that aggregation is the central principle around which streaming is organized. The need to acquire vast amounts of database fodder makes deals and partnerships with content producers essential.

Arguably, the notion of streaming may most precisely denote the user experience, as Herbert et al. (2018) argue. Despite technical differences in the provision of streaming, the user experiences temporary access to online media files, whether they be audio, video, or text-based. This means that streaming services arguably offer a coherent value proposition across industries, and despite some not even referring to their practices as 'streaming' (for instance, KU). As Herbert et al. (2018) summarize:

> Most importantly, streaming offers an on-demand service that liberates media users from previous forms of scarcity (the broadcast schedule or the retail inventory). The major services all offer users personalized recommendations to help steer them through vast catalogs, though some music services also offer more explicit forms of expert curation. These new services offer considerably greater choice and convenience for users, with 'always on' access to media facilitated across a range of different devices. Such services are generally paid for via monthly subscription (. . .), with no payment required at the moment of use, so the consumption of particular media feel 'free' to the consumer.

Other shared characteristics are restrictions on retrieval, sharing, and dissemination. An important common trait is that users have little control over content in the sense that they cannot do with the content as they please. As such, the consumer experience is but one string which ties the streaming concept together, the other being how streaming users are *users of a service* rather than consumers engaging in a transaction.

The starting point for the development of the network model presented here is thus an understanding that streaming services offer temporary and contingent on-demand access to vast content databases for a fixed fee paid on a regular basis, or for exposure to advertising, and through an internet-connected device. This understanding covers both the technological aspects and the basic business model premises of streaming. Moreover, it points out the multiple actors and relationships involved in streaming contexts, including services, users, advertisers, content producers, and devices.

It should be pointed out that streaming is not a fixed phenomenon but keeps changing (cf. Spilker and Colbjørnsen, 2020). The network may not be stabilized in a way that we can recognize all actors and relationships in 10 years' time. Further, there are services that operate under different conditions than Spotify, Apple Music, Netflix, and KU. Departing from streaming services that have big corporations behind them clearly has implications for the analysis and discussion of power relationships. The streaming network nonetheless allows us to identify central dimensions of the streaming network as it currently appears and in a way that can hopefully spur further analyses with different cases.

Case selection

Following the delineation given above, four cases of streaming media services were strategically selected to exemplify variations of the streaming model: Spotify, Apple Music, Netflix, and KU.

In the music industry, Swedish Spotify is arguably the dominant provider with 100 million paying subscribers and 217 million monthly active users, according to the company itself (Spotify Technology S.A., 2019). Apple Music, the streaming service of US technology company Apple, has amassed at least 60 million paid subscribers since the launch in 2015, according to reports (Garun, 2019). Spotify and Apple Music were selected because they offer slightly different approaches to music streaming, with the latter tying its software operations in with hardware. US streaming service Netflix is among the central players in film and television, boasting 148 million paying subscribers worldwide (Netflix, Inc., 2019a).[1] Netflix offers a case of streaming service for both television and film and with a specific content acquisition strategy. KU, the streaming service for e-books and audiobooks by US technology giant Amazon, serves as the case for the book industry. While user numbers for KU are hard to come by, the service is currently available to customers in United States, United Kingdom, Italy, Spain, Brazil, France, Mexico, Canada, Germany, India, China, Australia, and Japan. KU provides a case example of e-book and audiobook streaming, slightly different in technological and business model terms from the previous, but offering a similar user experience. While KU may not be marketed as 'streaming', its value proposition shares so many characteristics with textbook streaming examples that I have chosen to include it here.

The cases thus cover several industries (music, television, film and e-books/audiobooks) and include streaming providers with different backgrounds within the same industry (Spotify and Apple Music). All the cases are well-known, and the services are all internationally distributed, taking away the need for more contextualization than is necessary to map out the network. That is not to say that niche and national or regional services do not play a part in streaming. As will be addressed in the Coda section, the analysis of the streaming network could possibly be different with other cases and perspectives.

Despite being connected to different industries and having disparate histories and institutional backgrounds, all these four services provide an online subscription offer, presented to prospective consumers in similar terms. This general offer can be termed the services' 'value propositions' (Osterwalder et al., 2014; see also Lotz, 2017). For Spotify, Apple Music, and Netflix, the branding of the services as 'streaming' is explicit. KU uses other terms to denote a similar distribution model. These quotes from the streaming companies' websites indicate the similarities in value propositions:

> Spotify:
>
> Spotify is a digital music, podcast, and video streaming service that gives you access to millions of songs and other content from artists all over the world (Spotify, 2018).

> *Apple Music:*
>
> Stream 50 million songs ad-free. Download your favorite tracks. Play them offline. Access your entire iTunes library. Get exclusive and original content. Listen across all of your devices (Apple Music, 2019).

> *Netflix:*
>
> Unlimited entertainment, one low price. Stream and download to your heart's content, no extra fees (Netflix Norway, n.d.).

Kindle Unlimited:

KU is a new service that allows you to read as much as you want, choosing from over 1 million titles and thousands of audiobooks (Amazon, n.d.).

In these presentations, we find evoked notions of access, abundance, exclusivity, and boundlessness. While these values constitute central aspects of the marketing of streaming services, they say little about the wider networks of digital media distribution and production within which streaming services operate.

Theory: Streaming and relationships of power

The streaming network, which will be mapped out and discussed in the following, includes not only organizations and human actors but also nonhuman entities such as software and hardware. After all, it seems simplistic to try and grasp the streaming phenomenon without taking into account the various devices through which access is attained, be it a smart phone, a television set, a smart speaker, a computer, or a car. I derive this particular network perspective from actor–network theory (ANT) and science and technology studies, where scholars have argued for the inclusion of artifacts in actor–networks, thus allowing for nonhuman entities to bring about action (though without necessarily granting them agency of their own) (Latour, 2005). An artifact, in the ANT perspective, will enable some actions and restrain others: 'do this, do that, behave this way, don't go that way, you may do so, be allowed to go there' (Latour, 1992: 232). In this design process, there is power, that is, the ability to make people do some things and avoid other things. In my application of the network perspective, the nodes in the network (human and nonhuman actors) exercise power by bringing about or restricting action and by setting terms for how resources are deployed and distributed.

