


SPOTIFY AND ITS ALGORITHMIC STIMULUS: Do we choose what we listen to?

SPOTIFY E SEUS ESTÍMULOS ALGORÍTMICOS: escolhemos o que escutamos?

SPOTIFY Y SU ESTÍMULO ALGORITMICO: ¿elegimos lo que escuchamos?

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ABSTRACT:

This article presents a reflection on the algorithmic logic that transforms the way we consume music. We start from the concept of nudge (Thaler & Sunstein, 2008; Yeung, 2016) to understand the app's algorithmic mediations (Couldry & Hepp, 2020) that shape music consumption based on the app's algorithmic stimuli. Methodologically, we present an analysis of Spotify's functionalities to identify where these stimuli are presented in the functions. We conclude that the algorithmic logic of the app plays a role in music choices as a way of providing service to the user.

KEYWORDS: Algorithmic logic; Nudging; Spotify; Consumption.

Introduction

Our proposal in this article is to analyse the algorithmic logic of the Spotify music app by mapping its functionalities and their relationship with consumption practices and behavior. This involves investigating the experiences of use intertwined with the algorithmic functions and the actions that refer to or make explicit the mediation of music consumption through the algorithm's stimuli based on the concept of nudging discussed by Richard Thaler and Cass Sunstein (2008) and Karen Yeung (2016).

As there is no way of assessing how the app's code or algorithm programming is configured, the methodological procedure adopted involves mapping the technical functionalities in which the practice of consumption is the company's central objective. Therefore, the empirical analysis of the functionalities and their relationship with music consumption behavior on Spotify was the choice to try to get closer to a possible understanding of how the algorithmic logic is configured towards the regulation of behavior and use by users.

Based on the proposed objective, we based ourselves on what Barad (2007), quoted by André Lemos (2020), who, with regard to the methodological procedure,

"considers a phenomenon that generates practical consequences produced by an interweaving of real agencies (documents, users, business strategies, codes and data)" (Lemos & Pastor, 2020).

Investigating the algorithmic logic of apps to map the stimuli of these systems in order to generate results of interest to companies is a bold stance, since we are faced with the impossibility of knowing the algorithm's codes, so it leads us to take another direction, which is to experiment and pragmatically map its functions and then relate them to consumer agency.

The discussion in the article is divided into three parts. The first focuses on reflections on the stimuli (nudges) present in algorithms and how they mediate social reality. The interest is to point out the investigation of the algorithm not just as a code, but as a function embedded in our social reality. The second part focuses on mapping the functionalities of the Spotify app as an empirical methodological procedure to understand the algorithmic logic present in these functions and how it relates to consumer behavior. The third and final part focuses on reflections on the interactions mediated by the algorithm in the choice process and its relationship with music consumption behavior in terms of user experiences.

The nudging of algorithms that mediate social reality

Algorithms are computer programs that process large amounts of data to identify patterns and make personalized recommendations. In the information age, algorithms are widely used by technology companies to mediate our social reality. They are responsible for presenting content on various platforms, recommending products on online shopping sites, selecting news on apps, and suggesting videos on streaming platforms. They mediate the online experience, selecting what we see and filtering out what we don't see.

Taina Bucher (2018) presents another way of investigating algorithms. The idea is to go beyond their programmatic function in the code and understand how they help produce certain ways of acting and knowing in the world, knowing their political capacity and power, that is, by processing and classifying data, algorithms are political because they can show a version of the world according to business or government interests.

To research the presence and performance of algorithms, it is necessary to go beyond the technical definition of algorithms as systemic procedures for solving problems and create mechanisms that collaborate in understanding how algorithms can

have a significant impact on our social reality, as they often reinforce our existing points of view by limiting the diversity of information we receive.

This initial reflection encourages us to understand the relationship between the social world and the media and technologies based on Couldry and Hepp's (2020) argument that the media is one of the main ways in which social reality is constructed and reproduced, and that mediation is a fundamental process in this regard. In the case of apps, we focus our gaze on technical mediation and digital technology to substantiate how mediations affect the construction of social reality through a process that takes place at different levels, from media production to reception.

Based on the understanding that the social world has its own reality, everyday reality (Couldry & Hepp, 2020), which is constructed by human practices and their effects. This fact is accepted to a certain extent and is interfered with by institutional facts, companies and their respective applications and platforms for interactions, services and the marketing of products that operate through algorithms and artificial intelligence as mediators of consumption.

