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The Streaming Paradox: Untangling the Hybrid Gatekeeping Mechanisms of Music Streaming

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ABSTRACT

Why does music listening in streaming services seem tied to a superstar economy despite the plenitude of digital music? This article explores what we label the *streaming paradox*: the way in which plenitude at the outset produces narrowness as the outcome. Based on dissection of the interfaces of streaming services, interviews with stakeholders, and analyses of user data, the article introduces six key gatekeeping mechanisms (and concepts) at work in the platforms. These mechanisms are combined effects of algorithmic coding, interface design, and human curation and choices and serve as explanations for the streaming paradox.

The Promises of Music Streaming

It seems like ages since we seriously believed in the liberating and democratizing potential of the Internet – at least, this is the case in the cultural field. The mid-2000s were a period filled with enthusiasm about this potential. In academia, the most widely influential and discussed books about digital developments carried titles such as *Remix* (Lessig), *Spreadable Media* (Jenkins, Ford, and Green), *The Wisdom of Crowds* (Surowiecki), and *The Wealth of Networks* (Benkler). In the cultural field, this line of thinking had one especially influential spokesperson. Chris Anderson argued in his book *The Long Tail* that the bestseller-fixated mass culture was about to give way to greater cultural diversity via niche cultures. Anderson premised his arguments on a favorable reading of the technological affordances of the Internet in relation to those of older media such as vinyl, CDs, and the radio. Existing limitations on storage and distribution were, in a technical sense, disappearing, and one could now enjoy on-demand access to whatever whenever.

It is easy to understand how the development of the Internet could provide the basis for all of this optimism. In the early 2000s, the three most conspicuous and pronounced traits of this development were the birth of Wikipedia, the dominance of file-sharing networks, and the organic evolution of the blogosphere. The rise of streaming platforms such as YouTube and Spotify in the years that followed seemed like a logical extension of this evolution – legal and reliable platforms that gave users access to a limitless assortment of cultural content.

Since that time, however, streaming platforms have failed to live up to these expectations in both their technological and their economic development. Today, this freedom talk remains only in the rhetoric of the streaming platforms themselves, and hardly even there. Media researchers and other academics, in turn, have become pessimistic, largely occupied with detailed warnings regarding the dangers of the digitization of culture.

Fleischer, for example, notes that Anderson's long-tail argument has been criticized along two main fronts. On the one hand, there are those who share Anderson's *prognosis* but made the opposite assessment – that cultural fragmentation will amateurize culture and stifle creativity, as was most famously put forward in 2007 *The Cult of the Amateur*. On the other hand, there are those who share Anderson's *expectations* but argue that this development is headed in another direction. In *The Filter Bubble*, Pariser predicts a fragmented public sphere where media help people to find confirmation of their existing convictions from like-minded people and to shy away from divergent views. This argument has been applied to the consumption of cultural content as well: People will only be offered music that sounds similar to what they are already used to listening to.

Elberse points out that "mainstream" music listeners are used to listening to "superstars" and that streaming platforms actually reinforce the superstar economy they were supposed to disrupt (her arguments are based on an analysis of top charts and their share of total consumption). Relatedly, Lynskey finds that the level of song turnover and artist diversity in the British top 40 had significantly diminished between 1996 and 2016. Recently, 2018, Moreau, and Bourreau measured the development of musical diversity between 1995 and 2015 according to four different variables. In three of them – acoustic diversity, song turnover, and local repertoire share – diversity had significantly decreased since the introduction of streaming services. Only in the fourth – geographic diversity – had there been a marked increase.

These findings bring us to the heart of our research questions. How can it be that, with the technical barriers to distribution and storage removed and access to an unlimited amount and variety of music readily available, we see results such as the patterns observed by Elberse and 2018? This is what we label the *streaming paradox*: the way in which plenitude at the outset produces narrowness as the outcome.

Some research has confronted the effects of the introduction of streaming platforms, but less so the mechanisms behind these effects. One exception is the work of McKelvey and Hunt on *discoverability* in digital platforms, which resembles our work here. They explore "design and management of choice in platform interfaces (surrounds), the pathways users take to find content and the effects those choices have (vectors), and the resulting experiences these elements produce" (1). Their argument is conceptual across platforms and content types, and they do not relate discoverability to the underlying business models and economic incentive structures of music streaming (e.g. Spotify) as opposed to TV/film streaming (e.g. Netflix), as we attempt to do.