In media and communication contexts, power has often been discussed in relation to the asymmetrical relationships that exist between, on the one hand, ordinary users and audience members, and on the other hand, the big, multinational corporations that control the media (Curran, 2002; Freedman, 2014, 2015). Digitalization and the rise of social media have spurred new conceptualizations of the flows and relationships of communication power. Here, I will focus on the notions of 'network power', 'platform power', and 'algorithmic power'.

In his network theory, Manuel Castells defines power as 'the relational capacity to impose an actor's will over another actor's will on the basis of the structural capacity of domination embedded in the institutions of society' (Castells, 2011: 775). Castells (2013) is concerned about 'network power' as one of the four different forms of power in the network society. Network power is exercised through the standards of communication: 'Network power is the power of the standards of the network over its components' (Castells, 2013: 43). The power here springs from how social interaction is coordinated in the networks. Unlike 'networking power', where the inclusion/exclusion dimension is central, 'network power' is exercised 'not by exclusion from the networks but by the imposition of the rules of inclusion' (Castells, 2011: 775). Two basic mechanisms set the terms for the exercise of network power: *programming*, the ability to constitute and to program and reprogram networks, and *switching*, the ability to connect and enable cooperation within and between networks (Castells, 2011). It is important to note that power is not equally distributed across the network but favors certain social actors 'at the source of network formation and of the establishment of the standards (protocols of communication)' (Castells, 2013: 43). Consequently, the key to understanding power in communication networks, streaming networks included, is to

identify the actors that benefit from the established standards and protocols and how rules of inclusion are negotiated.

Similarly, Evens and Donders (2018) argue that platforms create asymmetrical relationships and exert power through critical (infra)structures. Seeing the emergence of new industry players such as Netflix, they are nonetheless concerned with how 'industrial structures and practices are deeply entrenched in existing structures of power, which are nearly unalterable or, at the least, take time to change' (Evens and Donders, 2018: 3). This perspective enables us to see how established media industry power structures and practices remain crucial to understanding how streaming services operate and how networks are formed (see also Herbert et al., 2018).

Digital media services increasingly rely on automation of processes for search and discovery. The algorithms that guide these computer-coded instructions have also been found relevant for the study of power in communication contexts (see for instance Beer, 2016; Bucher, 2012, 2018; Napoli, 2014). Bucher (2018) claims that the power of algorithmic systems stems from how they shape people's encounters and orientations in the world. The notion of algorithmic power enables us to see how algorithms filter media content based on principles over which the ordinary user has little control. As Beer has observed, 'it is often this ability to take decisions without (or with little) human intervention that is at the heart of discussions about algorithms [sic] potential power' (Beer, 2016: 3). Within the streaming network, algorithmic power is most clearly exercised when algorithms enable and restrict the ability of users to do what they want with the content and to navigate the services as they like (Arditi, 2018; Hagen, 2015; Kjus, 2016; Morris and Powers, 2015; Pittman and Sheehan, 2015; Seaver, 2018). This is not to underplay that algorithmic power can also be at work between organizations that collaborate, when one part controls automated processes that the other is reliant upon in its business.

Analysis: The streaming network

In the following section, I will present and illustrate the streaming network in five steps:

1. The core streaming model
2. Streaming and content publishing
3. Streaming and content origination
4. Streaming and device control
5. Streaming and advertising

Each step includes a discussion on the relevant nodes and connections, using the concepts of *relationships*, *flows*, *access*, *control*, and *exposure* to make sense of the streaming network. Finally, I will discuss the power relationships of the streaming network with reference to notions of communication power, platform power, and algorithmic power.

The core streaming model

Figure 1 is the starting point for the development of the network, identifying four nodes and the structured relationships that connect them. I call this the core streaming model.

Starting from top left, the first node is *the streaming provider* (Spotify, Apple Music, Netflix, KU, a type of digital service provider) who controls and provides *a database* of content to be accessed by *the user* through a *device and software*. These four nodes are connected by way of flows (black arrows) and relationships of *control* and *access* (white arrows with dotted lines).

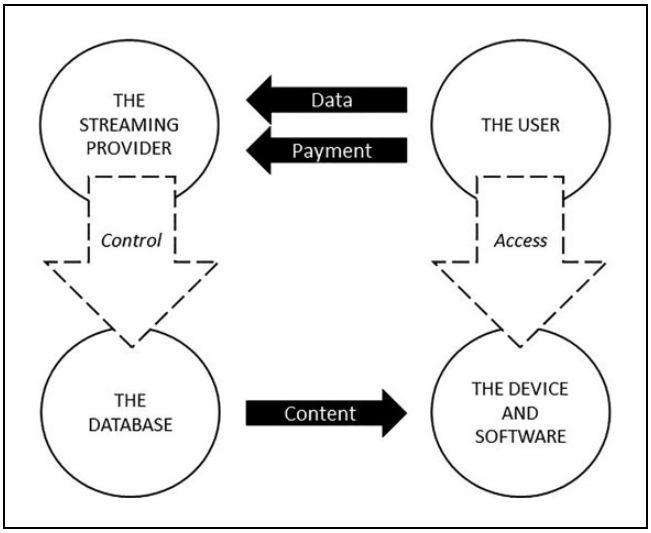

Figure 1. The core streaming model.

A flow of content connects the database with the device and software through which the user gains access to his or her desired piece of content. Note that the user does not have access to anything like the stream of content itself, nor to the database, but must go via the device and streaming software. The database, in turn, is controlled by the streaming provider. The streaming provider may, in accordance with the conventional End User Licensing Agreement (EULA), delete any item from a list when a license from a record company, a publishing company, or a film company expires. A piece of content will even be removed when the user has previously added the item to a list or made it available offline. The principle of temporary access overrides this agency of the user. It follows that offline access is still temporary and subject to conditions set by the streaming service. This is one of the significant differences between the access-based model of distribution and models based on single unit sales, transactions, and ownership. From the user perspective, we can conceive of the shift from ownership to access as a removal of control.

