

ALGORITHMS AND CURATED PLAYLIST
EFFECT ON MUSIC STREAMING SATISFACTION

by
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Submitted in partial fulfillment of the
requirements for Departmental Honors in
the Department of Business Information Systems

Texas Christian University

Fort Worth, Texas

May 7, 2018

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EFFECT ON MUSIC STREAMING SATISFACTION

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ABSTRACT

This research attempts to better understand the use of algorithms by music streaming services Apple Music and Spotify, and determine if their use affects user satisfaction. Both Apple Music and Spotify have integrated algorithms into their service in order to provide individually curated playlist. These playlists are created based on a user's musical taste gathered by interacting with the service. The playlists allow users to discover new music based on what they enjoy. The more a user provides information on the type of music they like, then the better at predicting the algorithms become.

The research attempts to answer: does the use of algorithms, analytics, and curated playlists enhance customer satisfaction and music discovery in Apple Music and Spotify? Both companies have invested heavily into their algorithms and it is important to know if they benefit the user. To find the answer to the question, college aged (18-23) individuals were surveyed on their engagement and satisfaction with Apple Music and/or Spotify. Without access to either company's algorithms a proxy for an input to them was used.

Results show that for a one degree increase in engagement there was a 37.8% increase in user satisfaction. The more a user interacted with the app and listened to music the more satisfied they would be with the service and curated playlists.

With access to their own algorithms and all their users Apple Music and Spotify can come to a more precise conclusion. This research is more for the benefit of other streaming companies or companies interested in joining the streaming industry. With the research results, these companies can understand that investing in algorithms to enhance user experience is beneficial.

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Introduction

Big Data is a large amount of structured and unstructured data that companies mine and analyze to make business decisions. Big data analytics is used to discover patterns, insights, and correlation in a large set of data. Companies can use their findings to make decisions such as what new products to develop, how to change the layout of their store/website, and which customers to offer what products. Analytics helps companies make informed decisions.

Streaming companies are using analytics to help make business decisions in order to provide a better customer experience. Netflix analyzes customer information in order to recommend content, license content, and produce content. Netflix tracks user behavior such as pause (leave and comeback), rewind, fast-forward, when users watch content (day, time, date), rating, searches, and browsing behavior. All this information is used to decide if Netflix should license content based on their metrics, the kind of original content to produce based on what customers are watching and rating highly, and what movies to license if they see that benefits exceed the cost to do so. Streaming companies use data analytics to help maximize profit and provide customers a great experience.

Customers can cancel their streaming subscriptions at any time because they are not contractually obligated to stay with the service. Streaming services' business decisions include ways to retain customers as well as get new ones. Data analytics can aid in retaining and gaining new customers through individually based recommendations.

This research will examine the music streaming services Apple Music and Spotify. Both Apple Music and Spotify have access to a large amount of customer data that they use to provide their service. Similar to Netflix, Apple Music and Spotify track customer behavior while interacting with either service. This research aims to answer the following question: does the use

of algorithms, analytics, and curated playlists enhance customer satisfaction and music discovery in Apple Music and Spotify? The answer to this research question will help identify whether or not Apple's and Spotify's investment in their algorithms and analytics actually leads to a positive customer experience and music discovery.

This research will begin with a review of literature about how Apple Music and Spotify use algorithms and analytics to create playlist and enhance music discovery. Then, the it will examine the research methodology, followed by the research results and discussion.

Literature Review

This section will provide an in-depth review on the literature on music analytics, and how Spotify and Apple Music attempt to leverage these tools.

Music Analytics

Analytics can be used by companies to help predict what songs/albums will have commercial success and what songs to recommend. The Music Genome Project and Hit Song Science were early pioneers in music analytics. The Music Genome Project, a project of Savage Beast Technologies, "used an algorithm of sonic traits called "genes" to determine similarities between songs" (Blumenfeld, 2016). Identifying similar traits between songs can help determine which song to play after a certain one or which songs recommend to users based on what they listen to. This project was intended to be a service for music recommendation at brick-and-mortar stores. In mid-2000s the company changed its name to Pandora and utilized the Music Genome Project. Through Pandora users can create radio channels based on songs, albums, and/or artists. Regardless of the artist or album, songs will stream to the user with similar traits to the radio channel. Similarly Apply Music and Spotify recommend music to its users.

Polyphonic HMI created Hit Song Science to “predict songs success by comparing them to past hits” (Blumenfeld, 2016). Using analytics to predict success can help record companies determine which album and artist to promote at certain times. This can allow them to maximize profit if implemented but could cause a self-fulfilling prophecy if they promote one artist more heavily than another.

By analyzing an artist’s streaming numbers across various platforms, record labels can discover “an independent artist who is blowing up on one particular platform” (Blumenfeld, 2016). Analytics can help record labels discover an artist and give them exposure to a larger audience through the backing of a label. Record labels benefit from this by signing a new artist they can promote to increase sales. While listeners gain exposure to a new artist to enjoy. Being able to analyze which artists and songs are currently gaining buzz can “tell you a little bit in advance that it’s going to be popular” (Shubber, 2014). Gaining insight into which artist is gaining traction can help companies make decisions on which artist to promote, and which to drop.

Using the information from various streaming platforms, artists can identify which cities and countries to stop at during their tour. Artists can gain more from tours by identifying the locations where the artist is most popular and can turn into ticket sales. Alongside, fans can watch that artist live if their surrounding area is a big listener.