Let us start by formulating an "H_0 hypothesis": The patterns inherent to the streaming paradox occur because users actually prefer mainstream music and superstar hits. That is, it is the people, not the technology or the underlying business models, who are betraying Anderson. The H_0 hypothesis will serve as a corrective as we discuss our H_1 hypothesis: The patterns occur because the platforms steer users by making some types of choices *easier for* them and also by making some types of choices *for* them.

If the H_1 hypothesis is correct, we would likely assume predominantly capitalist motivations behind it, though missionary nudging out of pure music passion might occur in some instances. However, through what mechanisms are these motivations asserted? Based on research over nearly a decade into the development of several music-streaming platforms, we shall here identify some of the central mechanisms implemented in the infrastructure, design, and operation of streaming platforms to direct the choices of users. We will call them *hybrid gatekeeping mechanisms*, developing this notion in the following sections.

Below, we will begin by outlining three stages in the evolution of music-streaming platforms; the current stage is, as we will see, marked by a strong focus on recommender and autoplay algorithms. Then we will anchor our research in what has been called "the algorithmic turn" in new-media studies. Following a description of our methods, we will turn to an analysis of six hybrid gatekeeping mechanisms at work in the platforms: *front boosting, novelty boosting, choice narrowing, flow prolonging, event gravitating*, and *context confirming*. In the final discussion, we will return to our two hypotheses and hold our findings up against research on user patterns.

Three Phases in the Evolution of Streaming Platforms

We can divide the short history of music streaming into three phases.

The Unlimited-Access Phase (2008–2011)

In this initial phase, the overriding sales pitch of early streaming services such as Spotify and WiMP/Tidal involved unlimited access to vast catalogs of music. This pitch emphasized the contrast to existing means of access – that is, piecemeal purchases of phonograms – by describing a move from limited ownership of some music to unlimited access to all music, as well as the contrast to the P2P-based filesharing and downloading that characterized the 2000s even more than the phonograms. In short, streaming services featured both legality and convenience (and, from the industry perspective, the ability to retain at least some revenue from their assets; see Spilker). Thus, these new services promised to cater to any musical tastes while transcending storage restrictions and various other obstacles, in line with the expectations of Anderson's long-tail theorem. In the words of Eriksson et al.: "The user was effectively conceived of as a sovereign individual, who already knew exactly what he or she wanted" (43). Soon, however, users lamented the inherent difficulty of navigating such an abundance of music in the services. It also became difficult for the services to distinguish themselves from one another when they all offered more or less the same content.

The Social-Streaming Phase (2011–2014)

The initial response to both of these challenges was to introduce different forms of social functionality to the streaming services – users gained the ability to friend or follow people if they knew them or liked their musical taste, exchange tips and recommendations, and share playlists and libraries. The main marketing terms were no longer "access" and "discovery" but "social" and "sharing." Possibly, the Internet optimists we discussed in

the introduction would have nodded approvingly at this step, which appears to reflect the ideas of the social net and its culture of sharing. It was also a culturally resonant move at the time, given the exploding popularity and prominence of social media platforms such as Facebook and Instagram. Indeed, the tight business cooperation and partial technical integration between the Facebook and Spotify platforms was indicative of the period's digital intersections. Interestingly, this whole strategy was abandoned after a relatively short time, partly because the new features were not used or appreciated as much as anticipated.

The Algorithmic-Streaming Phase (2014–Present)

The third phase is also part of a broader technological trend across the constellation of Internet-based services (and beyond), one referred to as the "algorithmic turn." Its new buzzwords have been "personalization" and "customized services" – advantages connected to the development of "smart algorithms" and other methods for harvesting "big data" that were arising amid intensified commercialization and competition across all Internet platforms (van Dijck, Poell, and de Waal). Most of the innovative efforts and investments of recent years have occurred within this field in the interests of developing and improving algorithmic features including personal recommendations based on the user's listening history, automatic plays based on musical similarity ("streaming radio"), and trending playlists based on various forms of aggregates of listening patterns (mixed with editorial/commercial curation). The services are no longer marketed through terms such as discovery or sociality but through the convenience and comfort they offer, as in this Spotify ad from 2018: "Now you can navigate less and listen more."

Throughout these phases, strategies and design varied over time and across services, even as the underlying business models and revenue-share models remained constant – in particular, a pro rata revenue-share model through which rights holders are paid *after* streaming takes place, rather than payment up front, detached from clicks or streams, as is the case with the licensing model of film and television streaming.

Expanding the Focus: From Algorithms to Hybrid Gatekeeping

Thus, the work of recommender and autoplay algorithms is crucial to today's streaming services. How might we conceptualize and untangle this role? We will anchor our research in the algorithmic turn, as mentioned above, but argue that this perspective must be supplemented by a simultaneous focus on the role of interface design and human curation in order to assess the full effect of these factors.