Further, the user is reliant upon a compatible *device and software* from which to gain access. There is no stream without a device, software, and Internet access. Accordingly, the breakthrough of streaming services with Spotify and Netflix a decade ago is connected to the development of broadband Internet and smartphones. Access to these services' content takes place via apps and dedicated software (see also below on streaming and device control).

In return for access, the user compensates the streaming provider by providing a valuable asset. For the cases examined here, the common model is by paying a monthly subscription fee, typically in the price range from US$9.99 (Spotify Premium, Apple Music, KU) to US$2.99 (Netflix Standard). Another form of compensation from the user is the contribution of user data, which feeds into the streaming provider's business model by enabling more precise recommendations, functionalities that enable discovery, and feedback on how the cultural products fare with users. User data can also be sold to advertisers or used to target advertising in ad-funded services such as Spotify Free.

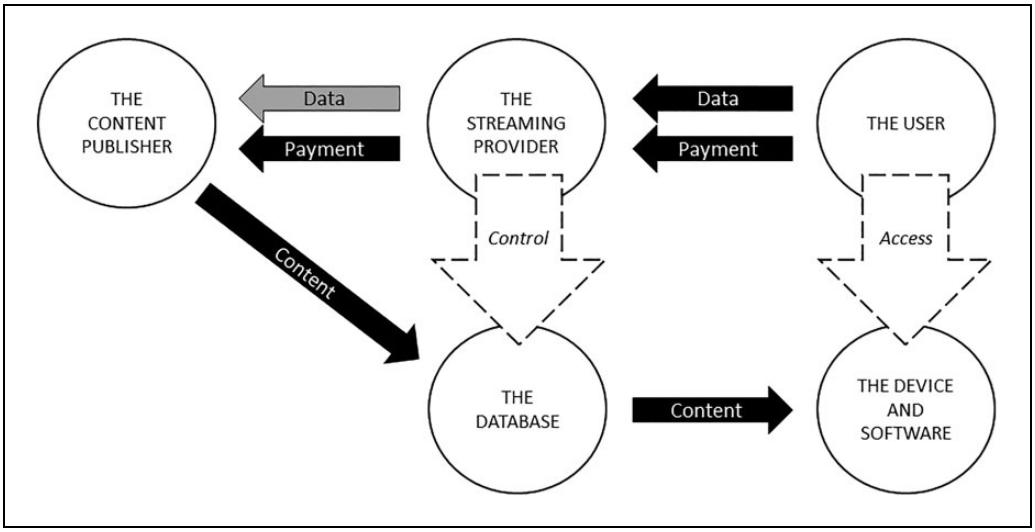

Figure 2. The streaming network with content publishers.

While the core model serves to highlight the key characteristics of streaming, the network is more than a structured relationship between streaming media users and streaming media providers. The next two steps of the streaming network, as seen in Figures 2 and 3, elaborate by including the role of content publishers and content originators in the network.

Streaming and content publishers

Content publishers in the context of Spotify, Netflix, KU, and Apple Music can be record companies, publishers, and production companies but also television networks and organizations that act on behalf of creators. These organizations take on various tasks and form a link between the creators and the streaming providers.

Strikingly, none of the companies behind the streaming services examined here have traditionally been involved in content production or publishing. Their key operations are either connected to hardware and software (Apple), retail (Amazon), or the services are positioned as intermediaries in the chain between producers and consumers (Netflix, Spotify). The position of the intermediary allows a streaming provider to maintain control over the database but lacking content control. Figure 2 indicates the difference of relationship between streaming provider and content publishers: Content publishers typically have little control over, or access to, the database. Mostly, they also lack direct access to users. However, some streaming providers, such as Spotify and Apple Music, do provide record companies with access to data analytics tools so they can see how their own content is performing, indicated in Figure 2 by the grey arrow. This data stream, nonetheless, is based on conditions set by the streaming provider, not the artist.

For streaming providers, content provision is a vital and challenging issue. How do you manage to fulfill consumers' expectations of abundance and boundlessness? For international or global services, the issue is still more complex because some licensing arrangements have to be made for

each territory. There are a few standard ways of dealing with these issues, which leads to different kinds of relationships with content publishers and content originators. The first question is whether to produce your own content or rely on outside production.

A streaming service such as Spotify does not produce content of its own, beside comparatively marginal offerings that help contextualize the main offering: The 40 million tracks provided by record companies and artists. Looking at Spotify's DPO, we find that licensing agreements exist with all the three largest music companies, Universal Music Group, Sony Music Entertainment, and Warner Music Group, as well as numerous independent record labels represented by Merlin. According to Spotify, these licenses accounted for over 85% of streams in 2017. The basic terms of licensing agreements include requirements to pay royalties and minimum guaranteed payments, as well as marketing and advertising commitments, and financial and data reporting obligations. Licenses are not granted permanently, but typically for 2-year periods and not automatically renewable. For Spotify, they tend to apply worldwide but 'subject to agreement on rates with certain rights holders prior to launching in new territories' (Spotify Technology S.A., 2018a).

The situation is similar for Apple Music. Despite its wide scope of operations, Apple is traditionally not a content producer (although a streaming television service with Apple-branded content was launched in 2019.) Streaming providers such as Spotify and Apple Music are thus entirely reliant on outside content providers that feed content to the database, to put it crudely. Both Spotify and Apple acknowledge this reliance. Spotify states as one of the crucial factors that may affect its results is 'our lack of control over the providers of our content and their effect on our access to music and other content' (Spotify Technology S.A., 2018a). Similarly, one of the risk factors listed by Apple in its 2018 Annual report is that the company relies on third-party content 'which may not be available to the Company on commercially reasonable terms or at all' (Apple, Inc., 2018).

