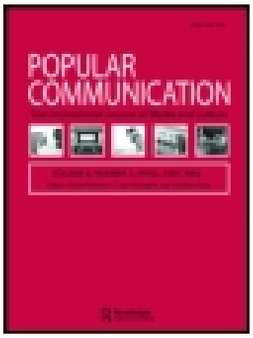

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Popular Communication
The International Journal of Media and Culture

ISSN: 1540-5702 (Print) 1540-5710 (Online) Journal homepage: https://www.tandfonline.com/loi/hppc20

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To cite this article: Arnt Maasø & Anja Nylund Hagen (2019): Metrics and decisions-making in music streaming, Popular Communication, DOI: 10.1080/15405702.2019.1701675

To link to this article: https://doi.org/10.1080/15405702.2019.1701675

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Published online: 11 Dec 2019.

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POPULAR COMMUNICATION
https://doi.org/10.1080/15405702.2019.1701675

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Metrics and decisions-making in music streaming

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ABSTRACT
Music streaming enables the tracking of listening behavior in more detail than any previous music-distribution format. While it is well known that streaming services collect troves of data, little is known about how stakeholders, including managers or label executives, make metric-based decisions and how they understand the impact of algorithms. The article uses anonymized interviews with music industry professionals, exploring how they use metrics in streaming services and examining their decision-making processes. The analysis concludes that they rely on a growing volume of data when making decisions about what to promote, and how. Nevertheless, most of the stakeholders focused on fairly simple metrics, such as salient spikes that were noticeable "at a glance." When discussing these findings, we draw attention to the reinforcing feedback loops between metrics, data-based decisions and algorithms, questioning whether datafication acts to intensify trending events and diffusion of new music.

ARTICLE HISTORY
Received 10 December 2018
Revised 19 November 2019
Accepted 2 December 2019

KEYWORDS
Affordances; algorithms; datafication; metrics; music-streaming services; Spotify

Introduction

Over the last decade, the music industries have seen a sharp growth in music-streaming services (MSSs) such as Spotify, Apple Music, Amazon, YouTube, TIDAL, and Deezer. In 2018, these services accounted for over 50% of all recorded-music revenues worldwide (IFPI, 2019). These on-demand platforms provide consumers with access (through subscription or exposure to advertising) to every song in a music catalog for a specific period of time (Wikstrøm, 2013, p. 105). The visible interface of an MSS on mobile phones or other devices generally contains "technical features (e.g., buttons, scroll bars, stars, icons) as well as regulatory features (e.g., the rule that a personal profile is required before entering the site)" (Van Dijck, 2013, p. 31). A selection of interactive features is normally also offered that enables subscribers to share, organize (in playlists, for example), search, and otherwise be creative with their music.

In addition, and most importantly for this article, the MSS utilizes an *invisible interface* (Van Dijck, 2013, p. 31) that is hidden from users and controlled by the streaming platform owner, who can manipulate it by hiding or revealing certain contents, or features, and by arranging music assets to perform in certain ways. This aspect of the MSS includes automated recommendation systems that provide listeners with music suggestions via playlists and streams through preprogrammed algorithms. For example,

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algorithms programmed to track popular songs (trending algorithms) and match your listening history to other users (collaborative filtering), may be used to present a user with a playlist based on a particular day of the week or likely activities during the time of day ("Friday Night Party Music"), that is not identical to what another user would be recommended at the same time and place. These recommendations impact the listener's music supply, and especially the selection of songs that are foregrounded and frequently rotated. The same impact could be ascribed to online interfaces and software offered by music-streaming providers to labels, artist, brands, and publishers. Like the consumer-facing interfaces, these B2B interfaces provide data about usage, as well as rules concerning the uploading of music files and metadata to the MSS. Overall, the algorithms and these invisible interfaces impact how music is perceived and made sense of in notable and unpredictable ways.