A number of studies have explored the construction of filtering and sorting algorithms and provided insight into their functioning on various social media and streaming platforms: Bucher on Facebook; Gillespie on Twitter; Rieder, Matamoros-Fernández, and Coromina on YouTube; Hallinan and Striphas on Netflix, McKelvey and Hunt across several digital platforms. With respect to music streaming, we will highlight three additional very useful studies. Morris explores how the recommender algorithms developed by the Echo Nest (and acquired by Spotify in 2014) rely not on the initial metadata tagging provided by record companies but on the gathering of acoustic and contextual information to suggest links and associations between songs and artists.

Kitchin reminds us that the main purpose of the streaming services' algorithm development is to create value and capital for the owners, meaning that the mechanisms we will describe below are intended, above all, to nudge the user's behavior in directions that gratify owners and stakeholders (a point to which we will return). Seaver draws analogies to anthropological theory concerning hunter societies to suggest that we might think of recommendation systems as "traps" trying to catch users, a suggestive metaphor highlighting the instrumental aspects of algorithm performance. In our analysis, we will try to disassemble the actual setups of the "traps" used in music streaming. To do so, however, we will need to be sensitive to the fact that algorithms do not operate alone – they are always part of larger networks and infrastructures. For our analysis of contemporary streaming services, two relationships stand out as particularly important: the relationship between *algorithms* and *interfaces*, and the relationship between the algorithms and the *human curation* that is also part of the process.

To exemplify the significance of the first relationship, we note that some algorithms are "visible" to users whether they like it or not. The opening page of streaming applications is what Latour calls an "OPP" – an obligatory passing point, a place or passage through which everyone must go. On contemporary streaming services, it presents both trending playlists based on aggregate algorithms ("Discover weekly") and personalized playlists based on personalizing algorithms ("Recommended for you"). Other algorithms, such as the autoplay functions that take effect when a chosen album or playlist has finished, do not appear on the streaming interface as such, but users cannot opt out of them either. These examples illustrate how algorithmic recommendations work together with interface design.

Furthermore, and unlike social media platforms, contemporary streaming services are "algo-torial" (Bonini and Gandini) and exercise, to various degrees, human curation in tandem with algorithm-based recommendations. We know that playlists such as Spotify's "Discover weekly" or Tidal's "Weekly brew" are built up based on analyses of aggregate user-behaviors, but each is presented as an editorial product. Other examples of human curation include playlists based on events and releases. As Bonini and Gandini note, music streaming platforms exercise "a data-intense gatekeeping activity, based on different mixes of algo-torial logics, that produces new regimes of visibility" (1; see also Prey, "Knowing Me"). In a similar vein, Roberge and Seyfert note: "Both automated and so-called 'manual' gatekeeping mechanisms thus co-exist more or less side by side in a sort of complex, if tacit and very delicate, tension" (10).

In order to analyze the outcome of the algorithmic machinery of music-streaming services, then, we must reconcile it to interface design and human curation. It is through the joint work of these three factors that streaming applications configure their hybrid gatekeeping mechanisms to try to steer or nudge users in certain directions by foregrounding some things at the expense of others – that is, by making some types of choices *easier for* users and also by making some types of choices *for* users.

One final point: Algorithms – like all other technological constructs – must go through processes of domestication by their users. That is, they are subjected to appropriation by user agency, and, in the end, their societal effect will depend on these processes. While this article is not an analysis of appropriation, our research question demands that we accommodate the role of users – both individual and aggregate – in our discussions and conclusions. For now, let us just state that users matter.

Method

The following analysis is based on more than a decade of extensive research into music-streaming services, including empirical evidence from two large research projects in which we were involved. Project A (*Clouds & Concerts*) was a university-based research project conducted in cooperation with the streaming service WiMP (now Tidal) from 2010 to 2015. In this project, we gained unique access to very detailed data about the configuration of the algorithms and interfaces of WiMP, as well as aggregate use and user data. Project B (*Streaming the Culture Industries*) represents a broader effort to analyze the effects of the rise of streaming as a business model across the industries of music, publishing, film, and television running from 2017 to 2021. It has given us insight, in particular, into the music-streaming services Spotify, Apple Music, and Tidal.