In return for providing audio content, the content publishers are paid a share of the profits from user subscription fees, typically based on the so-called pro rata model (Vonderau, 2017). Here, there is a marked difference between, on the one hand, music industry actors and book industry actors, and on the other hand, providers of television and film content. In music and books, the distributors and retailers pay royalties on consumption (streaming) or on units sold (traditional retail). In TV and film, distributors and retailers pay in advance for rights of distribution. Herbert et al. also noted this crucial point of divergence between the industries, concluding persuasively that '[l]icensing 'all television and film' would thus be prohibitively expensive for video services' (Herbert et al., 2018: 9). While these differences in business models might seem to make for different incentives in terms of whether to encourage increasing streaming numbers from each subscriber, the core business idea is the same for the paid streaming services: Attract new subscribers and avoid losing existing customers. As Herbert et al. note, streaming services do not strictly sell items of music, film, television, ebooks or audio books, but 'build and sell access to a library' (2018: 8).

Further, the relationship between content production and streaming provider relates to the notion of exclusive or original content, that is, content that competing services do not have licenses to stream. Lotz (2017) sees the drive toward exclusivity as central to the subscription model as opposed to the linear model for television, in particular because exclusivity was limited in the linear context.

Lotz (2017) points to the fact that exclusivity not only affects the relationship of streaming providers to content producers but also their connection with users. Streaming providers have crucial sway over users, as the subscribers cannot access exclusive content unless they continue subscribing.

Exclusive content, originals, and so on, are also convenient assets for streaming services with global ambitions, as the company does not have to negotiate region- or country-specific deals for each item. Netflix, for instance, increasingly acts as a content producer, financing original programming as producer or coproducer and by negotiating exclusive deals with outside production companies. This effectively means that Netflix has three categories of content, described as follows in the Q3 2018 shareholder letter (Netflix, Inc., 2018):

1) licensed non-first-window content
2) licensed original first-window content
3) owned original first-window content from the Netflix studio

The 'original content' strategy of Netflix can be seen as a way of increasing database and content production control within the streaming network. The company itself is quite straightforward about this in its own financial information:

> In addition to reducing our reliance on outside studios, this initiative provides us with greater control over the content we create (e.g., longterm global rights), the ability to strengthen title-brand-love and franchise value (like consumer products) and potentially lower costs (as we can avoid the markup 3rd party studios charge us). (Netflix, Inc., 2018)

Exclusivity as a way of gaining autonomy and power in the streaming network is also expressed by Netflix in Q4 2018, as the threat from streaming services with large existing catalogues (e.g. Disney) is quite directly addressed:

> We are ready to pay top-of-market prices for second run content when the studios, networks and producers are willing to sell, but we are also prepared to keep our members ecstatic with our incredible original content if others choose to retain their content for their own services. (Netflix, Inc., 2019b)

A service such as Amazon's KU works by different means to gain content control. First, Amazon runs a number of publishing imprints, such as Thomas & Mercer and Montlake. Even so, KU is reliant on outside content producers, both mainstream publishing houses that license high-profile titles and publishers of so-called genre fiction, such as romance, erotica, and crime novels. Crucially, a big bulk of Amazon's streaming service is served up by independent authors and nonprofessional users through Amazon's self-publishing program KDP. This strategy is discussed in the following section on streaming services and content originators.

Streaming and content originators

Content publishers can have a crucial role in the provision of music, films, television, and book content but still act as middlemen in most cases. Works of art and culture typically originate somewhere else, that is, with artists, composers, scriptwriters, authors, and so on. In terms of the streaming network, content originators typically feed content to the publishers who in return direct payments to originators, as depicted in Figure 3.

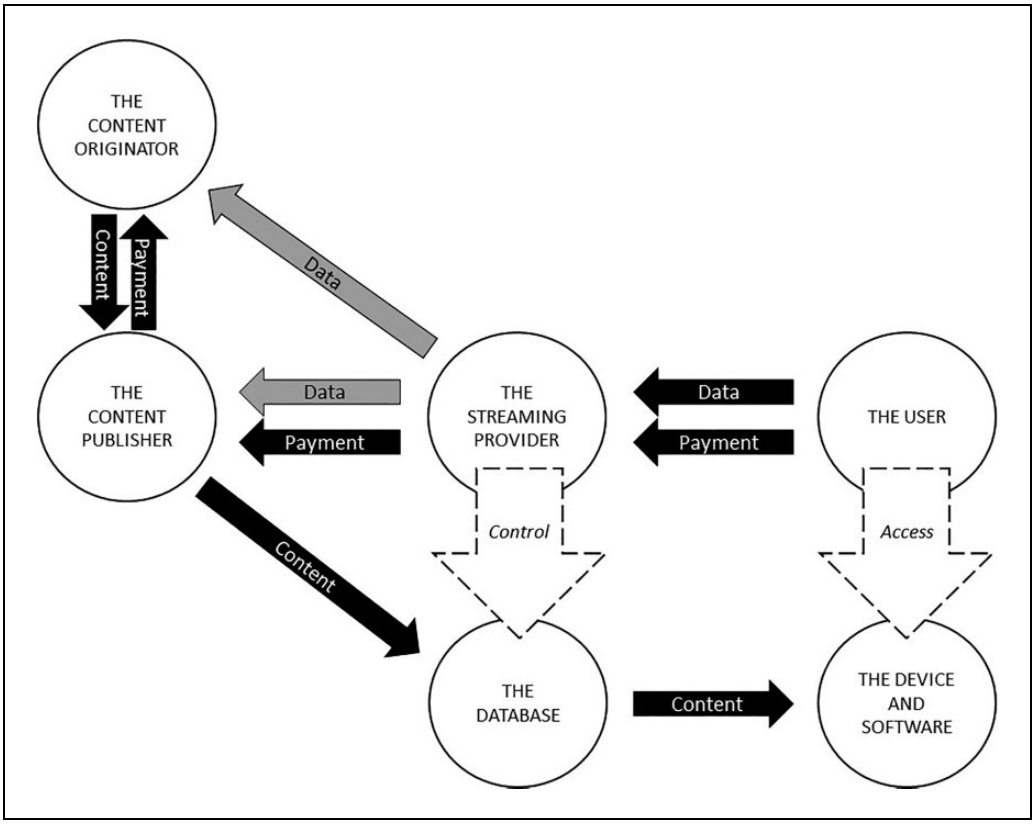

Figure 3. The streaming network with content originators.