For stakeholders dedicated to facilitating their music's path to its audiences – that is intermediaries such as managers or labels executives – the streaming algorithms present both an opportunity and a challenge. In short, music distribution through networked media such as streaming services is characterized by inherent structures that make the resultant spread more difficult for the music industry to control (Wikstrøm, 2013, p. 6). Nevertheless, the practice of streaming has become so culturally central that an understanding of the services' ways of working is critical, as they "constitute a reinforcing feedback loop that plays a crucial role in the music industry dynamics" and give "rise to (or end) fads, brands, acts, or genres" (Wikstrøm, 2013, p. 88). The new dynamics in the relationship between listeners and music that are afforded by streaming services and their algorithms are therefore crucial to the ways in which music distribution has developed over time in the streaming culture.

These dynamics are also at the heart of this article's research, which builds upon studies demonstrating the impact of MSSs on user' behavior (e.g., Hagen, 2015; Johansson, Werner, Åker, & Goldenzwaig, 2018; Maasø, 2018) to develop a perspective on how insights into data about user behavior may also trigger new patterns of decision making by different stakeholders and actors in the industry. For these stakeholders, streaming technology supplies opportunities to reach new audiences in new markets, but it also demands new skills to respond to the new competition, which now includes global partners and a host of various technologies and platforms with unique characteristics.

Fundamentally, the distribution of music online via MSSs presents an opportunity to monitor and analyze users' consumption patterns and interactions. Such monitoring activity, here coined "datafication", has not only been important to large platforms like Facebook but also to the development of Spotify and other MSSs (Prey, 2016). In this article, we will argue that datafication and metrics are becoming more central to a range of activities *outside* of the streaming services and are of growing importance in the strategic planning and execution of efficient music distribution among various other stakeholders in the music industry. The overarching research question for the article is as follows:

> How are metrics of streaming usage influencing strategic choices and actions taken by stakeholders in the music business, and what are the relations between the metrics of streaming and the algorithmic affordances of music distribution in music-streaming services?

In terms of this investigation, the Norwegian music business is a fruitful starting point, as Norway was one of the first markets to adopt streaming, which surpassed revenues from physical sales as far back as 2011 (IFPI, 2014). It currently accounts for 89% of the total

revenues from recorded music in Norway (IFPI, 2019). Spotify has always been the dominant MSS in the Nordics, and it is the service brought up by most of the informants in this study; hence, it will be the prime example in our discussion below.

In the following section, we will discuss existing research on this study's core concepts and connect them to the workings and features of on-demand MSSs.

Central concepts: datafication, algorithms, affordances

The term datafication was first coined by Mayer-Schönberger and Cukier (2013) to describe a broad range of phenomena through which our everyday life is tracked, quantified, and analyzed to inform predictive conclusions. Van Dijck (2014) discusses datafication in relation to surveillance and "life mining" or "dataveillance" by social media platforms. Couldry and Hepp discuss the impact of datafication in digital media and platforms, where "[datafication and digital traces] themselves become part of constructing media events" (2017, p. 116).

As mentioned, the MSS introduced the possibility of tracking in great detail how music is listened to in daily life by huge audiences. As part of the business model of the MMS, each and every stream (of more than 30 seconds) is counted, and these numbers directly impact how revenue is both generated and shared among the music's rightsholders. In addition, usage data, such as how many users are streaming what and where, the origination of the streams (lists, searches, browsing, and so on), skips, repeats, and so on, represents many potentially important clues to better understanding about the fate of their work for stakeholders including composers, artists, managers, and record labels.

The front-facing user interfaces of MSSs highlight selected lists or songs on the listening device. Decisions regarding what to feature here are made by both editorial teams and automated algorithms, programmed to calculate and predict data regarding anticipated usage. Understanding the algorithms and affordances of the various listening devices and platforms involved with MSS is hence crucial to understanding how MSSs work.

Some of the oft-used definitions of algorithms describe them as formal processes or sets of step-by-step procedures that are often expressed mathematically (Striphas, 2015) or encoded to transform input data into a desired output, based on specified calculations (Gillespie, 2016). However, no final agreed-upon definition of algorithms exists (Bucher, 2018), and Seaver (2017) even argues that arriving at a common definition is not important; instead, we should "approach algorithms as 'multiples' – unstable objects that are enacted through the varied practices that people use to engage with them" (2017, p. 1). Algorithms may thus be viewed as "heterogeneous and diffuse sociotechnical systems, rather than rigidly constrained and procedural formulas" (ibid.).

