**MKT716 analytics and databases**

Database and Analytics Plan: Music Streaming

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**Table of Contents**

[**1.** **Executive Summary** 3](#_Toc29383792)

[**2.** **Introduction: Context and Sector Selection** 3](#_Toc29383793)

[*2.1 Music Streaming* 3](#_Toc29383794)

[*2.2 Introduction to Spotify* 4](#_Toc29383795)

[**3.** **Data Sourcing** 5](#_Toc29383796)

[*3.1* *Sources* 5](#_Toc29383797)

[*3.2* *Channels* 7](#_Toc29383798)

[*Figure 1: Spotify Discover Weekly Data Flow Model* 7](#_Toc29383799)

[*3.3* *Tools* 8](#_Toc29383800)

[*Table 1: Spotify tools (adapted from: Baer and Samuelngahane, 2019).* 9](#_Toc29383801)

[*Figure 2: Spotify's 2018 ML Platform* 10](#_Toc29383802)

[*Figure 3: Spotify's 2019 ML Platform* 10](#_Toc29383803)

[**4.** **Data Crunching** 11](#_Toc29383804)

[*Figure 4: Big data impact (Lee, 2017).* 12](#_Toc29383805)

[*Table 2: Three types of data and how music streaming harnesses them.* 12](#_Toc29383806)

[**5.** **Insights from Data and Uses of Insights** 13](#_Toc29383807)

[*Table 3: KPIs, metrics and properties.* 13](#_Toc29383808)

[*Table 4: Evaluation of insights* 14](#_Toc29383809)

[**5.** **Effective and Efficient Data Management** 14](#_Toc29383810)

[*Table 5: Data Value Chain: process of collecting data through social networking on music streaming platforms (adapted from: Open Data Watch, 2019).* 15](#_Toc29383811)

[*Table 6: GDPR key principles and music streaming accordance* 15](#_Toc29383812)

[*Table 7: How Spotify uses vectors and top terms with assigned weights - example of keywords (adapted from: Whitman, 2012).* 17](#_Toc29383813)

[*Figure 5: Social Media Model (Complete Outsourcing, 2019).* 17](#_Toc29383814)

[**6.** **References** 19](#_Toc29383815)

[**7.** **Appendices** 23](#_Toc29383816)

[*Appendix A:* 23](#_Toc29383817)

[*Appendix B* 24](#_Toc29383818)

[*Appendix C:* 27](#_Toc29383819)

[*Appendix D:* 28](#_Toc29383820)

[*Appendix E* 29](#_Toc29383821)

[*Appendix F:* 30](#_Toc29383822)

[*Appendix G:* 31](#_Toc29383823)

[*Appendix H:* 32](#_Toc29383824)

[*Appendix I:* 33](#_Toc29383825)

[*Appendix J:* 34](#_Toc29383826)

# **Executive Summary**

Databases and analytics can be defined as the “process of examining data sets in order to draw conclusions about the information they contain, increasingly with the aid of specialised systems and software.” (Rouse, 2008). Sourcing, crunching, and analysing the metrics from the insights using data management systems is not yet mastered, although applied increasingly as the world is becoming smarter (Marr, 2015).

Big data, a mass amount of data, is described as the new gold, oil and plastics (Cuban, 2017), and “reaps commercial benefits” (Aquila, 2016). It is transforming society; conducting science, improving performance and operating business (Marr, 2015). It is argued that the world is experiencing the “digital revolution” (Oracle, 2019), and it is more important for businesses and organisations to take advantage of Big data. It is accumulating into larger amounts; in 2018, Intel anticipated that “by 2020 […] the average consumer will generate 1.5 gigabytes of Data per day from their associated internet activities” (Hemann and Burbary, 2018), and this was underestimated as in 2019, it is has exceeded at 2.5 quintillion bytes of data that is generated daily. Almost all the global data has been produced in the last 2 years (Rai, 2019).

This essay will act as a consultancy for music streaming with justified suggested improvements to the data management systems. Streaming is the fastest growing area within the music industry that opens doors for customer insights (Music Streaming Insights, 2018), with subscription streaming being a key driver in revenue and data (Aquino, 2019). Currently, music streaming outsources and employs third party tools but merely touches on internal pioneering technologies, as well as relying too much on insights that are not unique or in-depth. There are more opportunities, and this essay will argue, focusing mainly on *Spotify,* how internal social networking tools on the own channels will benefit music streaming in engaging more customers, becoming more personalised for users and an increased revenue.

# **Introduction: Context and Sector Selection**

Music streaming, Big data and analytics can assist in learning and research, however, there are issues that need to be recognised and resolved; businesses are not harnessing Big data to optimum performance despite their current usage (see Appendix A). There are issues relying too much on data management platforms, misleading data, and complicated models. 90% of Big data is unstructured (Ahmad, 2017), thus the importance of correct data management.

## *2.1 Music Streaming*

Within the music industry, music streaming, is harnessing the channels, tools and sources to “find [the] next stars, [be] aware of trends and make money by releasing music the fans want” (Setaro, 2019). The industry reaches more customers on their applications and websites as users sign up for access to a database of music, and the artists and labels of the songs aim to achieve a more mass audience on the platform. Music streaming could be argued as a partnership where both parties aim for the same goal; conversions and higher revenue, “some labels treat revenue from interactive music streaming as a licensing deal” (Billboard, 2011). For platforms like *Spotify*, the service can be profitable (Hollister, 2019), which is not the case for other services such as *Apple Music* which gains revenue, but does not turn profits (Niu, 2018). This could be argued that *Apple* is not fully grasping Big data and the benefits of analytics to market. With that said, even *Spotify* relies on other platform operators that are within the same market (Niu, 2018), and therefore, more innovative data management would be beneficial.

*Spotify* is not in the music space, but in the moment space (Seabrook, 2014), as it uses song analytics, and user data to help human and A.I. curators select appropriate songs for certain activities and moods through the insights that are detected. *Spotify* then builds playlists for those certain moments. The question of “are you playing music, or is the music playing you?” (Graham, 2018) raises questions of the ability of analytics and databases.