Although content publishers and content originators both play a part in supplying content to streaming databases, there are significant differences between them: Content originators, like content publishers, are in the network separated from important nodes such as the database and users. In the cases where content publishers act as intermediaries, content provision is conditioned by terms set by agreements made between streaming providers and content publishers. Thus, content publishers, and in some cases, copyright management organizations, act on behalf of content originators. As with the content publishers, content originators may also have access to user data but restricted to their own output and entirely contingent on the streaming provider.

Streaming networks also showcase content provision which disintermediates the publishers (a process not depicted in Figure 3), as in the case of KDP: In KDP, authors bypass publishers to deliver manuscripts directly to Amazon's platforms (KU and Kindle Owners' Lending Library). All the while, they may not increase their power in the network as they commit to contracts that tie their publications to Amazon.

KU is thus populated by self-published books, sold exclusively on Amazon to participate in a special promotion program. As it stands, there are approximately 1.4 million books available on KU. It has been estimated that almost 1.3 million of these are Amazon Exclusives, not available

through other sales channels than Amazon (Price, 2019). Exclusives can be both titles from Amazon's own imprints, but the large majority are self-published titles.[2]

In return for exclusivity to Amazon, the authors also have an offer to a (seemingly) lucrative royalty deal at 70%, far above the book industry standard. This deal depends on pricing in the transaction-based Kindle store: KDP authors earn a 70% royalty on books priced between US$2.99 and US$9.99, and a 35% royalty on all other price levels. Authors are paid by a pages-read model similar to the payment structure of music streaming services. Royalties are paid from a 'Global Fund' each month, divided after a set of complex rules:

> The share of fund allocated to each country varies based on a number of factors, such as exchange rates, customer reading behavior, and local subscription pricing. Author earnings are then determined by their share of total pages read, up to a total of 3,000 pages per customer per title. (Amazon, Kindle Direct Publishing, n.d.)

Industry sources claim that Amazon paid out more than US$220 million to authors in 2017, but the payment to each author varies considerably (Semuels, 2018).

While Amazon's content provision practices in KU are rather different from those by Spotify, Apple Music, and Netflix, the overall objectives are similar: to increase content control and gain exclusive content that can create a business advantage over competitors.

Streaming and device makers

The next step is to take into account the implications of users only having streaming access by way of a compatible *device and software*. Thus the device maker (and software maker) has control of the device access point and also gains valuable user data (in addition to being compensated for the technology when the user buys it). The position of the device maker in the network is outlined in Figure 4.

In some streaming contexts, the device maker is identical to the streaming provider (not indicated in Figure 4). Apple is an example of a company with multiple stakes. Its hardware operations have been less profitable in recent years, but the services division, of which Apple Music is part, has become more lucrative (cf. Apple, Inc., 2019).

The exchange and utilization of user data is a crucial part of the business models of all the streaming services examined here. Notice, however, the difference between the companies with device operations, Apple and Amazon, and the streaming-only companies Spotify and Netflix.

As a streaming provider of music and device maker/software maker, Apple gains access to user data at two ends: from the user's interactions with the streaming service and from the device. For Apple, the sale of devices such as iPhones, iPads, and Mac computers is a significant source of revenue and a base from which to launch services. An Apple-branded streaming service need not be profitable in itself as long as it keeps attracting buyers of hardware and keeps users in the Apple system of devices and services.[3] Similarly, Amazon's streaming services make up parts of the company's setup of services and can be added to this larger network of services and devices. When selling a device such as the e-reading device Kindle or smart speaker Echo, Amazon effectively bundles the device with other services:

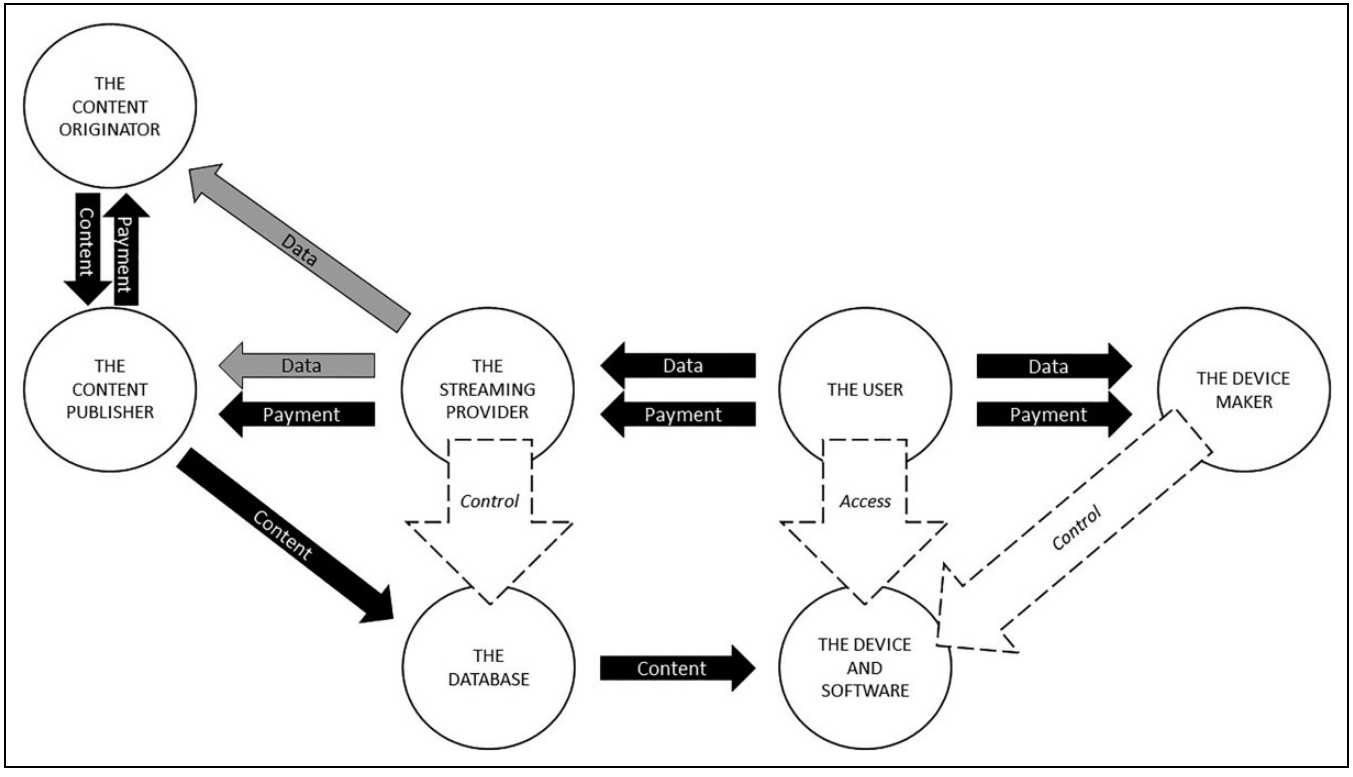

Figure 4. The streaming network with device control.

> Sales of certain of our digital devices are considered arrangements with multiple deliverables, consisting of the device, undelivered software upgrades and/or undelivered non-software services such as cloud services. (Amazon.com, Inc., 2018)

Despite the similarities between Apple and Amazon in their hybrid business model setup, there is a difference: While Apple is (still) predominantly a hardware company which offers services to attract buyers for their devices, Amazon is more heavily involved in services and offers hardware to promote its services.

Streaming-only companies need to work out different strategies. Interestingly, Netflix developed its own proprietary set-top box prior to the launch of the streaming service in 2007 but declined to release it. Netflix CEO Reed Hastings reportedly had doubts about going into direct competition with dedicated device makers such as Apple:

> I want to be able to call Steve Jobs and talk to him about putting Netflix on Apple TV (. . .) But if I'm making my own hardware, Steve's not going to take my call. (Robertson, 2013)

Despite the efforts of some streaming providers to decrease the power of device and software makers, they remain dependent on these user access points. Moreover, streaming providers need to engage with device makers and telecommunication providers to ensure their services are widely available and even exclude competitors. Partnerships with device makers and telcos are thus a crucial part of the business models of streaming providers that do not provide these services themselves. For instance, Spotify, in its Q3 2018 shareholder letter, announced several partnerships, such as with Samsung (maker of mobile phones and television sets) and with Sky (pay TV service), to ensure users have the Spotify apps available and to bundle subscriptions with pay-TV bills or Internet bills (Spotify Technology S.A., 2018b). In contrast, Apple and Amazon can rely more on its own devices. Besides offering Amazon-branded e-readers, tablets, and smart speakers, Amazon also provides server hosting through Amazon Web Services, including for many of its competitors, such as Netflix, further strengthening its position in the network.

Apple not only has device power but also software power: Through its App Store, Apple, along with Google/Alphabet and its Google Play Store, controls the fundamentals of the app business models. All the streaming providers represented here depend on providing users with access through mobile applications. For sales, including subscriptions, made directly through the apps, Apple/Google takes a 30% cut. In 2018, Netflix ended the ability to sign up for subscription through the mobile app, in a move to eliminate the revenue-share split with Apple and Google. This is another sign of actors in the streaming network safeguarding their interests vis-à-vis other network actors.

Streaming and advertisers

So far, I have discussed the streaming network in relation to a subscription-funding model. For some streaming services, advertising is a significant revenue stream.[4] Figure 5 illustrates what the streaming network looks like in the ad-funded model.

In advertising-funded streaming, the advertiser is allowed to expose the user to commercials and in return pays the streaming provider for this access or for ad impressions delivered. The relationship between the user and the advertiser is thus best described by the term *exposure*. In the ad-funded model, exposure compensates for the user's access (but users still contribute data as well). Advertisers can also be offered access to user data streams but entirely contingent on