Seavers's insight highlights how algorithms, over the last few decades, have moved beyond mathematics, informatics, and programming to increasingly engage social, political, cultural, and epistemological concerns, which is also why they are relevant here. It is important, that is, to understand the role of algorithms in online *power relations* (Beer, 2009) and the ways in which media and technology platforms steer visibility/invisibility and attract attention (Bucher, 2012a). Similar to the way in which Facebook's algorithms boast both the power and the threat of invisibility (Bucher, 2012b), software and algorithms in MSSs have the capacity to generate attention from audiences. Hogan (2015)

claims that the dominant ideology of information management "is one of sorting, especially personalized or relevance-based sorting, and infused with faith in machine learning" (p. 103) and shows how trending and ranking algorithms are dominating contemporary media platforms. Similarly, Gillespie has explored how trending and ranking algorithms make some information visible while hiding other information (Gillespie, 2016, 2018).

Understanding how algorithms work involves unpacking the affordances of the MSSs and user interfaces through which people stream music. The term affordance was first coined by Gibson (1986) as part of his ecological approach to human perception. Central to the concept was a relational approach to observers and environments: "The affordances of the environment are what it *offers* the animal, what it *provides* or *furnishes*, either for good or ill" (1986, pp. 2432–2433). In Gibson's initial description of the approach, he noted that surfaces afford various interactions to various observers – whether the surface is "walk-upon-able" or "sink-into-able" depends upon both the surface and the observer in question, including the characteristics of the environment, the capacity and need of the individual, the context of the situation, and so forth. This approach has proven relevant to human encounters with digital technology as well, including, in the present case, what streaming algorithms afford in terms of users' music consumption, and what the resulting widgets and data points afford to industry stakeholders as they make their plans. Affordances involve multiple layers, including contexts, objects, human communication, social relations, and non-human agency (Bucher, 2018).

Algorithmic affordances, as used in the following analysis, encompass the ways in which music is made available to users in music-streaming services, the ways in which this process is influenced by algorithms, and the ways in which the algorithms trigger new patterns of music consumption and data-based decisions and action (such as whether to invest part of a marketing budget on a given artist). Below, we will begin by describing the informants we interviewed in the hopes of addressing these issues.

Methods

The present analysis relies on material from fifteen semi-structured interviews (lasting from fifty-five to ninety minutes each) with anonymized music industry professionals, including twelve men and three women. The informants were recruited between spring 2018 and winter 2019, based on their position and expertise in the Norwegian music industry. Seven informants were music managers, most of whom also offered label, booking, publishing, or promotion services to help Norwegian artists achieve global penetration. The relevant management firms included between one and ten employees and boasted rosters of one to twenty artists/bands in both mainstream and niche popular music genres. The other eight informants were stakeholders from other parts of the music-streaming ecosystem, all with different insights into data and metrics: three informants with experience as employees at two different MSSs; one data analyst working at one of the three major labels; two label executives (one from a major label and one from a smaller indie label) who worked with or managed A&R, promotion, campaigns, and making various strategic decision for their labels and artists; and three informants who worked for music distributors or aggregators (such as The Orchard and Ingrooves Music), helping artists, labels, and managers get their files onto MSSs, as well as providing insights and analysis of streaming patterns and tracking royalties. Five of the informants had recent

experience at multiple companies and in various roles (for example, both for an MSS and for a label), and they were therefore able to provide relevant insight into several of the roles mentioned.

The informants have mainly worked with data and distribution practices in commercial popular-music contexts, but the material presented below describes how negotiations with streaming technology fundamentally inform industry developments in ways that likely also resonate with other music genres and partners.

The study's method centers on expert interviews in the interests of both exploration and orientation in a relatively new field (Flick, 2018, p. 236). The choice of a variety of stakeholders as expert interviewees was strategic, as the general need for these figures has increased amid the relative financial chaos of the streaming culture (Gordon, 2014), including new actors, tech companies, and digital platform providers (and their international partners) who pursue negotiations and regulations at unprecedentedly professional levels. The inclusion of various stakeholders and intermediaries also provided us with more insight into the various types and uses of data in the music industry, as well as a deeper understanding of how music metrics may have changed over time.