In both projects, empirical evidence was gathered from three principal sources: software analysis, business and industry data (including interviews with stakeholders), and use and user data (in Project A in the form of metrics about actual use at WiMP; in Project B in the form of both qualitative interviews and large-scale surveys with users). The analysis offered here draws primarily on the software analysis data but also refers to the two other data sources. In earlier publications, we performed more detailed analyses of subsets of the software analysis data to address more specialized research questions. This article represents a meta-analysis derived from the insights we gained from our earlier work – one that allows us to make claims about both the hybrid nature and the basic anatomy of the most important filtering mechanisms at work in contemporary streaming. In turn, these claims could provide a springboard for follow-up studies involving further testing and validation.

Analysis

Below, we will describe the setups of the six gatekeeping mechanisms most prominently at work in today's streaming platforms: *front boosting, novelty boosting, choice narrowing, flow prolonging, event gravitating*, and *context confirming*. Again, these are *hybrid* mechanisms, because they are constructed through the combined effects of algorithmic coding, interface design, and human curation and choices.

Front Boosting

Our first mechanism is about putting something up front at the expense of something else. Front boosting occurs along both *temporal* and *spatial* axes. *Temporally*, the front-boosting mechanism highlights the increased cultural and economic importance of the beginning of a song as well as sequences of songs. Since the rise of recorded music, it has been true that the beginning of a song must hook the listener and that the earliest songs in a given compilation are most likely to be played. The increased importance of these truths in the streaming era derives from a range of affordances that are specific to streaming: the ease of skipping and jumping, the ability to measure plays in an exact manner and in real time, and the ways in which recommender algorithms and human curators use these measures to decide what to promote and make available in the streaming service.

In the revenue-share models of music streaming, songs must be streamed for at least thirty seconds to generate revenue for rights holders. Thus, the user action of skipping becomes highly meaningful in an economic sense, and hooking and holding users is now reportedly influencing the work of at least some composers and producers (Tobiassen), as well as the selection process through which songs are included in a playlist or album (Bonini and Gandini; Maasø and Hagen).

The *sequence* of songs on a playlist or album is also of increased importance in the streaming era. While a listener does not *need* to start listening from the first track, most do, which in turn boosts whatever shows up early in a collection of songs. Research on the streaming service WiMP showed that #1 tracks on playlists and albums were streamed three times more often than #2 tracks and nine times more often than #10 tracks, and that the first three tracks accounted for more than 50 percent of the whole streaming catalog. Recent interviews with stakeholders indicate that they are keenly aware of this effect and that the beginning of a playlist is a coveted spot (Maasø and Hagen).

Spatial front boosting takes place through the graphic interface of music-streaming applications. People most often access streaming services through mobile phones, a narrow window to the almost limitless universe behind. All the most popular streaming services have an opening/front interface as a mandatory access point, and users have no way of configuring or sidestepping the content of this interface (in any direct or controllable manner). Thus, the placing and ranking of content in the interface represent a key instrument with which the services can nudge the user to make certain choices (Hogan). Tidal, Spotify, and Apple Music use large icons centered on the opening page to feature specific playlists, albums, or artists, as we will return to via the choice-narrowing mechanism introduced below.

All these services offer a mix of curated, aggregated, and personalized content on the front page, and the ranking of elements is one means by which the services seek to mark and market themselves as different from the others. For example, Spotify has long prioritized context-based playlists in its search section in addition to genres, events, and new releases, while Tidal gives more prominence to albums in relation to its peers. Apple Music's browse section highlights events and new releases in the first three vertical rows, and context-based playlists in the following three. Despite these differences, the services' commonalities regarding front-page use are most striking – in short, they operationalize the page as a mandatory access point and central tool for self-promotion and paid promotion. We have not analyzed the impact of spatial boosting as we did temporal boosting, but it would be an interesting task for future research. It is likely that items in the horizontal and vertical periphery, visible only through scrolling and swiping, are much less frequently chosen than content given visual priority.

Novelty Boosting

Our second mechanism involves a set of elements designed to push users toward listening to new music rather than to their personal libraries and old favorites. The weekly release of playlists such as "New Music Friday" and "Release Radar" on Spotify is a standard means of novelty boosting. The ranking of the vertical scrolling menu changes frequently, but these playlists are usually placed atop the menu, meaning that they are visible without any scrolling at all. Above the scrolling menu is, as mentioned above, the

large icon space, which is what jumps out when one opens the service. This space is most frequently used for (paid) promotion of new releases by major international artists. Our interviews with stakeholders including label executives, managers, and artists described daily discussions concerning sophisticated strategies for combining front-page visibility with search-engine optimization and other techniques to affect trending and ranking algorithms. Data from Spotify also suggest that new hits drive more traffic than before. For example, the first song to pass one billion streams was "One Dance" (by Drake, WizKid, and Kyla) in December 2016; at the time of writing (in 2020), seventy-five other songs have passed this threshold (Iqbal). While the number of monthly active users has also more than doubled over the same time (from 123 to 286 million), it is worth noting that all these most-streamed songs were *new* releases. This is a clear indication of the efficacy of novelty boosting via curated lists and campaigns. The role of trending and ranking algorithms, and the network effects of many users being recommended the same songs based on what "other listeners" have played, likely contributes to this novelty boosting.