The music industry’s data collection can determine what will generate the most money by examining consumer insights, rather than music bought from stores that week. For example, Logic, an American rapper, had a larger percentage of listeners to his song, *1-800-273-8255* and consumers were adding it to their personal playlist; and the song had more repeated plays. This encouraged Logic’s label to invest more money in marketing for the track and it then became number 3 on the Billboard Hot 100 as a quintuple platinum record (Setaro, 2019). “Essentially, Big data was a solution pitched and sold to the music industry as a panacea to fan engagement problems” (Graham, 2018) and it also reveals how to obtain more value from customers.

Additionally, another reason for music streaming services to harness Big data is that artists can tailor their setlists to individual cities with analytics. *Spotify* uses granular data to identify specific preferences of its city-specific fanbases (Wang, 2019). This personalisation increases value, and music streaming services can act on insights accordingly, for marketing and increasing engagement.

Streaming services such as *Spotify*, *Apple Music, Pandora Radio, SoundCloud* and *Google Play* accumulated $11,509,000 in revenue in 2019, with an expected annual growth rate, CAGR 2019-2024, to be of 6.2% which will then bring the market volume to $15,520,000 by 2024 (Statista, 2019). Appendix B displays how some of the market leading streaming services deliver their use and devices.

There are issues such as the digital eco systems that have been created by the “rapid and relentless introduction of new platforms, tools, data sources, and media distribution vehicles” (Hemann and Burbary, 2018). There is now so much data that is available that provides insights and identifies, anticipates and satisfies (Chaffey and Ellis-Chadwick, 2019), customer needs and generates financial benefits; nevertheless this makes it more complicated with how to source and crunch data and select tools to gather data. Additionally, content creators are not fully aware of the importance of data and data management, therefore this can have a knock-on effect of miscommunication to the public, through marketing campaigns, because of inaccurate data or inefficiencies (IPO, 2019).

## *2.2 Introduction to Spotify*

*Spotify,* the world’s biggest music streaming platform in terms of the number of its subscribers (Iqbal, 2019), is a freemium model that gives access to consumers who sign up for free, accompanied by adverts, and those who pay a monthly subscription have premium access to an unlimited amount of plays and skips. The foundations of *Spotify* were created when Daniel Ek and Martin Lorentzon sought to create a legal digital music platform when the challenges of online music piracy were rife in the early 2000’s, and now it dominates how consumers listen to music in the 21st Century (Iqbal, 2019). *Spotify* has competitors of *Apple Music, Tidal* and *Pandora* and other services, which ensures rivalry within the market and thus a battle for Big data and unique insights from the tools, channels and sources. A.I. and machine learning within the music streaming sector is particularly in *Spotify*’s domain with *recommended songs*, *discover weekly playlists* and calculated top songs within that year for each listener that compiles into a personalised playlist. *Spotify* are continuing to personalise their service for customers, but missing crucial language and sentiment tracking that could engage customers more.

*Spotify* claims that they are a data-driven company (Spotify, 2013). The service has multiple uses of data using *Kafka* for the collection, *Hadoop* for processing and other databases for the analytics and visualisation (see Appendix A). *Spotify* recognises that over time it has advanced in recommendation features (Spotify Labs, 2019), and now gradually uses more tools to analyse data and achieve more personalised marketing. This has not fully been recognised yet with complications still in their pathways, and data lakes; choosing the correct sources for the data leads to more holistic results and better evaluation of customers (Blades, 2019).

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# **Data Sourcing**

Any industries adopting Big data need to be aware of where they will get that data from.

Since the innovation of music streaming, services have entered into the market that are constantly shifting to establish new ways to expand user-base, development of products, grow revenues and obtain a sustainable long-term business model while in the competitive environment (Soundcharts, 2019). There are over 200 services that offer music streaming capabilities all fighting for methods to be the priority service for consumers, thus the mining and analytics of data to create personalised experiences, targeted preferences and the most relevant music for consumers is paramount to being successful (Soundcharts, 2019).

*Spotify*, the pioneer brand (Soundcharts, 2019), in particular stands by the notion of “build it ourselves” (Spotify, 2013) using both internal and external sources, channels and tools for data; “cross-functionality and autonomy of teams being the core of *Spotify* engineering culture” (Baer and Samuelngahane, 2019). For example, it gathers user-generated data, real-time and historic, along with external sources as a workflow manager with tools such as *Luigi* and also social media data. *Spotify* “acquire[s] data points, it’s using that information to train the algorithms and machines to listen to music and extrapolate insights that impact its business and the experience of listeners.” (Marr, 2017).

The Big data they collect can be compelling, for example, in 2013 “*Spotify* used streaming data to predict the Grammy Awards winners. *Spotify* did this by breaking down its users’ listening habit, considering song and album streaming, to determine the popularity of the music. In the end, 4 out of the 6 predictions made by *Spotify* turned out correctly” (Datafloq, 2019). This could be more accurate, with a higher predicted percentage, with internal sources and tools analysing qualitative data.

## *Sources*

“Data is coming from new sources to give us an even more vivid picture of how music is discovered, shared and enjoyed” (Langkjær‐Bain, 2018).

The music streaming sector use both internal and external sources when it comes to data mining and exploring data warehouses with digital ecosystems of extensive Big data. This is to be “intuitive and personalised, feeling in tune with a user’s taste and listening profile, those users are more likely to engage with the artists suggested to them. ‘This is where Big data comes into the picture: to create a service that feels personal for millions of people, you have to analyse each and every one of those people” (Langham, 2015). For example, “Spotify knows what time of day users listen to certain songs, and in many cases their location, so programmers can infer what they are probably doing—studying, exercising, driving to work” (Seabrook, 2015). Additionally, “programmers also hope to learn more about listeners by factoring in data such as what the weather is like, what your relationship status is now on *Facebook*” (Seabrook, 2015). Sourcing data strategically can enable services and business such as *Spotify* to automatically know both the music and the listener and put music in place with more context. The music streaming industry relies mainly on quantitative data such as the number of listeners, likes, shares which is argued to hold extraordinary data and unrivalled in the industry (Bly, 2020). Qualitative data, on the other hand, to analyse keywords and its use is something that was predicted in 2016 (Staring, 2016), yet has not been fulfilled. This may be because qualitative data is more complicated to source and crunch. However, this can be made easier with internal tools on the platforms.