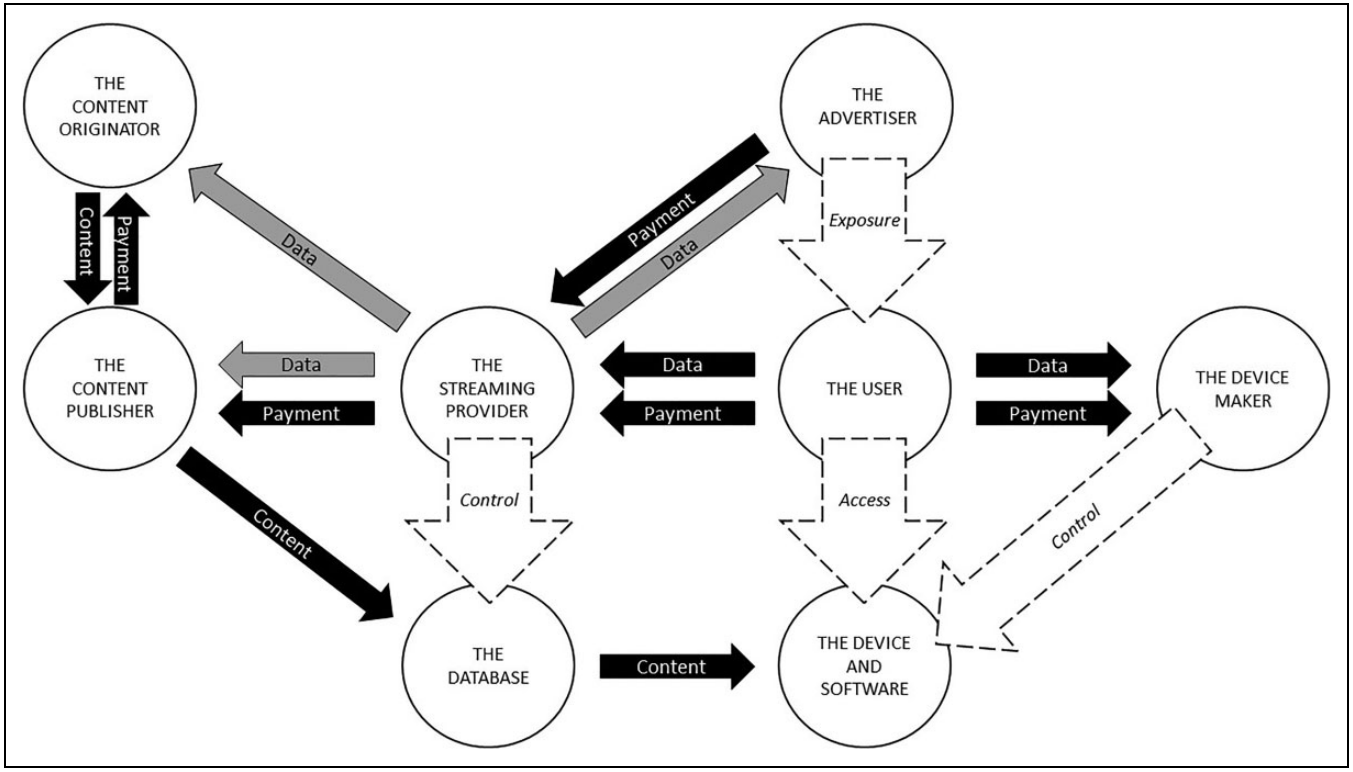

Figure 5. The streaming network with advertising.

conditions set by the streaming provider. This contingent data flow is marked by the grey arrow in Figure 5.

In this selection of cases, Spotify Free is the only example of funding through advertising. Spotify uses a two-tier model where the free, ad-funded option (Spotify Free) is combined with a paid option (Spotify Premium), the so-called Freemium model (see for instance Anderson, 2009). While only 46% of Spotify's users are paying subscribers (100 million subscribers vs. 217 million monthly active users), almost all revenues are from subscriptions (90% of 2017 revenues from Premium version (Spotify Technology S.A., 2018a)). Nonetheless, despite the overriding impact of subscription revenue on the bottom line, Spotify remains committed to the Free version as a stand-alone service. One reason is the contribution it makes in terms of valuable user data. By offering the Free version, Spotify has been able to grow fast and build a user-base from which to convert paying subscribers. The sheer nuisance of being exposed to ads can drive users to the Premium version (Eriksson et al., 2019). But equally important is the contribution of revenue from advertising, as Spotify is vying to be the third-largest digital ad platform, behind Facebook and Google (Bruell, 2017). Spotify's user data in relation to the ad-platform on the Free version gives the Swedish streaming contender an edge, according to their own marketing materials:

> At Spotify we have a personal relationship with over 191 million people who show us their true colours with zero filter. That's a lot of authentic engagement with our audience: billions of data points every day across devices! This data fuels Spotify's streaming intelligence – our secret weapon that gives brands the edge to be relevant in real-time moments. (Spotify for brands, n.d.)

As summed up in a magazine report: 'In Spotify's world, listening data has become the oil that fuels a monetizable metrics machine, pumping the numbers that lure advertisers to the platform' (Pelly, 2019). The free version is yet indispensable to boost user and listening numbers.

Discussion: Power in the streaming network

The streaming network model is not all encompassing and is undoubtedly a simplification of the complexity of actors and relationships involved in streaming media. To be fair, it emerges from an analysis of four specific streaming services, all of which are representative of complex corporate structures, typically associated with *Big Tech*. Not all streaming services spring out of such structures.[5] Nonetheless, the development of the network from the discussion of four examples enables us to see general relationships between nodes, not the least because the model does not attempt to cover every nuance and detail – and from these relationships, we may discern patterns of power distribution that apply across different types of cases.

Streaming power, I have argued, is exercised through relationships of access, control, and exposure. A critical point in the network's power configurations is the control over one or more of the relationships that can generate revenue. The central resources here are content, data and devices, but for these to be profitable assets, they need to be linked with users, meaning that the ability to join users with other nodes is the truly powerful asset. Streaming providers are specifically well positioned in the network to make these connections. The final version of the network (Figure 5) indicates how the streaming provider is on the receiving end of payments from users and advertisers and control the database. By controlling the database, streaming providers effectively control the protocols of communication and users' interactions, enabled by device and software affordances (cf. Bucher 2018; Castells, 2011). As such, streaming providers perform the

programming aspect of network power, but also facilitate cooperation within and between networks, thus performing the *switching* aspect of network power (Castells, 2011).

Device makers are also centrally placed in the network, receiving payments and data from users while also controlling device and software, the other node that connects users to the streaming content. It follows that device makers, while reliant on the *programming* of streaming providers, are nonetheless able to perform *switching* aspects of network power (Castells, 2011). Companies with combined business in streaming platforms and devices have both capabilities.

Actors who have no direct interaction with users are in some ways disconnected from power, for two reasons: First, they are devoid of both the payments made by customers and the valuable customer information that businesses have relied on for years, such as address, payment information, and purchase history. Second, they are detached from the multitudes of other data points that online users leave behind and that can be turned into competitive advantages and new business opportunities. This deficiency applies specifically to content publishers and content originators. Structurally, therefore, the power relationships in the network are asymmetrical.

Essentially, users and content producers (publishers and originators) hold the streaming network together by providing streams of content and payments, but compared with streaming providers and device makers, they lack control. Users are entirely reliant on streaming providers and must accept the terms specific to the streaming model to gain access, stuck in a network without command over neither database nor device. Leaving the service or resorting to illegitimate hacking remain among the few meaningful actions that a user can take to exercise control. The data streams to content originators and publishers are provided at the mercy of streaming providers, indicating that the asymmetrical power relations persist.