The interviews seek to capture the informants' *process knowledge*, which is instructive for understanding sequences of action and interaction in the field, as well as their *interpretive knowledge*, which addresses the expert's subjective orientations, rules, points of view, and interpretations (Flick, 2018, p. 237) as they are informed by streaming and algorithms. The analysis relies on our interpretations of the informant's accounts of their professional practices.

As a methodological framework, this approach provided us with the ability to explore the stakeholders' experiences of data-driven decisions in their work. The study hence contributes to a better understanding of the sociotechnical consequences of datafication and algorithms, as a core insight important to highlight both in the present and the future music industries. We will structure and present our results in the form of four main findings. The discussion that follows proposes a way of understanding the flow of data and decisions, and the ways in which algorithmic affordances and metrics may influence trends. Ultimately, we believe that the ways in which data are used may provide compelling insights into role of music-streaming services in music culture.

Findings

Increasingly detailed data

A first (and anticipated) finding, confirmed by all informants, is that data are indeed central to their decision-making, and that the skillset in using metrics is becoming more advanced.

> Twenty year ago, there was very little business-intelligence competence at all. I was shocked, as an economist, to enter a place where most were self-taught. The CFO I reported to did not even have a high-school diploma. […] Today we have dedicated analysts belonging to a global analytics team with hundreds of people. (Informant 13, major label executive)

> [When] we started this small label nineteen years ago, we did not know much about what happened with the use of music at all. Now we are sitting in front of screens most of the time,

> with ten to fifteen different tabs open with different streaming services and other online services that we constantly monitor. (Informant 11, small label executive)

While streaming is almost a decade old in Norway, most informants noted that it has only been since 2015 that music metrics have become sufficiently detailed for the use of artists, managers, and smaller labels. Several of them (Informants 1, 2, 4, 7, 11, 13, and 15) pointed to *Spotify for artists* (software intended for artists and managers launched in April 2017 following the release of beta version called *Fan insight* in November 2015) as comprising a milestone in music metrics (Spotify, 2017), as well as *Spotify analytics* (software intended for labels and distributors). A former executive at a competing MSS described a lack of business-intelligence resources when they initially built and launched the service: "The first few years, all that mattered was to model the revenue shares, and to report this and the market share to record labels and CMOs [collective management organizations]" (Informant 10, MSS executive).

Today, music metrics are essential to music managers and their respective artists and collaborating teams. Retrieving and analyzing data from streaming services and other platforms have become critical ongoing assignments that strongly influence everyday decision making.

> My job is about getting up in the morning, and then I log on to see the analytics […]. It's like a speedometer that we didn't have before the streaming economy, and it's fantastic. The work is simply to follow the numbers and try to understand what's going on. Because, if something starts to simmer, then we ought to see it, turn around, get geared up to act and just do it – maximize it. That's the key, really, even in studio work and A&R-ing. It's all about getting a grasp of the market's responses to the music. (Informant 4, manager)

This quote specifies that some kinds of interpretations and actions are made possible through insights from data. Datafication is decisive for strategic and relational planning, communication, cooperation, and the execution of music launches, marketing, publishing, audience targeting, and approaches to new and emerging markets. According to two of the informants (11 and 13), some labels are even using machine learning in their decision making regarding which artists to sign.

Metrics influence some of the managers' interpretations of data related to the long-term development of artist, but also their attempts to predict success or mitigate risk in the short term. For the latter, for example, artistic or commercial content can be pushed online to trigger the audience's interest before a concert or new release, based on existing metrics, and then this gesture will generate new metrics as well:

> We don't even have to release a song to test the audience interest. Instead, we can see whether we get likes on a picture. As such, streaming numbers, ticket sales, and followers on Instagram are all parts of the same picture. (Informant 1, manager)

The manager's observation illustrates datafication's permeation across the music business and from different services. In the interview, he goes on to argue for the economic benefits of metrics for his small company, given that large investments and binding agreements with other parties are less relevant today than they were for pre-digital processes of record production and distribution. His small management firm is now able to monitor market responses, streams, sales, and general interest using data from various sources, offering

him more control over his business because the risk is reduced through content development (e.g., music releases) and strategic planning (e.g., tour planning).