Music streaming gathers data from user-generated data which occurs on the platform itself. For instance, *Spotify* gathers payment (transactional) data when users transition to a premium account, as well as collected personal data for account registration (Spotify, 2019). *Spotify* also gathers data from third-parties, such as social media and search, with activity from other platforms: this multi-channel method is anonymised and aggregated for IT, research, data analysis, creating marketing, promotion models, new features, functionality and improving the service that customers get (Spotify, 2019). Additionally, while *Tidal* collect similar user-generated data, they also collect user content that users upload onto the application with geotagging and comments (Tidal, 2019), this gives them more competitive advantage.

Secondly, raw data is accumulated via downloads, apps, and online searches influences what songs are marketed and sold and which songs become hits (Moon, 2017).

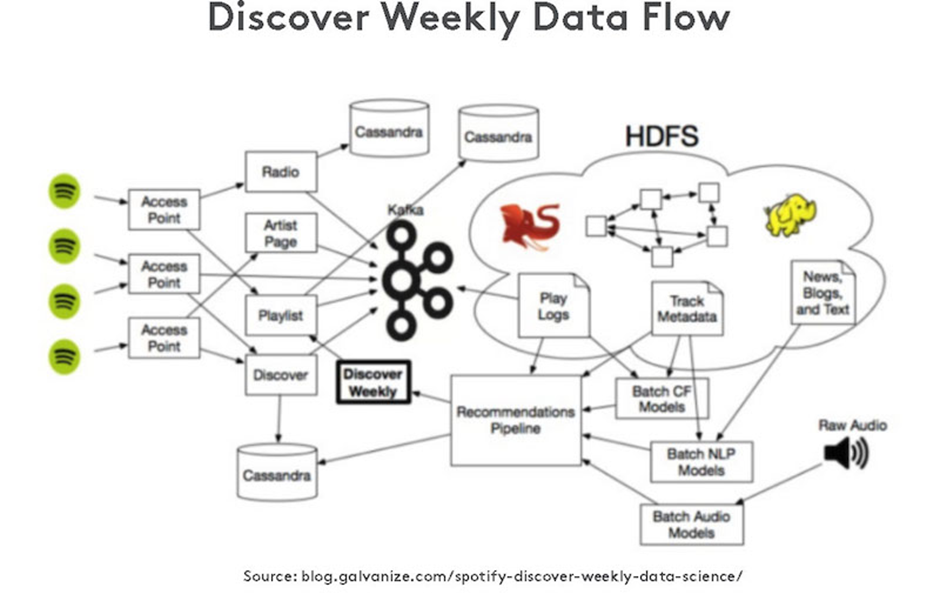
There are many ways that music streaming services collect user-generated data, and looking at four services; *Spotify,* *Tidal, Soundcloud* and *Apple Music,* it is clear of both the similarities and differences (see Appendix B); all which face challenges with their strategies.

Additionally, *Amazon Prime* employs an interactive speaker, an *echo* known as *Alexa.* The personalised audio player allows customers to stream songs hands-free and the technology with machine learning and voice recognition learns the customers preferences and tastes and customises music accordingly. The device, that is part of the Internet of Things; everyday objects with chips and signals that collect and communicate data (Burgess, 2018), acts like a digital personal assistant (Chermerhorn and Bachrach, 2017). The source and tool could generate between $18 billion and $19 billion in total sales for *Amazon* by 2021, and this is due to its data collection that enables more effective marketing for *Amazon,* brand and products; knowing what the customers want as well as their behaviour.

While some streaming services have technology that can benefit the business with more data outside of their initial platform, this requires a high cost and budget. Data sourcing can be made more effective with a lower cost if data is sourced on owned channels. For example, while *Spotify* is integrating into a more social network channel (Pusztai, 2019), there is an opening to incorporate more of a community and social tool on playlists, songs and artists on there that has not been implemented. This would give *Spotify* more access to data on their own channel; as well as more qualitative data which gives them competitive advantage with a wider knowledge of their customers and listeners.

## *Channels*

Music streaming use their owned media to collect data by their owned applications and websites, for example, *Spotify*’s *Discover Weekly* personalised playlists for its users is a model they use on their own interfaces after sourcing the data from internal factors. This is presented on a flow chart that depicts the structure of how the data is sourced and supplied through the owned channel (see Figure 1).



## *Figure 1: Spotify Discover Weekly Data Flow Model*

Additionally, earned media such as social media and listening to what fans are talking about online on specific songs can be used for data collection and analysis through databases. This has been made easier for *Spotify* with direct connections to other tools such as *Instagram stories* that enable a wider reach, and another tool to gain insights. Another partnership is with *PlayStation,* which adds to the growing number of devices that users can access *Spotify* on, and another source for *Spotify* and its stakeholders for data mining.

*Spotify* also harnesses SEO*.* This investment can be effective, however paid channels are more efficient. For example, *Spotify’*s ad campaigns that are placed on Google’s paid listings, *Facebook’*s display sponsored ads. They are measured through the metrics and KPI’s of click through rates (CCR), pay per clicks on Google (PPC) as they remarket, and the data will be collected on how effective their campaign is to achieve customers onto their servers and listeners for the artists and labels.

A disadvantage is that new platforms are emerging all the time, and people’s desire for data changes (Cho, 2019). “A great example is *Twitter.* People cared so much about *Twitter* in the past. Now, not many people care about that, and people care less about *Facebook* friend counts as well” (Setaro, 2019).To achieve data from the channels effectively, tools must then need to be chosen appropriately for the type of data sourced, and kept up to date with consistent development. To avoid this limitation, the music streaming industry would benefit from using their own channels more extensively.

## *Tools*

*Spotify* has always experimented with various tools for analytics. In 2019 into 2020, machine learning is a key process that is being used to predict, and this is constantly being developed (see Table 1). For example, *Spotify* uses machine learning to recommend songs with its *Discover Weekly* and *Recommended for Today* playlists that is personalised to a user’s activity, and *Year Wrapped* at the end of the year delivers insights to the user on what their favourite songs to listen to was for that year and how many hours they’ve played these songs and artists.

The constant development of tools gradually makes it easier to pave roads and create pathways that are smaller and simpler to lead onto the next tool. The difference between 2018 and 2019 is clear when seeing how developed *Spotify*’s Machine Learning Platform infrastructure has developed (see Figures 2 and 3). In 2020, *Spotify* has hopes for including *Kubeflow* components to their machine learning Paved Road; this includes using the cloud, an external source.

Additionally, it is increasingly popular for businesses and services to augment their own data with third-party providers that they purchase. It is estimated that in 2017, US companies spent more than $10 billion on audience data from external sources (Hemann and Burbary, 2018). Data visualisation tools make it easier to visualise and extract data from its masses.