Currently the major music analytics companies include Next Big Sound, The Echo Nest, and Semetric (MusicMetric). Next Big Sound was launched in 2009 and is a leading provider in music analytics. The company tracks hundreds of thousands of artists and provides analytical tools used by labels, marketers, and musicians. The company is part of Pandora and gives its customers insights about fans and artists. Forbes labeled Next Big Sound “Money Ball for

Music” (Greenburg, 2013). Alex White, a co-founder of Next Big Sound, in a Forbes article noted that the customer goes “to Spotify and streams Justin Timberlake's entire back catalog and then follows him on Twitter to see real-time updates and watch his behind-the-scenes YouTube videos. It's a totally different consumer experience, but the industry still needs to track that behavior” (Greenburg, 2013). Instead of listening to music on CDs and watching videos on MTV, customers can now stream their favorite artist on several platforms including Apple Music and Spotify, and follow them on social media. Record labels and artists need to track this information to better their exposure and increase their fan base. Next Big Sound creates dashboards for specific artists from various online sources and charge customers \$20 per artist per month.

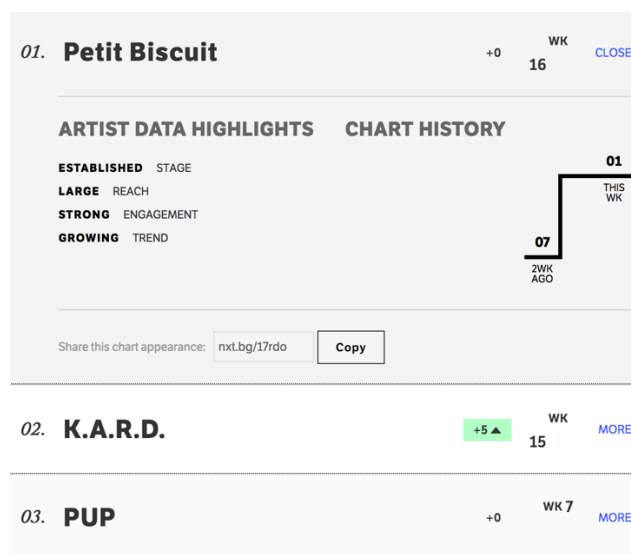


Figure 1: 11/24/17 Screenshot of Next Big Sound's Pandora Predictions Chart

Next Big Sound can help record labels with business decisions because it “promises to predict album sales within 20% accuracy for 85% of artists, giving labels a clearer idea of return on investment” (Greenburg, 2013). Knowing which artist is predictably profitable can lead record labels to devote more resources to that artist.

The Echo Nest provides music recommendations for Rdio, iHeartradio, Vevo, and Spotify. It works in the back-end of these services to recommend music to users. The Echo Nest “learns how, when and where you listen to music to help you figure out what you may want to hear next” (White, 2014). Similar to Netflix, The Echo Nest tracks user behavior and their interaction with the services The Echo Nest is linked to. The end result is song recommendations based on the users listening habits. Music Streaming services offer similar catalogs of music to choose from, “the real differentiation factor between services is going to be the user experience and the quality of those recommendations” (White, 2014). In order to retain users and market to new ones, streaming services need to invest in their customer experience, which includes song recommendation for music discovery. Providing users recommendations based on data can help users discover music they may have not thought of listening to but might enjoy based on their listening habits. The Echo Nest offers companies four services. First, music discovery and personalization “is a suite of capabilities delivered through a flexible API for building advanced, personalized music discovery experiences” (The Echo Nest, 2017). This solution allows companies to use The Echo Nest’s capabilities to give its users a discovery experience. Second, companies can gain dynamic music data. This solution allows users the ability to display artists’ biographies, videos, and news articles. Third, audio fingerprinting provides song identification tools and scan and match for locker services. Lastly, The Echo Nest provides interactive music and remix applications. This solution allows developers to create interactive music applications to remix songs. Companies use The Echo Nest to better their user experience and enhance music discovery.



Figure 2: Musicmetric pro dashboard

Semetric runs Musicmetric, which is a music analytics tool launched in 2008. It launched “as a way for music labels and other industry clients to track data on sales, BitTorrent downloads and social networking statistics for their artists” (Dredge, 2015). Clients of Musicmetric can not only track the sales of their music catalog, they can also track illegal downloads and streams with the tool. This gives clients a more accurate number of their music’s performance such as sales and streams.

A newcomer in music analytics is Soundcharts. It is a French startup that gives its clients a large set of data on music that is currently playing on the radio around the world, and what is popular on Spotify. The company uses music recognition technology to “turn an audio signal into structured data” (Dillet, 2017). It allows clients to browse the music that is playing by country, artist, song, and station. Artists and songs can also be compared among competitors. Soundcharts allows for social media, charts, playlists, and airplay monitoring. Clients can know what is playing and being talked about across different regions and on which playlists. Artist and record labels can track how well their music is performing and book tour dates in high listening areas.

Spotify

Spotify's music streaming service was launched in 2008. According to 9TO5MAC, the service has 100 million users, 30 million of which are paid subscribers as of 2016. The company is a data driven-firm, where their users create "600 Gigabyte of data per day and 150 Gigabyte of data per day via different services" (Rijmenan, 2017). The data is used for music recommendations, information forecasts and business analytics. To crunch the data, Spotify developed Luigi, "a Python framework for data flow definition and execution. Luigi is used to crunch a lot of data. Most of the data is user-centric data" (Rijmenan, 2017). The objective is to provide its users accurate music recommendation through their Discover Weekly and Daily Mix playlists. Spotify can use the data for predictions. In 2013, Spotify predicted Grammy winners by "breaking down its users' listening habits, considering song and album streaming, to determine the popularity of the music" (Rijmenan, 2017). Four of their six predictions were correct, the more users and therefore more data Spotify gets, the more their recommendations and predictions will be. Additional data allows for Spotify to accurately recommend music to its individual users.