In addition, stakeholders and intermediaries maintain an ongoing focus on real-time data and novelty when interpreting metrics from Spotify and other sources (Maasø and Hagen). This focus on the here and now has increased over the past few years and especially since 2017 with the increased availability of granular real-time metrics and automated spike notifications that make it possible for a host of intermediaries and stakeholders to take immediate action to monetize tracks (Maasø and Hagen 28) and to make the most informed decisions to maximize some hits over others.

In Project A, we compared online and offline use (that is, the streaming of songs downloaded onto the user's phone). There are various reasons for listening offline, including saving battery and limiting data download when users are away from Wi-Fi networks. Interestingly, our comparison found that users with a lot of offline use listened much more to their "old catalog" than did consistent online users (Maasø, "Streaming"). This indicates that user streaming patterns could well look different if users were allowed more freedom to configure the service's front page according to their own desires. But, as mentioned above, contemporary music streaming services are clearly designed in both overt and covert ways to push users toward new music rather than toward the archives or their personal collections.

Choice Narrowing

The mechanism of choice narrowing is about the ways in which the music-streaming services – again through interfaces, algorithms, and curation – configure access to the many-million-strong archives of tunes hosted on their servers. The operating principle of contemporary streaming is to ease the burden of choice and make listening seamless and uninterrupted for the user through preset choices and ranked, ordered lists (Hogan). In their initial, unlimited-access phase, the services focused on the user's ability to go exploring and make discoveries in a "limitless" universe of music. Today's services, on the other hand, take on the role of guides – or perhaps guardians – using ready-made playlists, while the possibilities for self-discovery are underdeveloped and downplayed. They also downplay or hide the social elements that were so prominent in phase 2, such as the ability to befriend or follow others or enjoy user-generated playlists.

Of course, there is an inherent limitation to all of this in the fact that access to these massive song archives takes place through the limited screen space of a mobile phone. Mandatory entry to streaming services through the front page represents a profound initial narrowing of choice. We counted the number of items (icons for songs, albums, and predominantly playlists) available on these small front pages (in May 2020) through vertical and horizontal scrolling (but without clicking or searching) and came up with 154 items for Spotify, 262 for Apple, and 263 for Tidal. Obviously, this represents only the smallest tip of the iceberg of the vast catalogs of songs, albums, and playlists each service boasts.

While the services have invested enormous resources in developing the front page through the development of recommendation algorithms, interface crafting, and carefully monitored and metrically measured human curation, other aspects of the services are less meticulously treated. The services all provide access to searches through a button at the bottom of the front page, but the search engines themselves have limited functionality compared to, say, other modern search engines such as Google's. For example, they do not provide contextual hits by misspelling, so the user must type the name of the artist or song very precisely. While services eventually did introduce auto-complete searching, it is based on similar trending and ranking algorithms and on collaborative filtering, all of which contribute to choice narrowing in the first place. Hence, when the user starts typing a word, the suggested results will be biased toward the most popular searches and streams, severely limiting the possible output. Furthermore, a completed query will not generate *all* possible matches for any given query. In Spotify, the user initially sees only the seven top hits within different categories, then must choose to see "all" songs, artists, and so on. This second step will generate an apparently endless list, but one that has been sorted according to trends and ranking and that eliminates the possibility of choosing further filtering, ordering, or other advanced search options. Other services feature similar choice-narrowing mechanisms in their searches. In Apple Music, for example, any search query will present three top results and a total of some thirty additional results. But selecting "show all" presents the user with fewer than forty results in total for albums and one hundred results for playlists. Furthermore, if the search term is broad (e.g. "love"), the user is offered no way to uncover songs other than the initial top three results. A narrower or less popular search query (e.g. "Oslo" or "New York") still presents the user with a maximum of thirty-eight results.[1] The choice-narrowing mechanisms probing the "unlimited" catalogs of streaming services thus serve to limit user choice, on the one hand, and to narrow the possible outcomes, on the other. While analyzing the ideology of the algorithms and machine learning that governs the ranking and ordering of data in music streaming (and other services), Hogan concludes: "[G]reater attention is being paid to the approaches that help users input less and receive more elements that are similar" (114).