Contrastingly, *Google Music Play* has the advantage of *Google*’s established systems, “just like *Gmail* allows Google to mine data from the contents of email, file attachments to the email and files stored in the same folder as the files that are attached to the message being scanned, *Google Play* will use music as a honey pot to draw users to the data mining machines” (Castle, 2014). *Spotify* also uses *Google*’s tools for some of their analytics, and *Google Cloud* is the primary collaboration; *Tensorflow* and *Python* both also being important.

Social listening tools are also increasingly used within the music streaming sector to help learn who the audience is, what content they engage with; sharing, liking, commenting, and where they can be reached on which channels and how long they are spending on each one (Hemman and Burbary, 2018).

Another tool for certain music streaming businesses is to collect from an audio footprint, and *Shazam* is one innovative application for doing so, “before everything went digital, data on music consumption was based on weekly store sales and radio airplay. Now, streaming services and other tools such as *Shazam* provide a granular, real‐time view of what audiences are listening to” (Langkjær-Bain, 2018). *Shazam* uses a spectrogram to gain real-time analytics without engineering. *Shazam,* utilising *Splunk,* is a platform that can recognise music playing in the background, during a night out or on the TV (McDonald, 2016). Owned and developed by *Apple,* *Shazam* has access to a “treasure-trove” of data and celebrated 15 million song identifications each day in 2013 (McDonald, 2016). *Shazam* has been known to predict the next big artist. This tool that *Shazam* has initiated can analyse what generates the most interest using their own consumer behaviour (Datoo, 2013).

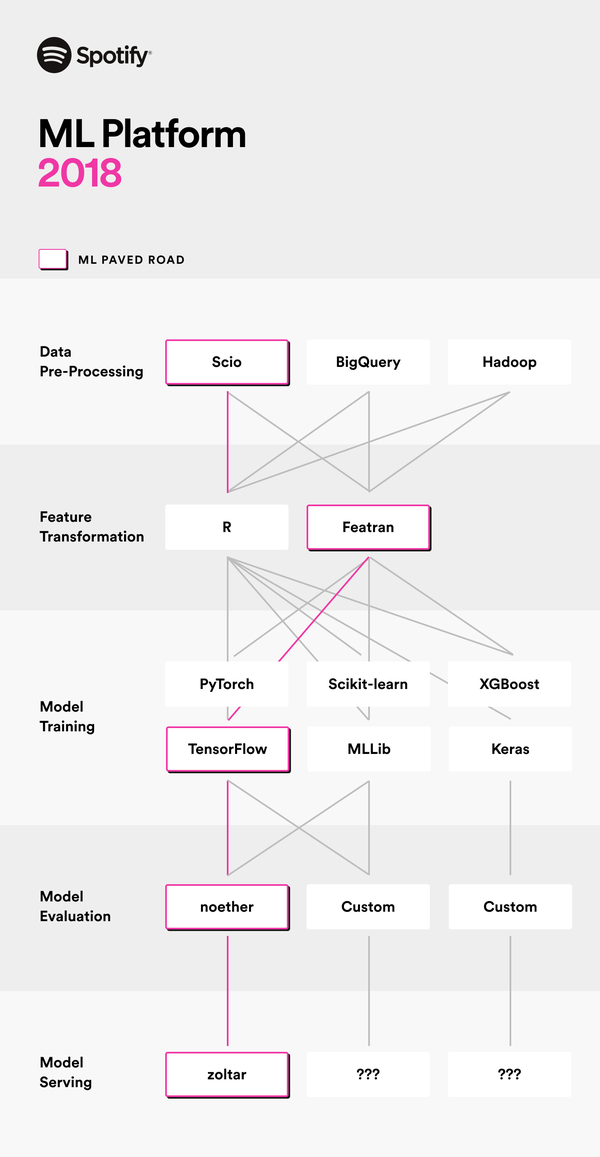
While cross-channel marketing is used and therefore data is collected between various platforms, the Internet of Things is a tool that is being used in the music streaming sector but not used with the knowledge of its potentials. It is estimated that by 2020, there will be “20 billion connected things” (Bludov, 2019). There are home speakers, wearables and smart home devices for streaming, like *Alexa* or *Microsoft*’s *Cortana*, but this has not been used to a further degree. Furthermore, a tool known as *Prism* has one aim; to choose the perfect music to play at specific moments. It can recognise voices in the room and understand the behaviour of the user to then play appropriate music as it learns and remembers habits and the context of the actions (Stereoklang, 2016). There are beginning to be more devices and tools that inhabit this on the market, and the music streaming industry should be wary of this and adopt them; for businesses with a higher budget in product design and marketing.

While there are many tools that the music streaming sector is utilising, there is still a lack of understanding and complicated models being used (see Figure 2 and Figure 3). This can limit scope for businesses to use data to its full potential. Moreover, while the Internet of Things is innovative, there are other methods for sourcing and analysing data that is more cost and time effective.

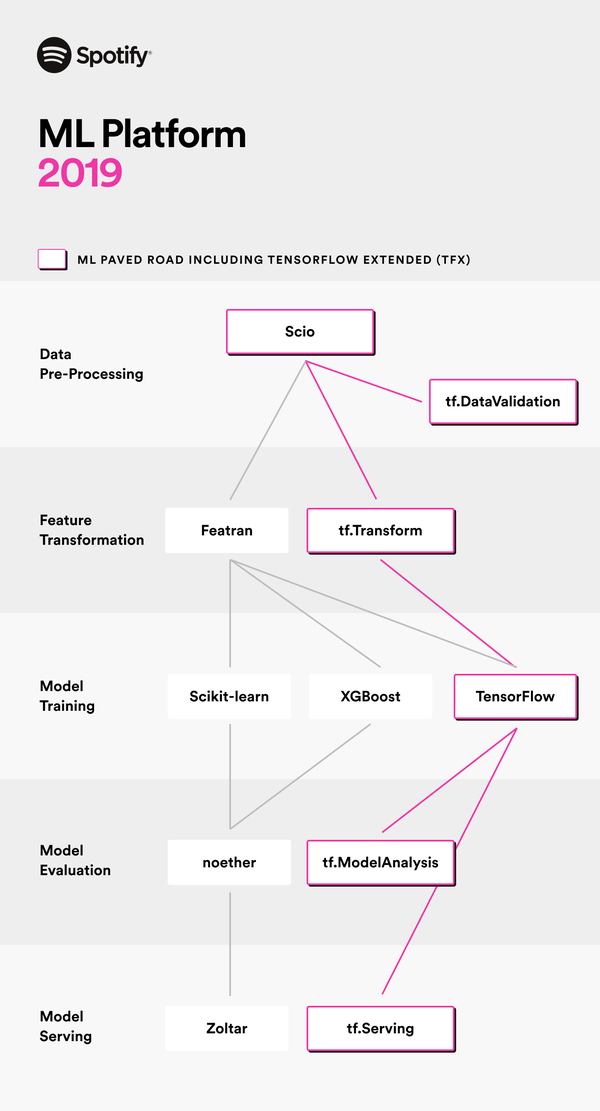
## *Table 1: Spotify tools (adapted from: Baer and Samuelngahane, 2019).*