In another example, interpretations of data made a difference in the development of the careers of two (here anonymized) artists.

> Take the case of artist X versus artist Y. X is an EDM artist, while Y is a more distinctive, quirky pop artist. X has more monthly listeners that Y, but Y has close to 500,000 followers in the streaming service. X doesn't even have 10,000 followers. Nevertheless, X has streams, because X's music spreads more naturally to playlists with many followers. (Informant 6, manager)

This manager uses streaming numbers to inform career moves for the artists they represent, "and Spotify is particularly good at making this [information] available" (Informant 6). The manager explains that the teams working with the artists, which include label, booking, production, and promotion partners, also are more likely to agree to strategic decisions when they are supported by data. In the case of artist X, the data would most likely support both a production esthetics and a market drive toward the goal of sustaining X's success on the algorithmic playlists he has already performed well on. The larger goal is to reach thousands of followers and earn streaming revenue. For artist Y, on the other hand, the high *following numbers* for her streaming profile suggest that more people are aware of her music via artist recognition than via the random streams generated through algorithms and playlists. Given this information about her legions of followers, the managers correctly predicted and prepared for a significant commitment to live performances for artist Y. Supported by information about the listeners' age, gender, location, and so on, the managers accurately identified audience loyalty and undertook successful tour planning and profitable concert deals all over the world. The fact that this informant's strategic thinking was so heavily informed by data suggests that industry partners are willing to adapt their work to the algorithmic system of the MSSs. Put differently, the rationale behind these career management moves is a result of both datafication and the algorithmic affordances that inform investments, activities, and even production esthetics.

In general, the informants had plenty to say regarding digitization's influence on their professional practice, particularly in terms of dealing with data. They also appeared open-minded and willing to learn. Interestingly, the things they were *less* capable of seeing and influencing also came up. Shortcomings were often expressed in relation to the workings of algorithms. Several managers, for example, identified challenges around controlling music-streaming distribution simply because the algorithms were so diffuse, functioning as they did in opaque, complex systems. Similar views were expressed by two of the informants who had worked in editorial teams at two different global MSSs (Informants 12 and 14). Both expressed frustration with their lack of understanding of the technical side of algorithms, and challenges associated with cooperating with the programmers making the software used to monitoring streaming: "I don't even know if the coders are sitting in the US or India," said Informant 12.

The overall attitude amounted to a clear acknowledgment of the importance of algorithms for song performance, with managers further mentioning algorithms' influence upon streaming numbers and wondering how to explain dips in popularity and changes in playlist positions and so on. Their interpretations of their own interactions with

algorithms in MSSs were couched in terms of failure or success through a kind of experience-based recognition that they would build upon in their future practices related to music distribution.

The competitive advantage of data

A particular finding of interest to this special issue, is that all the informants highlighted Spotify's competitive edge, not only concerning marked share, but in providing useful metrics.

One manager illustrated this while showing us *Spotify for artist* on his mobile:

> "[W]e have all the information here at the tip of our fingers. Google also provides good data, but they don't have a dedicated app. […] TIDAL used to be the best the first years, but has been a black hole after they changed owners [in 2015] […] It is easy to prioritize the ones that are the easiest to work with. And Spotify is clearly the most accessible" (Informant 2, manager).

Clearly, Spotify has been developing good relations with stakeholders over time, increasing its use value through, among other things, its advanced metrics:

> Spotify is increasingly providing strategic data – relevant data points and analyses that make it possible to take action. (Informant 8, music distributor)

Spotify's acquisition of the leading analytics company Echo Nest in 2014 (Prey, 2016) was also mentioned by several informants (8, 9, and 13) as important to improving the quality of its music metrics.