"Spotify collects a wide range of user data, but the most important is the listening data it collects from each user ... also use the data it collects to analyze how its users react to certain changes" (Langham, 2015). Not only does Spotify collect data to improve its music recommendations, it also collects data on user reactions. If a new feature is added and users seem to not like it or use it as much as expected, Spotify can alter it or delete the feature. It receives user feedback through the traffic a feature receives; data justifies Spotify's addition or deletion of features.

Spotify releases Discover Weekly, a weekly playlist of thirty songs, to individual users. The playlist is curated for each particular user and contains new music every week. Initially the feature did not have much user traffic. Spotify thought that users were not interacting with the feature because “perhaps people were using it more as a way to listen to their usual go-to bands rather than as a place to find something new. Others thought maybe there was something about the Discover screen that was too difficult to find or use” (Swant, 2016). Spotify began investing in algorithms to create personalized playlists for their millions of users. The more a user listens to music on Spotify, the more the service and algorithm learn about the user’s taste. Half of Discover Weekly listeners stream at least ten songs and most listeners come back to listen the following week (Swant, 2016). Users appear to enjoy the feature; it potentially would not have been as popular if Spotify did not invest in their algorithm.

Spotify tracks different user behaviors that their algorithm considers when creating the Discover Weekly Playlist. It tracks what songs a user adds to a playlist or Spotify library, skips within a thirty second interval, and when a user delves into a song’s artist and discography. If a user adds a song to a playlist or library, the algorithm views it as a song the user enjoys, and therefore takes the song’s artist and genre into account when creating a new Discover Weekly. Skipping a song signals dislike for a song; if done enough to a certain musician or genre then that music will be filtered out. If a user explores the discography and profile of an artist after listening to their music, the algorithm will pick up on that behavior. User behavior is highly influential in the creation of the Discover Weekly playlist. If a user chooses to not have their listening habits tracked and analyzed, then the user can go into private mode. This allows users to maintain privacy when listening to music on Spotify and not receive music recommendations.

In 2014 Spotify purchased The Echo Nest and uses the firm's analytical tool to build user profiles. These profiles are created to each user's individual taste in music and groups genres into micro-genres based on that person's taste. Users are not only linked to genres like country, rock, or rap they are associated with finely tuned genres like alt country, synthpop, and neo soul. Doing this, Spotify and The Echo Nest link users with their appropriate favorite genres rather than blanket genres.

Spotify not only looks at what users listen to, it examines users with similar music preferences and recommends songs to a user that another user has saved to their device. Spotify uses a collaborative filtering algorithm model that "finds users that are similar to each other, based upon their usage—the songs in common they have listened to—and then recommends the songs that only one person has listened to the other" (Moore, 2016). This allows users to discover new music they have not found or been exposed to, but another person with similar taste has. If two users listen to the same artists and genres, then they will be connected and songs will be exchanged between them if one user has not listened to a song the other has.

Netflix also uses collaborative filtering, but it also allows users to rate the show or movie they watched. If a user watches a movie and ranks it favorably, then Netflix will recommend that movie to a user with similar taste in movies. Ranking allows for the filtering of movies to recommend to users with similar taste that Spotify has not yet integrated into their service. User behavior is used instead to help identify which songs to recommend to users.

Spotify also looks at user-created playlists and professionally created playlists, such as Rap Caviar, to match musical taste with users. If Spotify notices that "two of your favorite songs tend to appear on playlists along with a third song you haven't heard before, it will suggest the

new song to you” (Pasick, 2015). Spotify cross examines other playlists with the same songs and artists to help pick songs to add to a person’s Discover Weekly playlist.

Spotify also employs Natural Language Processing (NLP) models to aid in making recommendations. NLP is “the ability of a computer to understand human speech as it is spoken” (Ciocca, 2016). NLP analyzes text from blogs, news articles and other text on the internet. Through NLP Spotify examines how people are describing songs and artists and “bucket them up into what they call cultural vectors or top terms... each term had a weight associated, which reveals how important the description is” (Ciocca, 2016). Once terms are associated with each artist and song then Spotify can recommend songs to users who listen to music with similar terms.

The third model used by Spotify is raw audio which analyzes the audio of each song. Spotify uses the raw audio model to aid in the inclusion of new songs to Discover Weekly. New songs or up and coming artists may not have as much traffic on Spotify or the internet for the collaborative filtering and NLP models to add it to Discover Weekly. Spotify uses convolutional neural networks, which are normally used in facial recognition technology, to analyze raw audio data. After processing songs, the convolutional neural network “spits out an understanding of the song, including characteristics like estimated time signature, key, mode, tempo, and loudness” (Ciocca, 2016). Understanding each song allows Spotify to discover similarities among them. Once similar songs are found, they can be recommended to users regardless if it is too new to have enough buzz online or be on several playlists.