|  |  |
| --- | --- |
| **Use** | **Tool** |
| Machine Learning | * Google’s Tensorflow: TFRecord and tf.Example * Google’s Kubeflow: |
| Data Pre-Processsing | * Scio * BigQuery * Hadoop |
| Feature Transformation | * R * Featran |
| Model Training | * TensorFlow * MLLib * Keras * PyTorch * Scikit-learn * XGBoost |
| Model Evaluation | * Noether |
| Model Serving | * Zoltar |
| Data Processing library | * (API’s) Apache Beam and Google Dataflow – Scio: * Featran: Feature engineering * Noether – Mordel evaluation * Zoltar – Connected trained models with JVM-based library Apollo * Apollo – Spotify’s production services |
| Programming | * Scala: builds high-performance systems with easy access to huge ecosystems of libraries (Scala, 2019). * Python: assists to integrate systems (Python, 2019). * Paved Road |
| Personalisation | * Cassandra: stores user profile attributes and metadata about entities like playlists and artists * Kafka: producers running on different services and emitting different kinds of events like completion of a song and delivery of an ad impression * Storm: real-time event processing * Crunch: for running batch map-reduce jobs   (Mishra and Brown, 2015) |

*Figure 2: Spotify's 2018 ML Platform*



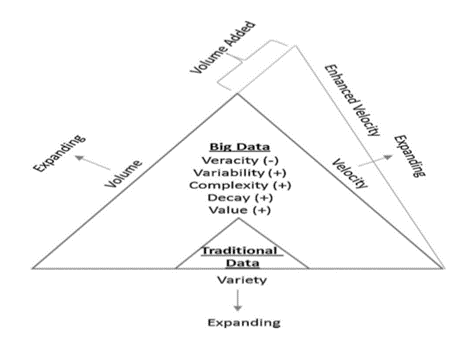
*Figure 3: Spotify's 2019 ML Platform*



# **Data Crunching**

Once data has been extracted, it must be crunched so it becomes useful when making marketing and business decisions (Wilson, 2006). “The traditional metrics like sales told us a record or CD was sold, but nothing about what happened after that,” (Smernicki, 2019). With more metrics and insights now, the growing volume, velocity and variety of data, which gains higher value but decays quicker, (see Figure 4), has exceeded the amount that is possible for humans to manage without sources, channels and tools (Scagliarini, 2016). When it comes to data crunching for marketing the business and service, tools must be used to obtain data that is relevant and not decayed while also making the numbers make sense. It is viewed that Big data holds no value without data crunching (Newman, 2017).

Crunching can be effective from in-depth analysis through data warehousing to data mining. For example, crunching showed that Latin artists were over-performing on *Facebook,* so more investment was put into the marketing on *Facebook* for Latin artists as the data showed it had an advantage to their target audience (Setaro, 2019). Furthermore, music sales, BDS counts of radio plays, and the Billboard charts crunch the numbers using databases to discover potential hits, help advance careers and determine the sound of music (Setaro, 2019).



## *Figure 4: Big data impact (Lee, 2017).*

Data crunching within music streaming is used variously and can give different types of data (see Table 2). Currently, most music streaming services search through the internet, through various sources, channels and tools, but tracking artist’s popularity and fan engagement on *YouTube* and multiple platforms can be complicated for record labels, talent scouts and different businesses within music streaming to analyse. As an example, Katy Perry, a famous pop artist, has about 19,000 different signals for different platforms and territories. It can be a challenge to turn the signals into useful information (Shubber, 2014); different social networks and channels have various demographics, characteristics, and consumer profiling to be targeted.

Moreover, the internet is taking power away from record labels but it’s also giving them the ability to predict future hits amongst other metrics (see Appendix C and D).

## *Table 2: Three types of data and how music streaming harnesses them.*

|  |  |  |
| --- | --- | --- |
| Descriptive | Prescriptive | Predictive |
| * Algorithms * Music streaming services deliver stickier playlists * Analyses visits to various playlists * Online music consumption | * Listening habits * Suggestions of playlists, songs * Social Listening * Unstructured and structured | * Indirect and direct signals   - artists building a following through social media  - Companies track and control over various platforms   * AI and machine learning   – recommended playlists and songs |

# **Insights from Data and Uses of Insights**

While *Amazon Prime* has innovative ways of obtaining more data, particularly with *Alexa*, research suggests that “it’s all about the contextual understanding of the listener” (Jehan, 2020) and personalisation. Currently, music streaming collects data for various insights such as the geographical location of listeners for certain songs, gender, age, and this can help to target audiences more effectively for marketing and the service itself. However, impressions and engagement are currently not calculated effectively (see Table 3) and click through rates are not efficient to measure audio when devices are usually placed in consumers’ pockets (Blattberg, 2015). This can lead to marketing to the wrong target groups, segments and demographics.

Patterns and movements of consumer behaviour presents insights that gives a business more creativity, and artists and labels more opportunity to add content that is more engaging. On the other hand, there are flaws; “you’re going to end up in this loop [where] everything sounds like Drake and Ariana Grande,’ since everyone would only want to chase what’s already popular” (Setaro, 2019).There is an argument that insights can control too much of what music becomes a hit, and it is said that through metadata archives there is misleading analysis that creates a culture of mainstream listeners rather than encouraging subgenres and a wider range of music to be experienced (Lucero, 2020).

Insights and the way they are currently sourced have positives and negatives, (see Table 4) and alternative methods will be argued and justified in the next section.