Algorithms programmed for a specific purpose are made up of codes that generate behavioral stimuli in application users. We use the same terminology to determine the stimulus that is the concept of nudging, whose original definition as a method was established by Richard Thaler and Cass Sunstein (2008) in the book *Nudge - Improving Decisions about Health, Wealth, and Happiness*. The authors define nudging as "any aspect of choice architecture that alters people's behavior in a predicted direction without coercion or prohibition of any option or significant alteration of their economic incentives" (Thaler & Sunstein, 2008).

The Cambridge dictionary (1995 p. 966) defines the term nudge as the act of pushing someone or something gently. In this sense, we can consider that a nudge is a stimulus, a "push" or an instrument that drives people to a certain action or behavior that is in line with the pre-established objectives of the companies that own the apps. This push or nudge can be generated by algorithmic functions to incite people towards a direction or decision - in the case of this article - the decision to consume or choose what they want to listen to on the music app.

Karen Yeung (2016) adapts the term to Hypernudging when she discusses the high level of nudging we receive on a daily basis because of the way companies use big data in the architecture of choice. For Yeung, Big Data-driven nudging is agile, unobtrusive, and highly potent, providing the data subject with a highly personalized choice environment - which is why I refer to these techniques as 'hypernudging'.

Hypernudging therefore depends on highlighting correlations determined by algorithms between data items within data sets that would otherwise not be observable by human cognition alone, thus conferring a 'saliency' to the highlighted data patterns, dynamically configuring the user's informational choice in a context intentionally designed to influence their decisions.

In this way, we continue to reflect on this article based on the technical and algorithmic practices present in the Spotify app, as the basis of the investigation, to answer questions about how these mediations occur, how they interfere in the social reality of consumption - in this case of music, but which can be expanded to other areas. How do we interact with algorithms in the processes of choice? We accept the choices made by algorithms in our daily reality, but to what extent can we interfere in this algorithmic logic of consumption?

Mapping Spotify's functionalities

The Spotify application is a streaming service that allows users to listen to music, podcasts, create playlists and listen to music from other users' playlists on the platform itself. It works through algorithms that act as experts in music and genres and, through machine learning, constantly learn from consumer use to feed its recommendation system (Santini, 2020).

The mapping presented sought to cover most of the features, however it is worth saying that we selected those with the greatest capacity to contribute to the investigation, as the quantity is considerably large and would not fit in just one article, but rather in a larger research project.

The service is offered in a free version with ads and no music control, and a paid premium version, which allows users to download for offline listening, control the songs in the order they want, etc., and its algorithm is programmed to personalize music recommendations for each user, based on their playback history, playlists and musical preferences.

The algorithm works with a multitude of data to identify patterns and trends in the type of music the user listens to and likes. By observing how it works, we identified what information is considered by Spotify's algorithm:

- a) Playback history: The algorithm examines the songs the user has already listened to, listens to frequently or skips and creates an understanding of their musical tastes and preferences.

- b) Playlists: The algorithm analyses the playlists created by the user and the songs that have been added to them, including those that have been marked as "liked".
- c) Discoveries of the week: Spotify's algorithm automatically creates and presents a personalized list of songs for each user, called "Discoveries of the week", based on their musical preferences. In this function, the app also suggests "Discover something new for you".
- d) User behavior: The algorithm considers user behavior, such as the time they spend listening to music and what types of music they prefer to listen to at different times of the day.
- e) Popularity: The algorithm considers the popularity of music in general, as well as the popularity of certain songs among users with similar tastes.
- f) Most listened to songs in the period: Based on the audience of the songs, the algorithm creates and suggests a playlist and highlights the "Based on what you've listened to recently" function in the app.
- g) 100% for you: this is an exclusive and individualized function of new music or podcast options that the algorithm makes available to each of its users.
- h) Friends' listening patterns: Spotify's algorithm can analyze the listening patterns of a user's friends to offer suggestions of songs and artists that are popular in their social circle.
- i) Enrich function: Recently added, the function consists of the user authorizing the algorithm to include new songs in their already created playlists to "enrich" the playback selection. The algorithm uses existing genres and types of music to select and include new ones of the same standard.