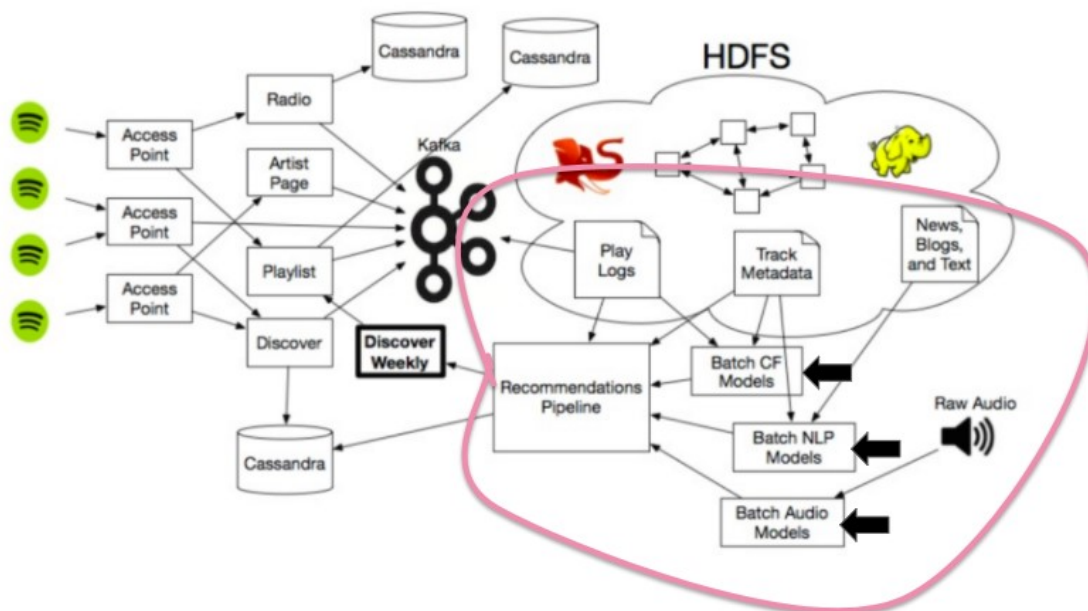


Figure 3: Spotify's Discover Weekly Data Flow Model

Spotify's Discover Weekly Data Flow Model shows the recommendation pipeline for the Discover Weekly playlist. The three recommendation models go through the pipeline to recommend music to users. Collaborative filtering's sources include play logs and metadata, NLP's sources are metadata and text on the internet, and raw audio's sources are the songs themselves. Spotify applies multiple models to provide songs to their users based on a range of criteria. Users and their music preferences are unique; Spotify must find patterns in the data to accurately recommend music to them.

Users are not blindly recommended music; Spotify invests in their algorithms and methods to provide an excellent user experience. Matt Ogle, a senior product owner at Spotify, mentioned that "if you're the smallest, strangest musician in the world, doing something that only 20 people in the world will dig, we can now find those 20 people and connect the dots between the artist and listeners" (Pasick, 2015). Regardless of a person's taste in music, they can

receive accurate recommendations because there are other users who have similar interests on the service.

Similar to banks, Spotify uses outlier detection to find outliers in users' listening logs. Rather than looking for fraudulent activity as banks do, Spotify looks at particular songs played by a user and determines if it is part of that user's normal listening pattern or an outlier. This is done to insure a user is not recommended a song based on an outlier they listened to once. For instance, if a user is a heavy listener of rap but randomly listened to a country playlist or album, Spotify's models will not take that into account when creating Discover Weekly. Not until the user begins to listen to country on a regular basis will the models take the genre into consideration.

Spotify's Discover Weekly rolls out every Monday, and users created such a high demand for the feature that Spotify suffered an outage in the fall of 2016. Matt Ogle said about the outage "That was when I think we realized that we've created not just something people check out, but it's a ritual, it's a habit" (Swant, 2016). Discover Weekly is a popular feature that exposes users to new music. Users get exposed to new artists and songs that they had not had the time to find themselves. Spotify gets rid of the need and effort that goes into trying to find new music that a person might like.

To recommend music, Spotify looks at listening data for each user. It features "particular artists in the recommended section of users who are statistically likely to be interested in them (Langham, 2015)." Instead of simply recommending the top forty billboard songs to users, Spotify recommends music to individual users based on the artists, genres, and songs they have listened to previously.

Alongside Discover Weekly, Spotify releases the Release Radar to its users. Discover Weekly helps users discover new or old music based on their listening habits. Release Radar focuses on “all the new releases from the artists you love, in a single playlist” (The Spotify Team, 2016). Release Radar refreshes every Friday with newly released songs for the user with two hours of content instead of the thirty songs present on Discover Weekly. To further help with music discovery, Release Radar is populated by artists the user follows and listens to regularly as well as artists the user does not. The same technology used to create the Discover Weekly playlist goes into creating Release Radar. Music listening habits are taken into account when creating this playlist but the output is exclusively newly released music.

Record labels or others cannot pay Spotify for a spot in Discover Weekly, Release Radar, or other Spotify owned playlists. Discover Weekly and Release Radar are created for a specific user. Allowing companies to pay for a spot on either playlist would ruin their authenticity and goal of music discovery. Public playlists made by Spotify like RapCaviar are created based on overall streaming numbers. Users can create their own playlist and make it public to everyone else. If a certain user has a large following, then companies can pay them to include certain songs in their playlists. Since these playlists are not created by Spotify, paying for spots in these playlists is allowed. Those songs can gain a place on Spotify created playlists if they get enough plays and match with listening habits.

Apple Music

Unlike Spotify, Apple is less revealing of its business and practices. It does not disclose too many specifics about its streaming service, Apple Music.

In 2014 Apple bought Beats, a headphone company, for \$3 billion. At the time, it was unclear why Apple went through with the acquisition. Beats had a music streaming service called

Beats Music, which was Apple's main target in the purchase. In a world where Spotify and Pandora already exist, Apple decided to join the music streaming industry through the acquisition of an existing company in the industry. Eddy Cue, a senior VP at Apple, said the reasons Apple bought Beats are "talent, great headphones, and Beats Music" (Molen, 2014). Apple wanted the talented staff at Beats, the quality headphones which would eventually be sold at Apple stores, and the streaming service Beats Music.

In 2015, Apple purchased Semetric, home of the Musicmetric analytics tool. Apple did not specify why it bought this company, but it could have been tied to their Beats acquisition. Speculation at the time suggested "Musicmetric's dashboard could become Apple's in-house tool for labels and artists to track their sales and streams within iTunes alongside social networking stats" (Dredge, 2015). Apple could use Musicmetric's dashboards to communicate stream numbers with record labels and artists.

Apple's streaming service Apple Music was launched in the summer of 2015. It is integrated into the music application in Apple devices as a paid subscription. It could compete with Spotify because of its integration inside the native music app, and Apple's large collection of music. Having Apple Music integrated into the native music app removes the need to download a separate streaming application and therefore take up more memory on a device.