## *Table 3: KPIs, metrics and properties.*

|  |  |
| --- | --- |
| KPIs | Properties |
| Click Through Rate (CTR) | * Measures amount interaction of clicks with song, album, artist, playlist * Difficult to measure metrics for audio |
| Impressions | * User-generated data * Location * Demographic * Not all music streaming services have the data open-sourced * Can not be targeted |
| Engagement | * Can measure how long consumers are spending on playlists etc * Music streaming services are not utilising likes, follows, comments that are featured on social networks |

## *Table 4: Evaluation of insights*

|  |  |  |
| --- | --- | --- |
| Evaluation of Insights | Pros | Cons |
| Open Source | * Free for business to access and share | * Less competitive advantage |
| Data visualisation tools | * Optimise marketing through Chartmetric, Tableau, Revelator, Next Big Sound and others | * Slow analytics – velocity increasing * Sometimes complicated |
| Sentiments | * Recommender systems, characterising user behaviour, | * Too much reliance |
| Data extraction | * Trends and Patterns | * Too much reliance causes misdirected marketing |
| Data warehousing | * Big data storage for customer, competitor and consumer data | * Unstructured data * Junk data * Decayed data |
| Data Mining | * Dashboards and Scoreboards for clear analysis |  |

# **Effective and Efficient Data Management**

Data Management can be defined as “the development of architectures, policies, practices and procedures to manage the data lifecycle” (Weinberg, 2019). Music data has always been time-consuming and expensive to obtain, verify and manage, which meant the distribution of revenue often required collecting societies’ ‘discretion’ (Parker, 2004). Big data platform and management systems should be a solution that is specifically designed to meet the needs of one organisation (Chandrasekhar et al., 2013), there are many aspects to consider when looking at what data management systems are appropriate for a specific sector, service and business (see Table 5).

Nowadays, observations of enormous volumes of data, due to the evolution of technology and the massive exchange of information, are why music streaming currently open source and use Proprietary Software (Nereu et al., 2017). The music streaming sector, as well as using their own channels and tools, rely on third parties, open and outsourcing. Businesses like *MusicBrainz* offer their tools and services to big music streaming companies (Musically, 2016). However, this does not give businesses competitive advantage; if *Spotify, Apple Music* and *Amazon Prime* are all using the same data. This method can also be slow and limiting. Services such as *Spotify* should be adopting more social networking tools on their platforms to enable the collection of more raw data and gain in-depth insights which would be cost and time effective. Insights would be more narrative to the context of customer behaviour. They would show an in-depth analysis of sentiments, feelings, thoughts and emotions in context with the time of year, time of day, geographical location, and in context to their activities outside the platform as well as diverse dialogue from different cultures. Currently, *Spotify* have *friend activity*, but no option to interact with that notification. Implementing more interaction tools and interfaces would increase engagement and make it easier for the service to collect more quantitative data, as well as qualitative data using language processors, AI and finally this would aid the machine learning in creating a more personalised experience for customers.

On the other hand, when collecting consumer and customer data, especially in the UK, privacy and ethical laws need to be considered; to protect the customer but also the business (see Table 6). This challenge can be overcome with compliance and security, and public comments on the platform would need an opt-in button and transparency on the fact that user’s interaction on the platform would be public.

*Table 5: Data Value Chain: process of collecting data through social networking on music streaming platforms (adapted from: Open Data Watch, 2019).*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Collection | Publication | Uptake | Impact |
| 1 | Identify | Analyse | Connect | Use |
| 2 | Collect | Release | Incentivize | Change |
| 3 | Process | Disseminate | Influence | Reuse |

## *Table 6: GDPR key principles and music streaming accordance*

|  |  |
| --- | --- |
| Key Principles to note: | Music Streaming Services |
| Lawfulness, fairness and transparency | * Terms and Conditions stated * Privacy Policy stated * Transparent on how data is collected, used and if shared, how it is shared |
| Purpose limitation | * Remarketing * Personalisation * Purposes are limited and cannot be changed |
| Accountability | * Owned domain * Third-party * Outsourced * Open-sourced * Databases need to be secure and encrypted * Tools, channels and sources need to be researched before employing them |

Using a data value chain (see Table 5), the new data management and strategy can be checked and reviewed that all aspects are covered. It is important to use both data warehouses and data mining with Big data for both unstructured and structured data, however, the complicated Big data can be made easier to navigate through *Oracle*’s dashboard and database. Utilising *Oracle* for its database and dashboard would be flexible and cost effective (Oracle, 2020), and help to contextualise and narrate the data (Coombs, 2016). This would allow social listening and keyword searching easier to track and target. For example, platforms that would allow commenting and conversations on user playlists and playlists that users can follow would give freedom for the service to analyse conversations in a more qualitative method and therefore, making the service more personal for customers. *Spotify* will not take complete control over their data process, however, internally sourcing and in-housing the qualitative data using their own social network tools would give them competitive advantage for unique data sets and insights. Additionally, *HPPC* can be employed to assist with data lakes and identifying language to detect what customers are saying about certain music and the sentiments (see Appendix E).

*Spotify* operates natural language processing and AI to scan a songs metadata, blog posts and discussions online about news, artists and other metrics (see Table 7), but it is time consuming; it would be useful and innovative to do this on their owned channel. *Spotify* would be guaranteed to see a significant boost in engagement metrics and an increase in song streams through social networking tools that would also increase customer loyalty and lifetime value (Titlow, 2020).

*Amazon Prime* also uses recorded audio data and voice recognition, however this holds more issues with privacy laws, ethical laws and GDPR; it has been reported that data that was collected by *Alexa* had been leaked to the wrong customer by mistake (Statt, 2018). This increases the chances of lawsuits, and loss of money and reputation. Social networking and social listening decrease these challenges.

It can be argued that using third party tools, sources and channels can be confusing to adopt and keep up-to-date data, while data decays at a rate of 30% a year (Brence, 2016). There is uncertainty where outsourced and third-party sources may not be cleansing their databases as regularly as they should be, which also could be an infringement of GDPR in the UK. With internally sourcing and using owned channels, music streaming can avoid these challenges.