Still, despite all of the data Spotify collects in house, it still turns to other stakeholders for access to *other* data points that it does not have. When managers, labels reps, or distributors are pitching new artists or music for playlists, Spotify face what are known as "cold start problems" (Seaver, 2018), because it simply lacks the data to inform its algorithms' predictions and choices. As one informant explains, "What Spotify, Apple, and others say [in pitch meetings] is 'Why should we push this particular artist? Do you have any metrics indicating that it would be useful for us to do this?'" (Informant 11).

Stakeholders then produce a host of data sources including radio play, social media presence, and tour success for Spotify, amounting to an exchange of data, often in face-to-face meetings, that builds relationships among the parties over time. Other moments of exchange and relationship building include music business gatherings or face-to-face sessions with stakeholders:

> We hosted many meetings between small and large stakeholders and Spotify, where they built trust through answering questions and being transparent (with data). (Informant 9)

When Spotify also opened several APIs for third party developers and stakeholders like music distributors and labels in 2013–2014, and more data about artists in 2013 access to data over time contributed to strengthening the relationship and reliance on Spotify, over their competitors – as was clearly their intention (Dredge, 2013).

Events

Most MSSs feature different types of *events* on the user interfaces of their consumer-facing software. These events might be created by the services' editorial teams – that is,

employees with the power to curate and control service content – or fueled by algorithms. An informant with a background on editorial teams at two competing MSSs explained:

> 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. (informant 12, editorial team at MSS)

The biggest events typically claim priority real estate on the service's interface – for example, in the top banner "announcement" on Spotify's desktop version or the top row of the "home" tab. Often they resonate with general public events that are already absorbing people's attention, such as the holiday season or a major music festival. Other events start out as unplanned happenings, such as commemorations of the deaths of popular icons like David Bowie or Prince (Maasø, 2018). Memorial playlists and events are also prioritized on the MSS' interfaces and generate notable streaming numbers.

Important recurring events in the music industry, such as album releases, also receive attention from the MSSs. In 2015, a globally synchronized adaptation of the recording industry to the digital music industry produced an agreement to move the new music release day from Tuesday to Friday (Grow, 2015) – perhaps to better accommodate streaming patterns, and present fresh music for the Weekend? (Fridays and Saturdays have dominated in usage since the launch of MSSs, cf. Maasø, 2014). Playlist events such as Spotify's *Release Radar* and *New Music Friday* promptly followed, gathering a selection of new releases into playlists every week. Industry-related playlists and events are often followed with great interest by general audiences, artists, A&R reps, promoters, and booking agents, as well as the intermediaries of this study.

Moreover, playlist updates have become events in and of themselves, cementing the crucial role of the MSS in contemporary music distribution. The attention these playlists generate reinforces both their positions in the MSS and the MSSs' position as gatekeepers worth following, because they curate "the best released tracks collected in one playlist," as Spotify claims.

Because MSSs are considered the gatekeepers of new music, stakeholders, including our informants, work hard to nourish their connection. One said: "I try to keep in close contact with Spotify, several times a week, if we have forthcoming releases. It's basically: 'Can you add it on New Music Friday?'" (Informant 4, manager). Moreover, the MSS affordance of event-driven music distribution motivates pitching, marketing, and release coordination with event playlists in mind, simply because an invitation to these prioritized events can kickstart streaming of one's music.

New Music Friday and other lists are therefore regarded almost like "release parties," or "a place we can perform very well and get to the top" (Informant 1, manager). The opposite is also true: "If some person at Spotify decides not to [playlist you], the track falls completely out of the loop" (Informant 4, manager). Missing out on a playlist hence has consequences for the algorithmic loops that define the distribution logic and trending algorithms (Gillespie, 2018).