Similar to Spotify, Apple uses algorithms to recommend music to listeners in their My Favorites Mix, My Chill Mix, and My New Music Mix personalized playlists. My Favorites Mix contains music users listen to the most in their saved Apple Music library. My Chill Mix is a personalized playlist dedicated to help users relax as they listen to it. This playlist is not only geared to soothing music but could include rock and rap if Apple Music determines it is a

relaxing genre for that user. My New Music Mix is a recommendation of newly released music based on the user's taste.

The more a user listens to music on Apple Music, the more Apple Music's algorithms learn about the user and the better the recommendations. Unlike Spotify, Apple Music has access to the user's entire iTunes library to help the algorithm learn. To start off with, Apple Music has some music data to work with to build their recommendations, while users must begin interacting with Spotify for recommendations to happen. Apple Music tracks the rating users gave to their previous music library on iTunes and their listening habits. The more a user listens to a song or artist, the more Apple Music learns that the user enjoys that artist, the song, and genre.

Research Methodology

The goal of this research is to investigate the question: does the use of algorithms, analytics, and curated playlist enhance customer satisfaction and music discovery in Apple Music and Spotify? To explore the question, surveys were sent out to college aged (18-23) TCU students that ask about their experience with either service and if they use these services to discover new music. This demographic was chosen because they are also the largest demographic of users on Apple Music and Spotify. The surveys were completed online through SurveyMonkey, a survey development software. 111 respondents took the survey. The aim of the survey was to determine if users are satisfied with either platform, and if the playlists impact their satisfaction. Questions related to users' interactions, willingness to provide data, and satisfaction of either platform were asked. Of the 111 completed responses, 80 responders said they have a paid subscription to one of the two platforms. To aid in answering the research

question, linear regression was used to determine a correlation between the use of algorithms and customer satisfaction.

Results

Spotify and Apple Music use user listening data and algorithms for their individually curated playlist (Discover Weekly and My Chill Mix). These playlists are meant to provide users a way to discover new music based on their personal taste. In relation to these specific playlists, users were asked about the amount of time spent on either platform, amount of songs saved/downloaded on either platform, how often they look for new music, and if they use these playlists to find that new music. Out of the respondents, 52 (65%) use either platform every day, only 12.5% use them less than 15 days per month (Appendix C). Users are actively engaged in listening to music, and 49 (61.25%) save/download music onto their device. In terms of looking for music, the results are fairly dispersed. 33 (42%) of the respondents mentioned that they often search for new music (Appendix D). It was also the second or third reason users listened to music on either platform. In terms of how users discover new music, 48 (52%) of respondents mentioned they use either Discover Weekly and/or My Chill Mix to help them discover new music (Appendix I). 54 responders mentioned listening to either playlists, with 30 (56%) of those being satisfied with them (Appendix K). Spotify and Apple Music rely on user data to make the best possible playlist for each individual. The more a user interacts with their service, the more than can learn about them. This is key to satisfaction of their playlists, because users will be more satisfied with a playlist that matches their preferences. Since users only look for new music 42% of the time, and their main reason for using their services is not to discover new music, this leads to a 56% of users being satisfied with either playlist.

When told about the purposes of both Discover Weekly and My Chill Mix, and how they are created, users were more than likely to interact with the service to get a better playlist that is personalized to them. 67 (87%) of respondents checked that they are more likely to engage with these services (Appendix M). If users are told more blatantly that their use of data is incorporated in creating playlist just for them, then they are more likely to engage and provide the necessary data.

As mentioned earlier, Spotify and Apple Music use algorithms to create public playlists for their users. 64 (81%) of the responders with a paid subscription mentioned they listen to music through a playlist created by either platform. Only listening to their favorite artists, which 65 (82%) selected, was ranked higher (Appendix E). A large percentage of users, who were surveyed, mentioned that they listened to the public playlists. 63 (79%) respondents mentioned they were satisfied with the playlists created by either platform (Appendix F). This satisfaction was measured on a scale of 1 to 5, 5 being most satisfied and 1 being least satisfied. These 63 responders selected either 4 or 5. Spotify's and Apple Music's investment into their public playlists creation appears to be paying off. Users are satisfied with this feature and are actively using it while on their platform. The playlists are created based on genres, moods, activities, etc. The goal of this research was not to identify which public playlists users are most satisfied with or listen to the most. Instead, it attempts to identify if users are satisfied with what they personally listen to. Most users were positively satisfaction with these playlists as well the service as a whole.

Without access to Spotify's or Apple Music's algorithms to test, it was necessary to use a proxy for the algorithms to determine correlation. The literature review reveals that the algorithms pay attention to user engagement with either services. The algorithms consider a

variety of way a user engages with the service. Saving music into their library is important to the algorithms because it is an indicator for what the user enjoys. To calculate the linear regression, saving music was used as a proxy for the algorithm and overall satisfaction was the dependent variable. The results show a beta of 0.378, P-value of 0.005, and an R^2 of 0.0127 (Appendix O). indicating that for every increase propensity in engagement to save music there is a 37.8% increase in satisfaction. Using saving music as a proxy shows that the algorithms are working as intended, users are satisfied with both services and satisfaction is affected by the playlist created through algorithms.

Conclusion

Spotify and Apple Music have heavily invested in creating a great service for their users. They have done this through internally developing their capabilities and acquiring companies that can enhance them. Through this, they have created an experience in their platforms that users are majorly satisfied with.

Although users use these platforms to listen to their favorite artists, they do listen to what Spotify and Apple Music recommend in their playlists. Personally curated playlists, such as Discover Weekly and My Chill Mix, use data to make the right recommendations. Users are willing to provide such data if it results in a good service. Spotify and Apple Music see a rise in satisfaction towards their curated playlists the more their users interact with their platform. The linear regression demonstrated the correlation between the algorithms and overall satisfaction.