Flow Prolonging

Flow prolonging is also about reducing choice – but at the other end. While the first three mechanisms worked to steer the user's choices in the first place, flow prolonging wants to obviate the need to make any further choices. The flow-prolonging mechanism addresses the ways in which contemporary music streaming via services automatically and infinitely continues after the user's initial choice of music has been played through – as a built-in default that the user cannot disable. On the other hand, the user does have the

ability to choose infinite streaming rather than songs, albums, or playlists through choices such as "artist radio." With this option, the most popular songs of a given artist will be queued first, representing one more contribution to the Matthew effect of contemporary streaming.

Autoplay – also commonly called "streaming radio" – is one of the new features that are emblematic of the algorithmic streaming phase. Autoplay is algorithmically generated based on the user's initial input, and studies by Morris and Eriksson and colleagues (Eriksson, "Close Reading"; Eriksson et al.), indicate that the algorithms are fueled by both acoustic information (based on the analysis of sound similarities) and cultural information (based on Web crawling for connected mentions). Autoplay has two knock-on effects that are of interest to the present analysis. First, autoplay creates musical "echo chambers," because its whole point is to prolong listening sessions by not disturbing or challenging the user's taste. Autoplay may even be trained and improved based on user reaction, which, over time, will create even more customized flows, but experiments by Eriksson et al. raise doubts about whether this machine learning is actually working or mainly represents a rhetoric to encourage user engagement. Second, the fact that the semantic analysis of the cultural information is based on (quantifiable) mentions will necessarily point the autoplay toward popular or new artists.

Interviews with stakeholders suggest that Spotify's autoplay algorithms to some extent use a type of trending algorithm or collaborative filtering to suggest songs that "other listeners are listening to" in the upcoming queue. After Spotify introduced autoplay in 2017, this characteristic seemingly worked to the benefit of trending songs. Alternatively, SoundCloud's "Related tracks" autoplay, at least in 2016, used similarities between two particular tracks to suggest the same unknown artist (Rory Fresco) to all users immediately following a new Kanye West song (McKelvey and Hunt).

Regardless of how the given autoplay works, metrics on usage demonstrate its increasing utility in optimizing flow and reducing skipping, especially since *Spotify for Artists* introduced a new level of feedback from metrics in 2017, as interviews with stakeholders in Project B and Maasø and Hagen show. For example, a data analyst at a major label described to Maasø how he removed a huge 2009 hit from a love-song playlist because the data showed that it acted as a "flow stopper." When he listened to it, he found out why: There was a twenty-second keyboard intro that "ruined the way a song worked [in a playlist] in 2018–2019." This account also indicates that flow prolonging may be related to front boosting when viewed through the prism of metrics-based decision making.

Event Gravitating

The event-gravitating mechanism denotes the way in which music-streaming services guide attention toward certain happenings or occasions. While it overlaps with the novelty-boosting mechanism whereby new music releases are turned into events, there is a wide range of other happenings and occasions, music-related and otherwise, that the streaming services turn into events as well. Music-related opportunities include anniversaries, reunions, and deaths that become events occasioning special attention to the album, band, or artist in question. Music festivals are also frequently marked through festival playlists and other presentations of the artists, especially for users located in the

vicinity of the event (Maasø, "Music Streaming, Festivals, and the Eventization of Music"). Nonmusical happenings ranging from rocket launches and royal weddings to pandemics and terrorist attacks are also turned into streaming opportunities with the fronting of relevant playlists.

Important work done by editorial teams at streaming services involves following and creating events and making and updating related event playlists. An informant with experience at two competing streaming services explained how this would work:

> We would typically have weekly meetings with colleagues in the other Nordic territories and discuss what worked in international and local markets, based on the data we had. We would discuss trends, brainstorm campaigns, [think about] which events and seasonal happenings we could tag along with—graduation parties, "after ski" season, summer and festivals, and so on—and we would then create playlists and campaigns based on these events. (quoted in Maasø and Hagen 26)

Some of the managers and other stakeholders who were interviewed recalled pitching songs for event playlists or coordinating marketing and releases with events in mind, because addition to such lists could kickstart streaming (Maasø and Hagen). Streaming users even seem to turn to (recurring) happenings that are not featured in editorial choices as such but are nevertheless promoted by algorithms because many other listeners are turning to a particular song at the same time, thus fueling the trending and aggregate playlists.