There are, of course, limitations with this data management approach, however and data ownership and data stewardship have disadvantages. Music streaming should continue employing both organisation strategies but to avoid customer criticisms on overusing data, the language processing and AI should assist in finding niche music; subgenres and not only focusing on mainstream music (see Appendix F), which has been an apprehension for many listeners and loyal customers of *Spotify* and other music streaming services.

To overcome these limitations and challenges, an internal social network is a source and tool that is simple yet has been overlooked; models can be imitated from existing social medias (see Figure 5). This would create a new epoch and a cultural and digital shift in allowing customers and consumers to have more of an indirect and direct influence on music, and businesses to gain advantages from social listening (see Figure 6). Customers can like, comment and interact with users they follow, as well as their friends. This community aspect will allow keyword searching and sentiment tracking and can then be used as predictive data.

## *Table 7: How Spotify uses vectors and top terms with assigned weights - example of keywords (adapted from: Whitman, 2012).*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| n2 Term | Score | np Term | Score | adj Term | Score |
| Dancing Queen | 0.0707 | dancing queen | 0.0875 | perky | 0.8157 |
| Mamma Mia | 0.0622 | mamma mia | 0.0553 | nonviolent | 0.7178 |
| Disco era | 0.0346 | benny | 0.0399 | swedish | 0.2991 |
| Winner takes | 0.0307 | chess | 0.0390 | international | 0.2010 |
| Chance On | 0.0297 | Iis chorus | 0.0389 | inner | 0.1776 |
| Swedish Pop | 0.0296 | vous | 0.0382 | consistent | 0.1508 |
| My My | 0.0290 | the invitations | 0.0377 | bitter | 0.0871 |

## *Figure 5: Social Media Model (Complete Outsourcing, 2019).*

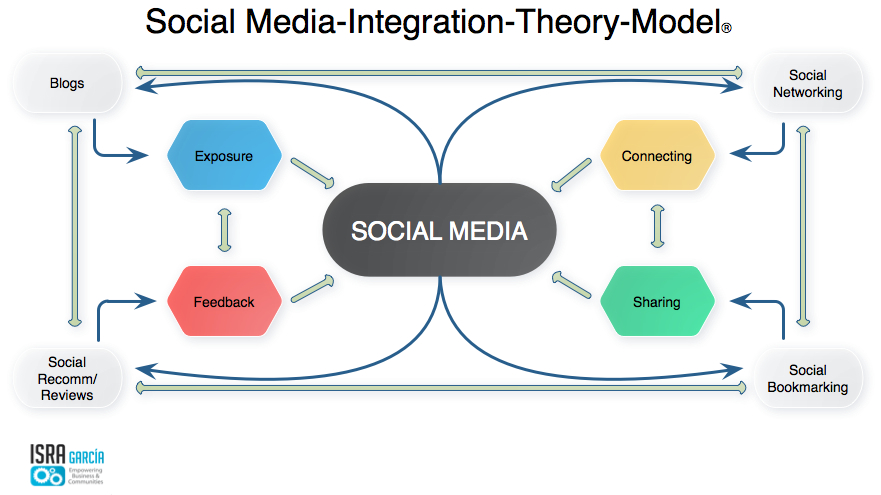


Figure 6: (Business Wire, 2019).



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# **Appendices**

## *Appendix A:*

*Spotify data use cases (adapted from: Spotify, 2013)*

|  |  |
| --- | --- |
| Use Cases | How they are used |
| Reporting | * Labels, licensors, partners and advertisers that supports partners |
| Business Analytics | * Analysing growth, user behaviour, sign up funnels * Company KPI’s * A/B testing * NPS analysis * Segmentation analysis |
| Operational Metrics | * Root cause analysis * Latency analysis * Better capacity planning (servers, people, bandwidth) |
| Product features | * Radio * Top lists * Recommendations (Internal rather than external parties because of the amount of data) |

## *Appendix B*

*How Music Streaming Services Source Data (adapted from: The Trichordist, 2018).*

|  |  |  |  |
| --- | --- | --- | --- |
| Service/Business | Personal Data | User-generated/ activity | Third-party |
| Spotify | * Account Registration * Service Usage Data * Payment Data | * Contests * Surveys * Sweepstakes * Voluntary Mobile Data | Advertisers  Partners  Social Media |
| Apple Music | * Display name * Profile photo * Other personal information on Apple personal profile * Shortened and encrypted hashes of phone numbers and email addresses of user contacts | * Songs played * How long songs are played * Sync library with apple devices * Approximate number of phone calls and emails sent and received: computes a deoce trist score when attempts of purchasing * How user uses Apple * Listening activity: playlists, music added to library, content user ‘loves’, comments, shares * IP address * Device, app, car interface used to play * Time the song is played and how long * User demographics: age, gender | Social media |
| Soundcloud | * Account information: username, email address, age, password * Name * Billing address * Payment verification information * City and country user lives in * Profile picture, header or avatar * Details of other websites and social media profiles and links to them * Gender | * Information user posts: comments, community discussions * Survey informatation * Communications: email or platform between user and service * Usage information: pages that user visits, links clicked on, streaming offline listening, download, uploading and recording tracks, connected to social media accounts, sharing with users, following and unfollowing users, performing a search, time, frequency and duration of visits, interaction with emails – opened, clicked on, forwarded. * Log data: details about how user used the platform, IP address, access time, browser type and operating system, device information, event information (crashes, browser type), page user viewed or engaged with before or after using platform * Cookies: pixels, local storage, mobile device identifiers, tracking technologies, behaviour * Location: general location, IP address * Device information: interaction with platform, information about device, hardware model, operating system, coockie information, device settings, movile device, advertising identifiers, apps installed, browser type, language, battery level, time zone, Apple’s iOS Advertising Indentifier (IDFA), Google’s Android Advertising ID | * Business Partners an service providers who use SDK’s: companies that assist with payment processing, analytics, advertising, marketing, data processing and management, customer and technical support, content moderation, hosting * Interaction with content and advertisements and enabled analytics and other features through mobile devices * Single-Sign ons: Signed through Google or Facebook collects information |
| Tidal | * Username * Password * Name * Contact information * Process of payments | * User content – photos, comment and other materials * Metadata – content creation data, formatting information, location information * Geotags – creation data, location * Communications between user and service * Favourites * Playlists created * Tracks played * Downloads * Time of log-in * Versions of the application user uses * Device and unique device number * Log file information: browser type, referring/exit pages and URLs, number of clicks and interaction with clicks, domain names, landing pages, pages viewed * Survey information: anonymous and aggregated responses | * Analytics tools and providers: measure traffic, usage trends – collected as a group of visitors * Social media: Facebook, business partners, advertising networks, telecommuications providers |