Event-driven music distribution seems to have become more important in recent years, presumably because machine learning has improved and the user base of the MSSs has

increased dramatically, thereby increasing the number of data points feeding the algorithms. Major streaming events thus seem to spread even more virally around the world, serving to propel a few blockbuster tracks to the tops of ranking and trending lists, searches, and playlists. Spotify and other MSSs also provide playlists of top-ranking songs nationally, globally, and virally, completing the feedback loop between what is promoted and what is listened to and what, in turn, drives further promotion and listening through algorithmic success. Monitoring such data points can also fuel action, as one manager explains:

> Once we have reached a certain level, it's all about using the numbers to reach even further. To the Global Top 50 [playlist], for example. We might see that we lack 50,000 streams. Then we try to influence this by approaching a playlist in a smaller market – obtain streams over there, then hit the bigger playlist. (Informant 5, manager)

A similar approach is taken when using metrics in search engine optimization and to manipulate search patterns:

> Often, we make marketing decisions to direct users to a playlist rather than to a track, because if the data shows that the playlist will get X number of additional streams, then the list will go to no. 1 in search within Spotify. Which will then get you organic traffic. (Informant 15, data analyst)

Fresh data and novelty

Another interesting pattern involves the informants' regular reliance on real-time data – that is, up-to-the-moment metrics focused on "spikes," or sudden or salient changes. Even managers invested in understanding the long-term consequences of streaming for the artists they represent gauge those consequences via the "speedometer" of real-time changes. One seasoned executive said, "If [the data] is not provided in real time, it is rarely used. People don't go back in time to interpret data. They are interested in the present." (Informant 14, music distributor). Several other informants echoed this sentiment, using formulations such as "here, I access the day-to-day data" (Informant 7), "the focus is on the here and now" (Informant 9), and "snapshots in real time at a glance – that's what we want from data" (Informant 11). Real-time metrics provide the opportunity to act quickly. For instance, informant 2, who was quoted earlier discussing the competitive advantage of *Spotify for artists*, went on to explain why fresh data were so important:

> It is difficult to prioritize cooperation [with an MSS] when you do not know the effect of your activities. […] If we've made a marketing effort, have a good story, have done something extra – [with MSS TIDAL at this time] we still have no idea about the effect. Today, we perhaps only get the data after seven months. It's hard to tell whether an activity has had any effect at that point. (Informant 2, manager)

Fresh data are hence seen to provide "instant feedback" to stakeholders regarding whether their activities and choices are working.

A couple of informants also mentioned software that provided *automated* detection of spikes including Informant 12 (who worked for an MSS) and Informant 14 (who worked for a music distributor): "We use 'spike notifications' actively, which trigger a message that is sent directly to the labels."

When prompted, a few informants acknowledged that they occasionally review old data. Informant 11 brought old data to meetings with Spotify when he was pitching an artist who had a new release after a long hiatus, and he searched old data for a "hook" to get the local press to cover a new release.

Among the music managers, only one (Informant 4) talked about occasionally digging deeper into old data, using *Spotify analytics* and the subscription service *Spotontrack* to "follow the journey" of a particular song since its release, including how many playlists it had been added to and when. Yet these exceptions to the fresh data rule did not fuel important data-based activities or decisions, except in the case of the one data analyst among our fifteen informants. While he also usually dealt in fresh data ("four-year-old data is useless"), he acknowledged that he explored historical data in order to understand how the algorithms of a particular platform work (such as the search and recommendation algorithms on YouTube) and to investigate allegations of fraud and so-called "fake artists". He also drew from both old and new data while exploring the emergence of K-pop as a genre:

> What I did was to try to "reverse engineer" how [anonymized band] spread through the internet, in order to see if we could replicate this. […] So now I'm talking every week with the Korea office, because I did this analysis. (Informant 15, data analyst at a major label)

Exploring and acting upon old data patterns that are not easily detected by the readymade metrics highlighted by the MSS dashboards require particular resources, time, and skills in coding, and sometimes the collaboration of a global team of experts. Only the largest labels and distributors, as well as the MSSs themselves, have these kinds of resources, as our informants acknowledged:

> Our challenge is that we cannot hire statisticians and data analysts, which is what Universal, Sony, and Warner do. They have the resources to hire people who crunch data. As a small label, we have to figure this out ourselves. The major challenge is not the amount of data we get, but getting something useful. It is so much data! So many different things! (Informant 11, small-label executive)

Most stakeholders, that is, are forced to focus on the present, the trending, and the relatively obvious, whether they want to or not.