In Project A, we looked at how certain songs quickly became "songs of solace" after the 2011 terror attack in Oslo and Utøya in Norway in 2011 (Maasø and Toldnes). A more well-known example (turned into a meme) is Mariah Carey's "All I Want for Christmas Is You," which starts trending on Google and YouTube (and presumably the music-streaming search engines) in late September every year.[2]

The event-gravitating mechanism may have become more important in recent years due to the increasing amount of content competing for attention – events and virality, in this case, come to represent reliable ways to break through the "clutter" in the attention economy (Maasø, "Music Streaming, Festivals, and the Eventization of Music").

Context Confirming

The last mechanism points to patterns that promote certain listening contexts related to time, place, everyday activities, rituals, or contexts, such as working out, drinking coffee in the morning, partying, doing homework, performing household chores, using music to shut out the immediate soundscape while working or concentrating, and falling asleep. The *contextual turn* (Prey, "Knowing Me") in streaming may in fact be a user-driven innovation. In the social-streaming phase, when users were still encouraged to create and share playlists, context-based playlists were among the most frequently uploaded and circulated types.

When we analyzed the user-generated playlists of WiMP in 2013, we found that twenty of the one hundred most common playlist names were related to contexts and activities such as "work out, party, relaxing, start of school, sleep, wedding, Christmas and birthdays" (Maasø, "Music Streaming in Norway"). Similarly, Spotify revealed that among its one hundred most common user-generated playlist names, context accounted for 41 percent, which led Paul Lamere, Spotify's Director of Developer Community (and

formerly of the Echo Nest), to state that "context is the new genre." Spotify founder Daniel Ek expanded on this statement: "People don't look at things like hip-hop or country anymore – they are looking at things based on events and activities. We need to be able to deliver the right music based on who we are, how we're feeling and what we're doing, day-by-day" (quoted in Hu).

Findings such as these related to user-generated playlists prompted the streaming services to redesign their playlist offerings in the third phase of streaming. Instead of user-generated playlists, however, the users were served ready-made playlists intended for contexts, activities, and moods. While it remains possible for users to create and share playlists even in the algorithmic streaming phase, this is presently a relatively hidden feature, whereas machine-generated and editorially curated playlists based on context are prominently positioned on the front/opening interfaces of all the services. It is hard to apportion the amount of editorial, aggregate (based on what others are listening to in the same context), and personalized (based on the user's previous listening habits) selections in many of these playlists, but what we know about both editorial assessments and algorithmic machinery would indicate that these selections sustain the choice-narrowing trends we have identified here. In addition, Spotify has even been accused of prioritizing music for which it has negotiated reduced royalty rates in several of these context playlists, creating a controversy over "fake artists" (Deahl and Singleton). This also shows that the gatekeeping mechanisms highlighted here are all in some way related to the economic incentive structure of the business model of streaming.

Conclusion

We introduced this article by reflecting upon a paradox. Music-streaming services have made available limitless archives of music in a way that has transcended any prior means of distribution. As Morris and Powers state, "streaming services offer the illusion of increased control by offering greater access to more music in more places" (118). However, empirical studies from recent years indicate decreased control by users (Elberse; Snickars; Lynskey; 2018), and the findings in our own projects support these observations. In this article, we have delved into the microdynamics of streaming platforms to uncover the hidden logic behind music recommendations and to explain the paradox that increased access limits choice.

In the current phase of music streaming, services have dedicated themselves to developing automated and curated recommendation systems and to operationalizing data and interpreting metrics to increase the impact of these recommendations on listening behavior and churn. These curated recommendations are heavily based on advanced algorithmic analyses of content and user data. In the case of music-streaming services, however, more is at work, including both design and editorial choices. Algorithmic analyses are combined with interface design and human curation to put into effect what we call *hybrid gatekeeping mechanisms* to steer or nudge users by making some types of recommendations more convenient and others harder to escape. We identified six such mechanisms that represent a preliminary taxonomy of the ways in which music-streaming platforms influence users' interaction with and discovery of music: front boosting, novelty boosting, choice narrowing, flow prolonging, event gravitating, and context confirming.

Since all these mechanisms rely on input from user data, one can wonder whether, in line with our H_0 hypothesis, users have only themselves to blame for the lack of diversity in the music dominating the streaming era. Research on user satisfaction conducted by us within Project B, and research by others, indicates that most users consider algorithmic recommendations to be both helpful and relevant, even as they occasionally try to sidestep, bypass, or otherwise manipulate them. In short, users generally go with the flow and choose what is offered. For decades, self-proclaimed connoisseurs and taste experts have blamed fans for succumbing to industry control and for settling for poor music. This has supposedly led to the mainstreaming of music and to its superstar economy. While such a view may be partly true, it is remarkable that these allegedly undesirable outcomes have in fact been *amplified* by the streaming turn in music distribution.