Both Spotify and Apple Music have the capability to conduct such a research on their own, and they benefit by having access to their respective algorithms. With full access to their algorithms further insight can be gathered. The purpose of this research was not to solely help these companies but to help others that have not invested into algorithms as much as Spotify or

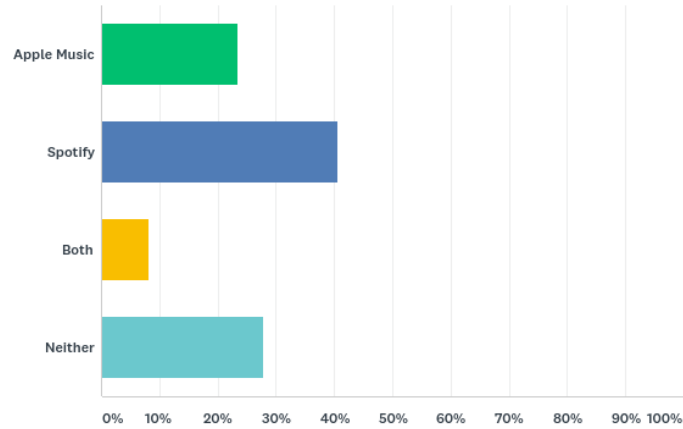
Apple Music. SoundCloud, another music streaming service, allows users to not only listen to music but also upload their own music for other listeners. Through SoundCloud artist such as Lil Yachty and Lil Uzi Vert could gain popularity and record deals from the music the posted on SoundCloud. Currently, this company does have a paid subscription but for the same price users gain more features from Apple Music and Spotify. SoundCloud paid subscription only offers ad-free streaming and offline listening, however Apple Music and Spotify offer the same and more.

SoundCloud and other companies attempting to join the music streaming industry could benefit from this research. Knowing now that there is a correlation between the use of algorithms to encourage music discovery and overall satisfaction, SoundCloud can take advantage of this by investing into their own algorithms and implementing similar features. This could help SoundCloud improve their users' satisfaction while at the same time adding more value to their service.

Appendix

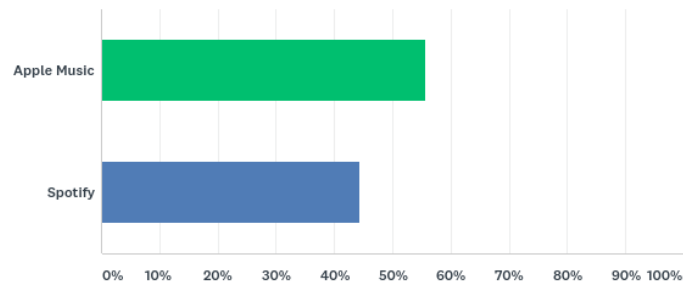
A: Paid Subscription

Q1 Do you have a paid subscription to Apple Music and/or Spotify?



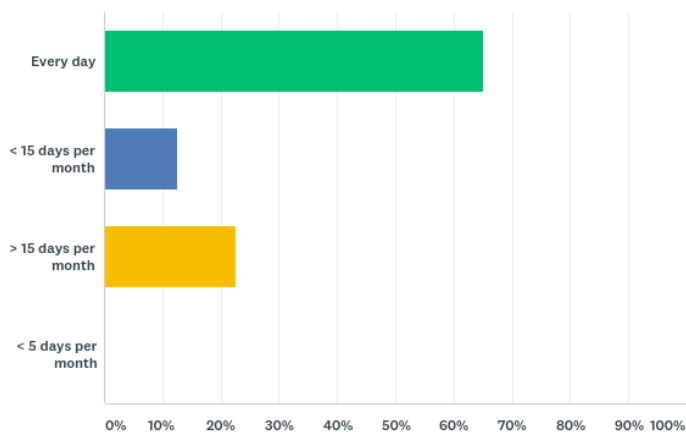
B: Preference if Both

Q2 Out of both services, which do you prefer?



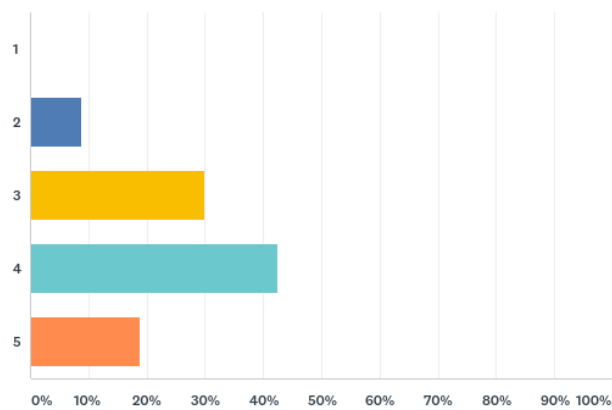
C: How Often Users Use Either Service

Q3 How often do you listen to music on Apple Music/Spotify?



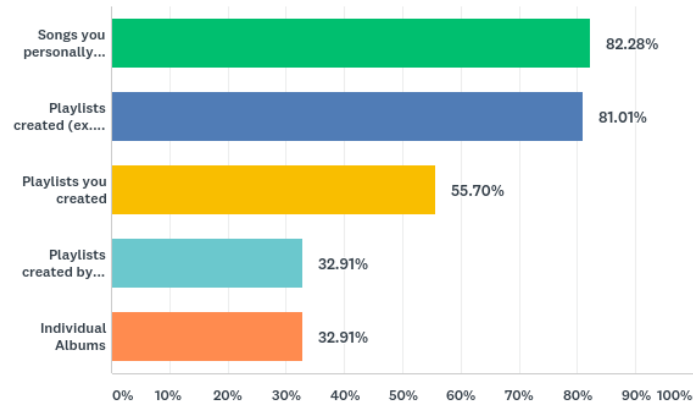
D: How Often Music is Saved

Q4 How often do you save music from Apple Music or Spotify? On a scale from 1 to 5, 5 being very often and 1 being not at all.