Even efforts related to making *old* tracks popular to new audiences are generally informed by real-time music metrics:

> Almost by accident, we had a track in SKAM [the TV series], which made us turn around quickly to maximize the track. The song, which already was a few years old, suddenly became super relevant again. And it also opened up new territories and markets. In Sweden, it was up on Top Three in Spotify. […] So, this "renewal" thing, it changes the work of marketing music as a product, because nothing is ever dead. It can always be made relevant again. (Informant 4, manager)

This illustrates the impact of real-time metrics on understanding the immediate potential of monetizing a track. Informant 4 went on to explain that these numbers even made the argument for setting up a concert tour in Sweden with the artist whose track had bounced back.

The focus on novelty in the music industry is by no means unique to a streaming context, but its relevance to current music distribution has been enhanced by the vast

networks of listeners who are affected by the MSS algorithms and those stakeholders who both monitor and feed those algorithms via data-based action, as we will address below.

Discussion: reinforcing feedback loops and algorithmic affordances

As we have seen, over the last few years, streaming services, and Spotify in particular, have made an increasing amount of data available to different stakeholders on a daily basis, and those stakeholders have enjoyed increasing flexibility to monitor and act based upon these metrics. No single stakeholder has access to all relevant data points about music, but it is clear that the MSSs and major labels are dominating the metrics race. These actors also have the resources and skillsets to interpret this data in ways that others do not.

According to our informants, Spotify has been the most successful actor at acquiring and providing music metrics and has capitalized on its first-mover advantage in the music-streaming business even in the company of such data behemoths as Amazon, Google, YouTube, and Apple.

Based on the way the informants use metrics, we realize that datafication in the music business is *relational*, flowing between different stakeholders and services in multiple directions. The true power of MSSs resides in the way in which they have become central information hubs, with links and feedback loops to all of the other stakeholders in the music business – either directly, through the interfaces and algorithms they control, or indirectly, through data gathered from partners and intermediaries.

We also propose that datafication functions *cyclical* or *processual*: action taken by a stakeholder or MSS creates data and metrics to be again interpreted and reacted to – creating reinforcing feedback loops of action and reaction. Similar to how Couldry and Hepp (2017) discusses datafication and media events, datafication itself may create trends and influence the music culture thanks to the algorithmic affordances of MSS. Since there are millions of actors in this information network, many people may interpret the salient signals in the same way, instigating similar actions and reinforcing trends and network effects. Data, then, beget data.

Of particular interest in terms of the broader implications of music metrics are the choices made by algorithms regarding what to render visible or invisible. Algorithms are clearly programmed to show or hide music in the interfaces used by regular listeners to stream music, as is the case with algorithm-fueled content on other social media platforms (Beer, 2009; Bucher, 2012a). Music streaming services also rely on algorithms to power the software facing artists, managers, labels, distributors, and other insider stakeholders, supplying them with metrics on trends, top lists, follower numbers, and so forth. As Hogan (2015) has shown, *sorting* and *ranking* ultimately dominates the way in which software engineers design and program interfaces. Based on the interviews, and observing the different software in use, this is the case for MSSs as well. The ideology of sorting is echoed in important ways by our interviewees' framing of their situation – how they talk about, understand, and act upon data, and why they focus on novelty, lists, trends, and spikes.

When metrics are presented, interpreted, and acted upon by numerous stakeholders making decisions that is then fed back to, and doubly reinforced by, algorithms in both consumer and business facing software, we suspect that these reinforcing feedback loops

may have cumulative effects over time that in turn may impact the diversity of music culture writ large. Datafication, then, risks reinforcing only the most salient data, thereby becoming a tool best suited to making superstars and global mega-events even bigger, at the expense of smaller acts and local events.

Acknowledgments

This research was supported by The Research Council of Norway, grant 271962. The authors thank two anonymous reviewers for valuable comments of earlier versions of this paper. We also thank copy editor Nils Nadeau for substantially improving the language, and colleagues in research projects *Music on demand: Economy and copyright in a digitised cultural sector* and *Streaming the culture industries* for useful support and comments.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This work was supported by the Research Council of Norway [271962, 263076].

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