The asymmetrical power relations notwithstanding proximity to the user node does not equal control over the entire network itself. The strength of an actor is determined by the node's position in the network relative to other nodes and the ability to act as a connector between different sources of revenue. For instance, access to and/or control over content is important, but not sufficient in itself, unless that content can reach users. Actors in the streaming network who seek to connect users and content need database control. We find thus that the source of power is not a single resource or a definitive position of strength, but lies in the relative position vis-à-vis other actors, an insight much in line with ANT. Access to users is desirable because it can generate revenue from subscription fees and advertising, and because user data can be turned into profit. Control over devices and software provides an access point to users as well, both in terms of direct payment for the products and services and in terms of user data access. The ability to control both content *and* user or user *and* device is more valuable than controlling merely one, because streams of payment *and* data are particularly valued. Recognizing this, the streaming providers maneuver the network to strengthen their position. The development of Netflix and other streaming providers to become less dependent on outside content production is indicative of strategies to shift the network's power configurations. In this regard, power relationships are unsettled and distributed throughout the network.

We can perhaps conceive of a truly powerful player who controls all central nodes in a streaming network, but this is not the case for any of the streaming services Spotify, Netflix, KU, and Apple Music. Moreover, the four services and the companies that own them have slightly diverging interests and strategies to attain power in the network.

Spotify was an early mover in the field of music streaming and as such present at the moment of network formation (Castells, 2013). As an industry outsider, the company was reliant on building relationships with content producers but also with device makers and

advertisers (for their ad-funded tier). Spotify's *forte* in the streaming network is the service it provides and the user base it controls. Spotify is nonetheless vulnerable because the company lacks content and device control. Netflix has a similar first-mover advantage to Spotify and controls a vast user base worldwide (148 million users in more than 190 countries). This sheer scale is one of Netflix' main power assets vis-à-vis competitors. The company is still partly reliant on outside content production, however, and is entirely reliant on device compatibility and terms of access. As such, both Spotify and Netflix rely on maintaining acceptable relations (financial and other) with content producers and device makers.

Apple Music came later to the streaming party but benefits greatly from Apple's 'installed base' of over 1.4 billion devices (Apple, Inc., 2019). Arguably, Apple's strategy is mainly to keep as many people within its own network of services as possible. KU benefits from being under the Amazon umbrella. In one sense, the company comes close to a complete control of the value chain: The KU service connects Amazon's publishing division, including its KDP platform with the Amazon store and the Kindle devices. By setting precise terms for inclusion in the publishing program, Amazon also exercises control over content provision. However, it is worth taking into account that Amazon mostly acts as a provider of a self-publishing platform, not primarily as a publisher and content producer. As providers of hardware and software systems, both Apple and Amazon are in a position of technology control. In practical terms, they are able to bundle services and devices. Arguably, this ability puts them in a favorable position in the network (cf. Evens and Donders, 2018).

Coda: The streaming network in context

Having presented and discussed the various parts of the streaming network, it is pertinent to caution against a network perspective without context. In the analysis, I have tried to show how Spotify, Apple Music, Netflix, and KU, and the technologies they control (or not), enable and restrain agency in relation to users, content producers, device makers, and advertisers. Of course, other examples could have been used and would likely result in a slightly different analysis. The streaming network can be expanded to include a wider socio-technical context or narrowed and analyzed in more detail. The streaming network as presented here is the result of the case selection and perspective. As ANT emphasizes, how you draw the network depends on perspective and starting point. Here, we departed from what I conceive to be the central relationships between the streaming provider, the database, the user and the device and software (the core streaming model). Future research will indicate to what extent the network components presented here – including flows of data and payments and relationships of access, control and exposure – are relevant and useful outside of the context of the four services.

The contextual surroundings of the streaming network include politics, cultural policy, economy, finance markets, and so on. Researchers analyzing the shift to streaming in music have noted the need to examine the wider techno-cultural-financial networks of which companies such as Spotify are part. For instance, Hesmondhalgh and Meier have highlighted how, what they term 'the streaming ecosystem' is driven by an interplay of start-up companies in IT, big technology companies, and telecommunications providers (2018: 1565). Ad-funded platforms are specifically interesting to study with a wider lens: For instance, Vonderau has argued that Spotify is less a music business than a 'media company operating at the intersection of advertising, technology, music, and – most importantly – finance' (Vonderau, 2017: 3; see also Eriksson et al., 2019). YouTube, a streaming service not included here, in effect constitutes a setup of its own by way of

multiple stakeholders and multichannel networks (cf. Lobato, 2016; Vonderau, 2016). A case selection including, for instance, Tidal and Deezer, or Disney and HBO, or Storytel and Scribd would likely change the discussion on relationships and relative strengths to a degree. If we were to substitute the big, corporate actors with smaller and more niche-oriented actors, this might further shift the points for discussion. Scholarship on alternative distribution channels for digital television (Christian, 2018), cinema (Smits and Nikdel, 2019), music (Hesmondhalgh et al., 2019), and digital books (Have and Pedersen, 2019) indicates ways forward for such research. But the fundamentals of the network would still, I would argue, be similar and much alike, highlighting the importance of database control and device control to gain access to subscription/advertising revenue streams and data streams. In any event, the streaming network, as already noted, is not fixed and entirely stable. New players come in; others exit. User practices evolve. Business opportunities arise. The streaming network does not end here.

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Notes

1. By Q1 2020, the number of subscribers worldwide is 182 million, the increase possibly related to the coronavirus outbreak resulting in millions of people in quarantine or advised to stay indoors (and watch TV) (Netflix, Inc., 2020).
2. Among the 8% of the Kindle Unlimited catalogue that are not exclusives, it is likely that we also find a number of self-published authors that have not entered into the Kindle Direct Publishing program.
3. In a 2018 interview, Apple CEO Tim Cook admitted that Apple Music does not strictly have to be profitable: 'You're right, we're not in it for the money' (Safian, 2018).
4. Clearly, a network including the advertising-funded YouTube would need to emphasize this business model much more strongly than I have done here.
5. For examples of services that cater to niches or come from a different place than big tech, see for instance video services such as MUBI, Criterion, and SnagFilms, music services such as Idagio and Gaana, or digital book streaming services such as Bookmate, Storytel, and Fabel.

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