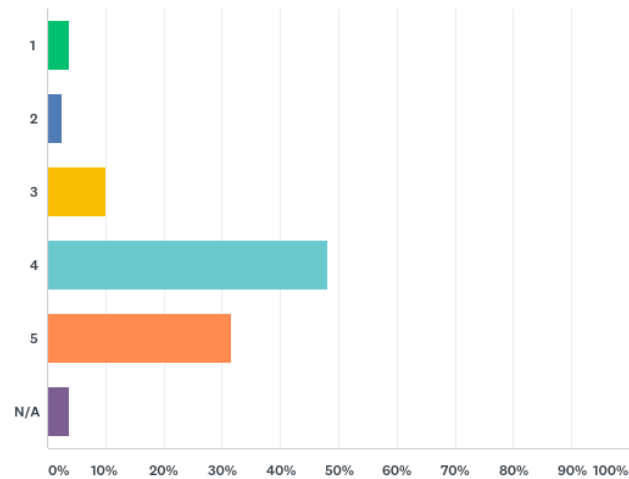
E: How Music is Listened to

Q5 How do you listen to music on Apple Music and/or Spotify?



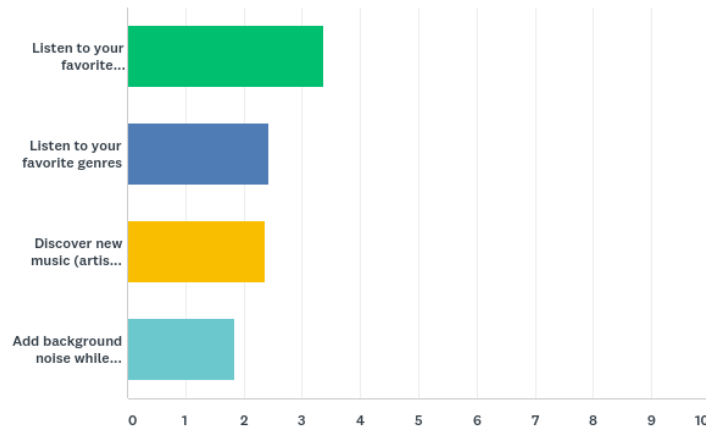
F: Satisfaction with Public Playlists

Q6 Apple Music and Spotify have large selections of playlists to listen to. How satisfied are you with the ones you listen to? On a scale from 1 to 5, 5 being most satisfied and 1 being least satisfied. If not applicable select N/A.



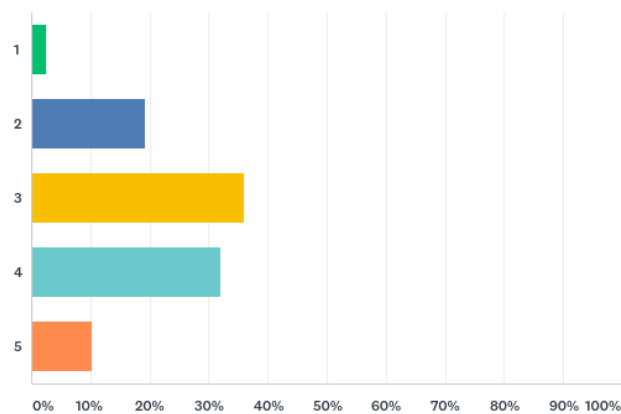
G: Why Users Use Either Platform

Q7 Rank the following in terms of why you listen to music on Apple Music/Spotify. Rank from 1 to 4, 1 being your biggest reason and 4 being your least important reason to listen.



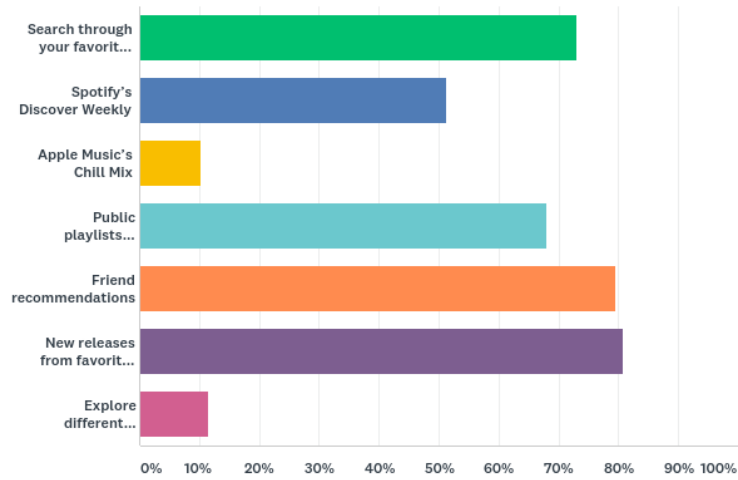
H: How Often New Music is Searched For

Q8 On a scale from 1 to 5, 5 being most often and 1 being not at all. How often do you search for new music to listen to? An artist/genre you have not heard before.



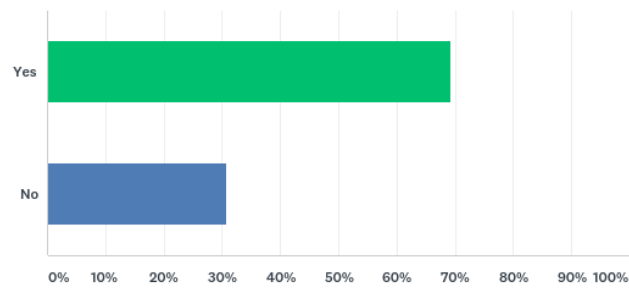
I: How Users Discover New Music

Q9 How do you discover new music on Apple Music and/or Spotify?