The functionalities are numerous. There are also features available to improve the user experience, such as: offline listening mode, which allows users to download music and podcasts to listen to without an internet connection. Another feature is that the app allows the user to choose the best way to play the songs: random mode, repeat mode and sequential mode of the songs in the playlist. If the user is listening to a song on the free plan, there is the possibility of going to the online radio station that is playing it.

Other features are playback controls, including forward, rewind, pause and play, customization of audio settings, including equalizer and streaming quality, display of lyrics synchronized with music playback and control of audio devices, such as speakers and Bluetooth headphones.

For these functions to be viable and assertive, the app's algorithm collects a high range of data from its users, which can include: registration data: name, email, password and date of birth; usage data: information about how the person uses the service, such as

the songs they listen to, the playlists they create and the artists they follow; location data: information about the approximate location of each user, based on the IP address of the device; device data: information about the device, such as the model, operating system and app version; connection data: information about the user's Internet connection, such as the type of connection and the download and upload speed; payment data: information about the financial transactions made on the service, such as paid subscriptions; and interaction data: information about their interactions with other users of the service, such as comments and messages.

In addition to the data generated and collected within the app, Spotify can also collect data from external sources such as third-party platforms like Meta (Facebook and Instagram) to better understand the profile of its users and their respective preferences. The algorithm can also collect and use the user's location to recommend songs that are popular in that region or to create playlists based on specific activities in each city. Another source is purchases, i.e. Spotify can consider user purchases in environments outside the app, such as concert tickets or albums by certain artists.

How does Spotify's algorithm classify songs?

According to information collected on Spotify's website, which provides exclusive content for developers and programmers, the application's Artificial Intelligence takes the following elements into account:

- a) Basic song structure - The elements that involve the basic song structure are the tempo or duration of the song, the pitch, the mode (major or minor), time signature (3/4 or 4/4, for example) and the BPM (beats per minute, which defines the speed of the song's pulse).
- b) Musical genre - Regardless of the previous classification of genre by whoever produced the music, Spotify considers its own mapping of musical styles based on algorithmic classification.
- c) Acoustically - This is a measure of 0.0 to 1.0 and shows whether the track is acoustic, i.e. whether the track was recorded in a controlled environment without noise or if there was any kind of interference from the environment at the time of production.
- d) Danceability - This is the criterion used to determine the degree of danceability of the music based on the rhythm and BPM. This considers the strength of the beats, i.e. the closer the BPM is to 0.0, the less danceable the song is and the closer it is to 1.0, the more danceable it is.

- e) Measured Energy - Represents a perception of intensity, i.e. energetic tracks are generally perceived as fast, loud and noisy.
- f) Instrumentality - Still on a scale of 0.0 to 1.0, it analyzes the amount of time between voice and instrument present in the music.
- g) Liveness - Detects the audience in the phonogram. Identifies songs that were recorded live, i.e. with audience interference in the audio. The scale is 0.8 and an example is music recorded at live concerts.
- h) Loudness - Detection of how loud/intense the track sounds, based on specific compression parameters.
- i) Speechness - Analysis of the proportion of spoken voice within the recording. Using the scale already mentioned, songs with a high amount of spoken voice are closer to 1.0. This type is more common in podcasts, talks and audiobooks.
- j) Valence The aforementioned 0.0 to 1.0 measure is used to classify the "sound positivity" of the music, by cross-referencing tonality, mode and BPM data. To classify, the algorithm understands that the higher the valence gradient (1.0), the more the music is understood as happy, euphoric, or joyful.

It is the cross-referencing of all this data collected from various sources that allows the app's algorithm to deliver an individualized user experience. The degree of knowledge of the profile of each person who accesses the app is high, allowing systemic actions to take place in the direction of the company's objectives. In this sense, consumer behavior is shaped and influenced by the stimuli triggered by the algorithm.

Do we choose what we listen to?

Music consumption is related to the cultural and social environment in which the individual is inserted and is therefore influenced by the context, mood, and level of concentration of the person (Moschetta, 2018).

Consumption behavior depends on where the user is, the device they use, the activity they perform, among other contextual and individual factors. The very classification of content by mood on Spotify calls into question the traditional categorization by genre or musical style (Moschetta, 2018).