Ultimately, then, the aggregate use patterns of music-streaming services most likely result from the cumulative effects of the ways in which musical content is presented *and* from users' reactions to this presentation. That is, each of our six gatekeeping mechanisms directs users toward certain choices *and* is at once reinforced itself by user engagement and is better able to reinforce its peer mechanisms. For example, choice narrowing works together with front and novelty boosting to generate a preponderance of recent music in both top-ranked content and autocomplete suggestions, based on user input. Furthermore, the ability of gatekeeping mechanisms to constantly monitor and immediately adjust to user feedback introduces certain self-reinforcing effects that lean toward both narrowing and boosting so long as users choose the most conspicuous solution – that is, follow the script that is written for them. Finally, and crucially, because the business model of music streaming is based on sharing revenue with rights holders *after* streams have been logged, and because the pro rata revenue-share model incentivizes high-frequency usage and megahits (Maasø, "User-Centric"), stakeholders and intermediaries monitor music metrics very closely and make choices and adjust marketing efforts daily as a result (Maasø and Hagen).

The contribution of this article has been to unpack the microdynamics – the hybrid gatekeeping mechanisms – that steer the actions of users in certain directions. An important task for further research is to connect these microdynamics to the wider power dynamics at play around music streaming. Eriksson ("Unpacking") has embarked on this task in her analysis of the data streams flowing from and to Spotify, uncovering the importance of "third party supply chains" (backbone networks, content delivery networks, cloud services) in the operation of Spotify. Prey ("Locating") problematizes the "curatorial power" of streaming platforms and argues that we cannot end the analysis of power inside the platforms themselves. Music labels, advertisers, investors, and other stakeholders advance their own interests, resulting in conflicting pressures and tensions.

There exists a central difference between music streaming and television or film streaming in this respect: "[D]atafication in the music business is *relational*, flowing between different stakeholders and services in multiple directions [. . ..] and [its] functions [are] *cyclical* or *processual*: action taken by a stakeholder or [music streaming service] creates data and metrics to be again interpreted and reacted to – creating reinforcing feedback loops of action and reaction" (Maasø and Hagen 29). In the case of television and film streaming, only the streaming provider (e.g. Netflix) uses data and algorithms to optimize users' viewing experience according to its own goals and

strategies (such as more streaming of its original content). Production houses, studios, and other intermediaries receive none of these data apart from what is useful to Netflix from a PR perspective, and they cannot take immediate action based on it (such as removing a flow-stopping episode from a season, for example). Thus, our analysis has clearly strengthened our H_1 hypothesis.

In recent years, several researchers have discussed possible ways of developing diversification algorithms to expose users to more varied content (Helberger, Karppinen, and D'Acunto; Van den Bulck and Moe; van Dijck, Poell, and de Waal), either in the hope that today's commercial platforms can be convinced or forced to take greater public responsibility or as part of an argument for developing alternative platforms. Kiberg has promoted these ideas in relation to music streaming, arguing that exposure to diverse cultural content is an important democratic value. And several of the music services we have mentioned would argue that they *have* taken measures to increase diversity. Tidal, for example, would point to its editorial team of music journalists, which promotes, among other things, music from the Norwegian indie scene. Spotify would likely mention its "time capsule algorithm," which invites users to stream older music from chosen periods, or its "Smirnoff Equalizer," a distinctive blending of liquor marketing and neoliberal feminism that confronts male biases in music selection by asking users to set a distribution between female and male artists by percentage (Werner).

Our criticism of this sort of thing is that there is limited value to surface stunts if basic designs and structures continue to work in the opposite direction. In this article, we have shown that the reinforcement of the superstar economy, the lack of song turnover, and the diminution of acoustic diversity and local repertoire are linked to key structural features of the way in which streaming services are designed to respond to their under-lying economic model. Thus, "redesigning" them would involve a concerted effort across all the constituent parts of the hybrid gatekeeping ensembles: the engineering of the algorithms, the editorial curation of content, and the design of interfaces, as well as their interlinking. Our main contribution here to this ongoing discussion has been to identify the variety of mechanisms that together contribute to the aggregate narrowness and uniformity of today's music consumption.

Notes

1. Searches and visual analysis of the mobile interfaces of streaming services were performed on an iPhone 11 Pro with iOS 13.5.1, May and June 2020.
2. See, for instance, imgflip.com/i/3ef2es (accessed 22 September 2021).

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