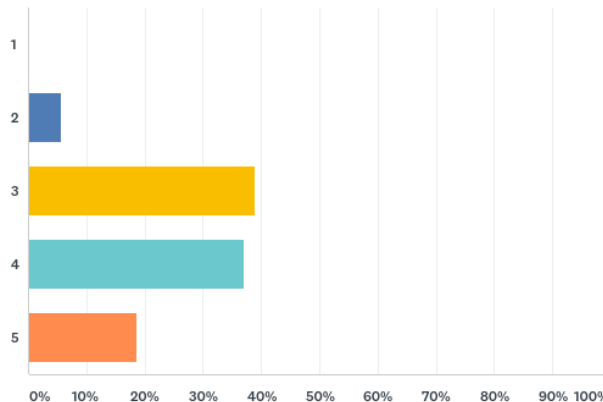
J: Listen to Curated Playlist

Q10 Do you listen to Spotify's Discover Weekly and/or Apple Music's Chill Mix playlists?



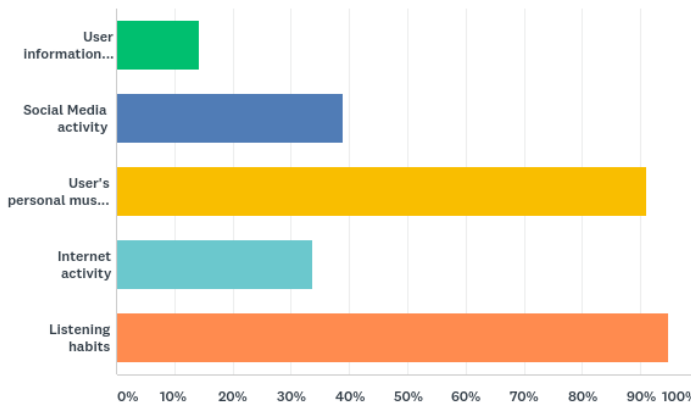
K: Satisfaction with Discover Weekly/My Chill Mix

Q11 On a scale from 1 to 5, 5 being most satisfied and 1 being least satisfied. How satisfied are you with either Discover Weekly or My Chill Mix?



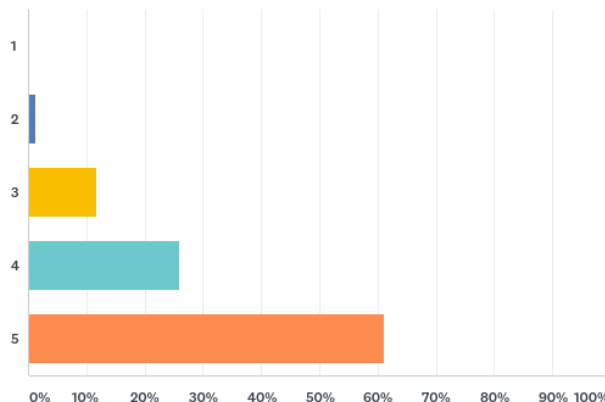
L: User Thinks is Gathered

Q12 Spotify's Discover Weekly and Apple Music's Chill Mix, create playlists for individual users. These playlists are created to give users the opportunity to discover new music. They use user data and algorithms to create these playlists. What kind of information do you think they keep track of to create these playlists?



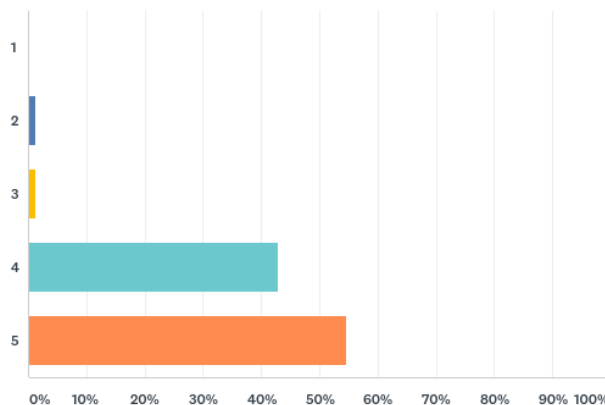
M: Users' Willingness to Interact More

Q13 Spotify's Discover Weekly and Apple Music's Chill Mix are created based on the user's listening habits and music library. They also take note of songs a user skips within a certain time frame of it starting. The more frequently a user engages with either platform and saves songs, the more these playlists become better created for that individual users. They do this to give users a better experience and a chance to discover new music. Knowing this information, how likely are you to engage with either platform to discover new music? On a scale of 1 to 5, 5 being most likely and 1 being least likely.



N: Overall Satisfaction

Q14 On a scale of 1 to 5, 5 being most favorably and 1 being least favorably. How would you rate your experience with Apple Music and/or Spotify?



O: Satisfaction Regression on Engagement with Overall Satisfaction as Dependent Variable

Regression

Regression - Variables Entered/Removed

Variables Entered/Removed^a

Model	Variables Entered	Variables Removed	Method
1	How often save ^b	.	Enter

a. Dependent Variable: Rate experience

b. All requested variables entered.

Regression

Regression - Model Summary

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.378 ^a	.143	.127	.450

a. Predictors: (Constant), How often save

Regression

Regression - ANOVA

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.762	1	1.762	8.684	.005 ^b
	Residual	10.553	52	.203		
	Total	12.315	53			

a. Dependent Variable: Rate experience

b. Predictors: (Constant), How often save

Regression

Regression - Coefficients

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.813	.290		13.142	.000
	How often save	.214	.073	.378	2.947	.005

a. Dependent Variable: Rate experience

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