In 2019, Scott Cohen, founder of The Orchard, one of the first companies focused on the digital distribution of music, made a statement about the way we choose what we listen to. For him, the term "musical genre" is losing relevance and being replaced by "songs I like". This is because Artificial Intelligence selects and delivers music according

to people's preferences. According to Cohen (2019), 20,000 songs are uploaded to Spotify every day and it is unlikely that all of them will be listened to.

This displacement of the basic information - genre and taste - that drives the recommendation system is driven by technologies and the processing of large amounts of data to adjust towards ritualized consumption behavior (McCracken, 2007).

To understand the algorithmic logic of the Spotify app, we seek to use the four regimes of interaction (Landowski, 2014) to understand these subject-subject and subject-object interactions, which imply ways of being in the world: programming, manipulation, adjustment, and accident. Based on the interactions between user and app, we can say that the process goes through the phases shown in the table below:

Tabel 1 - Interaction regimes vs. nudging of algorithm

Interaction regime	Designation	Relationship with the application
Regularity	Programming: refers to the developed code that makes up the application's algorithm. It poses no risk, as it is predictable.	Determines the stimulus (Nudge) that incites users' actions and consumption behaviour's.
Casualty	Accident: refers to the ways in which the user interacts with what has been programmed but is completely unpredictable.	It depends on the user's own action when they skip a song already added to their playlist, for example. This behavior provides information on the level of taste. He added it - he likes it, but he always skips it, which indicates that I like it less than others.
Non-regularity	Adjustment: a chance that can be understood, i.e. different paths can occur, but which complement algorithmic learning.	This is an adjustment to the response to stimuli that the user has had contact with. When the app adjusts its suggestions to the user's actions based on machine learning and the algorithm's ability to create stimuli aligned with behavioral changes with the aim of adjustment.
Non-casualty	Manipulation: this is an order that has levels of predictability and unpredictability.	Here we relate manipulation to consumption, for example, with the constant creation of new trends. Functioning of the recommendation system linked to user responses and accepting, sharing and their acceptance of

		the app's suggestions.
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Fonte: Landowski, 2014 pp. 21-30.

Returning to the question posed in the title of this article: Do we choose what we listen to? the app's interaction regimes reinforce the idea of the algorithm as a strategist-manipulator who acts in foreseen and unforeseen situations to shape consumer behavior:

[...] if the strategist-manipulator recognizes the other person's will and, even better, if they dedicate themselves to knowing it in depth, to making it as transparent as possible, to detecting its determinations (understanding that if the will is the foundation of the subject, it does not necessarily presuppose its autonomy), it is only in order to manipulate it with greater security, to gain more power over it, acting on its motivations and its reasons, possibly the most secret ones. In this context, the recognition of the other as a subject is therefore no more than a necessary moment in the process of dominating and instrumentalizing them by obtaining their consent, more or less forcibly (Landowski, 2014 p. 33).

Based on the functionalities (some of them) presented in this mapping, it can be understood that the Artificial Intelligence of the Spotify app is also capable of classifying the personality patterns of its users. In 2016, Portal Terra published the article "What do the songs you listen to reveal to Spotify? In the publication, Brian Whitman, the professional responsible for the data sector, made the following statement: "We are able to discover, with a high degree of reliability, things about you: certainly, the age and where the person lives, but also personality matrices". According to the app, the complexity of user information collected by the algorithm makes it possible to know whether a person is sociable, introspective, or adventurous. Political preferences - left or right - and even groups they might sympathize with.

Fernanda Bruno (2019) discusses the "psychic economy of algorithms", a term that refers to the psychological impact that algorithms have on users and society in general. As digital platforms become increasingly ubiquitous in our lives, algorithms can shape our perceptions and behaviors in subtle but significant ways.

By the psychic economy of algorithms, we mean the contemporary investment - techno-scientific, economic, and social - in algorithmic processes for capturing, analysing and using psychic and emotional information extracted from our data and actions on digital platforms (social networks, apps, streaming services, platforms for sharing and/or consuming audiovisual content, etc.). The information that interests fast data capitalism

is no longer just the traces of our actions and interactions (clicks, likes, shares, views, posts), but also their psychic and emotional "tone" (Bruno, 2019).

For example, algorithms can encourage addictive behavior on social media platforms, such as continually scrolling the news feed in search of new and interesting content. They can also create information bubbles, where users are only exposed to information and opinions that reinforce their own views, leading to a polarization of society.

In February 2023, the UK's Center for Data Ethics and Innovation published its report on the impact that streaming services' recommendation algorithms have on music consumption. The main criticism is that the app's algorithm, the way it operates, can disadvantage artists from certain regions and favor others. This is because the "play count" is done globally and not regionally. Among the data presented, the study shows that Spotify's app also uses advertising to broaden its users' musical tastes and preferences.

Considerations

Algorithmic consumer behavior is a form of consumption guided by algorithms that use data and mathematical models to make decisions and recommendations to users. Digital platforms use these algorithms to personalize the user experience, offering suggestions for products, services or content based on data about the user's preferences and previous behavior.

In an attempt to relate the stimulus of the algorithm to the functionalities presented by the Spotify app, we relate these functions to the four examples of situations that interfere with people's decision-making presented by Thaler & Sunstein (2008): 1) situations in which the benefits are short-term; 2) situations with which they are not frequently confronted; 3) situations in which there is no immediate feedback; and 4) unfamiliar situations in which it is difficult to relate the outcome to something known. Based on these situations, the following table shows the relationship between stimuli, functions and how this interferes with behavior:

Table 2 - Relationship between stimulus, app function and consumer behavior

Situations that influence the decision	Examples of app nudges related to functionalities	Influence on user consumption behavior and choice
Situation that offers short-term	1) "Getting rich" 2) "Chosen for you"	When the user allows the app to choose for them by adding new

benefits	3) "Your Programs"	songs to the playlist.
Situation they don't face often	<ol style="list-style-type: none"> 1) Spotify retrospective 2) "Suggestions of the Week" 3) "Friday is release day" 4) "What's new for you" 5) "Based on what you've heard" 	<p>Reinforces what is most listened to, corroborates genres or most listened to songs and artists</p> <p>Repetition behavior. User is encouraged to listen to what is already preferred</p>
Situations in which there is no immediate feedback	1) When the app collects user data from external sources and third parties	It is not transparent to the user how and where their data is collected and for what use, but it is used to shape music consumption behavior
Unfamiliar situations in which it is difficult to relate the result to something known	<ol style="list-style-type: none"> 1) Classification of suggested music genres 2) "Your mood" function 	Suggestion of happier music, which generates mood changes ("sound positivity"), but this is not perceived by the user.

Source: Based on Thaler & Sunstein, 2008.

As for users' ability to choose when faced with the algorithmic decisions and stimuli of the Spotify app, we can say that the user has - to a lesser degree - a certain amount of autonomy when it comes to searching the app, creating playlists, repeating, or skipping a song. But this initial behavior is the raw material for the decisions made by the algorithm.

While algorithmic personalization can improve the user experience in many cases, there are concerns that it can lead to the creation of information bubbles, where the user is only exposed to information and opinions that reinforce their own views, and to the loss of cultural and cognitive diversity. In addition, there are concerns that algorithmic personalization could be used to manipulate user behavior.

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RESUMO:

Este artigo apresenta uma reflexão sobre a lógica algorítmica que transforma o modo como consumimos música. Partimos do conceito de *nudge* (Thaler & Sunstein, 2008; Yeung, 2016) para compreender as mediações algorítmicas do aplicativo (Couldry & Hepp, 2020) que moldam o consumo de música a partir dos estímulos algorítmicos do aplicativo. Metodologicamente, apresentamos uma análise das funcionalidades do Spotify a fim de identificar onde se apresentam esses estímulos nas funções. Concluímos que a lógica algorítmica do app protagoniza as escolhas de músicas como forma de prestação de serviço ao usuário.

PALAVRAS-CHAVE: Lógica algorítmica; estímulo; Spotify; Consumo.

RESUMEN:

Este artículo presenta una reflexión sobre la lógica algorítmica que cambia la forma en que consumimos música. Partimos del concepto de *nudge* (Thaler & Sunstein, 2008; Yeung, 2016) para entender las mediaciones algorítmicas de la app (Couldry & Hepp, 2020) que moldean el consumo musical a partir de los estímulos algorítmicos de la app. Metodológicamente, presentamos un análisis de las funcionalidades de Spotify para identificar dónde se presentan estos estímulos en las funciones. Concluimos que la lógica algorítmica de la aplicación juega un papel en las elecciones de música como una forma de brindar servicio al usuario.

PALABRAS CLAVES: Lógica algorítmica; estímulo; Spotify; Consumo.