## *Appendix C:*

*Table depicting the types of customer and competitor data.*

|  |  |  |
| --- | --- | --- |
| Customer Data | Customer media (owned and earned) | Competitor data |
| Reach data | Owned social media metrics | competitor |
| Action data | Earned social media metrics | Partner data |
| Conversion data | Paid search metrics |  |
| Engagement data | Organic search metrics |  |
| Competitor data |
| Partner data |
| Other data |

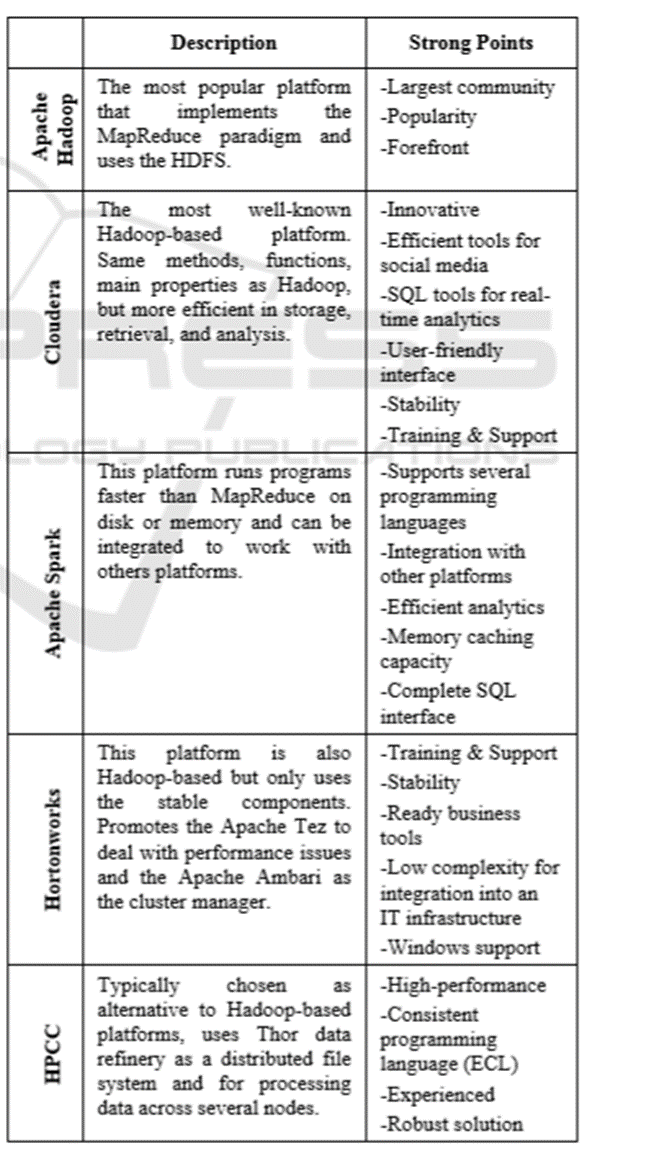
## *Appendix D:*

*Types of analytics and their use (adapted from: Hemann and Burbary, 2018).*

|  |  |
| --- | --- |
| Type of analytics | Use with music streaming |
| mobile | * Applications data * Flexible |
| geofencing | * GPS, RFID, Wi-Fi and cellular data with preprogramed actions and RFID tags - specific marketing * Customisable for cultures and regions |
| Location-based | * Predicts areas for demand on certain music and artists * Predictive data: planning concerts |
| Social media – network, interests, sentiment, influence, audience | * Social listening to find music popularity and sentiments |
| Web analytics | * Search, SEO, paid ads, multiple channels to find what music will make the most profit and engagement from customers |

## *Appendix E*

*Data management platforms and their strong points (Nereu et al., 2017).*



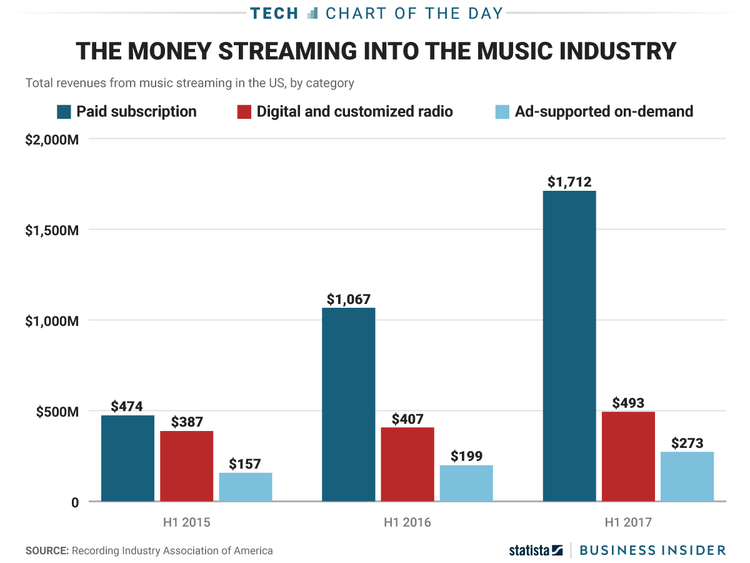
## *Appendix F:*

*Strategy and tools of data management (adapted from: Hemann and Burbary, 2018).*

|  |  |  |
| --- | --- | --- |
| Strategy and tools | Positive aspects | Challenges |
| Data ownership | * High degree of control and expansion | * Privacy issues |
| Data Stewardship | * Content and metadata can be kept up to date and relevant | * Costs |
| Metadata | * More in-depth analysis | * Misleading and complicated |
| Data quality | * High quality, effective and relevant to marketing | * Difficult to find within digital ecosystems |
| Data usage | * Relevant and targeted for marketing and engagement | * Ethical issues |
| Outsourcing | * Service providers with expertise can present useful insights | * Costs and data sharing can be privacy and ethical challenge |
| Managing tech stack | * Technologies enables music streaming services to program langugages, various frameworks, indexes, libaries, servers etc. | * Needs skills and expertise for the tools and technologies * Costs |
| New tech | * Innovative * Competitive advantage | * Costs * Time consuming * Innovative breakthroughs |

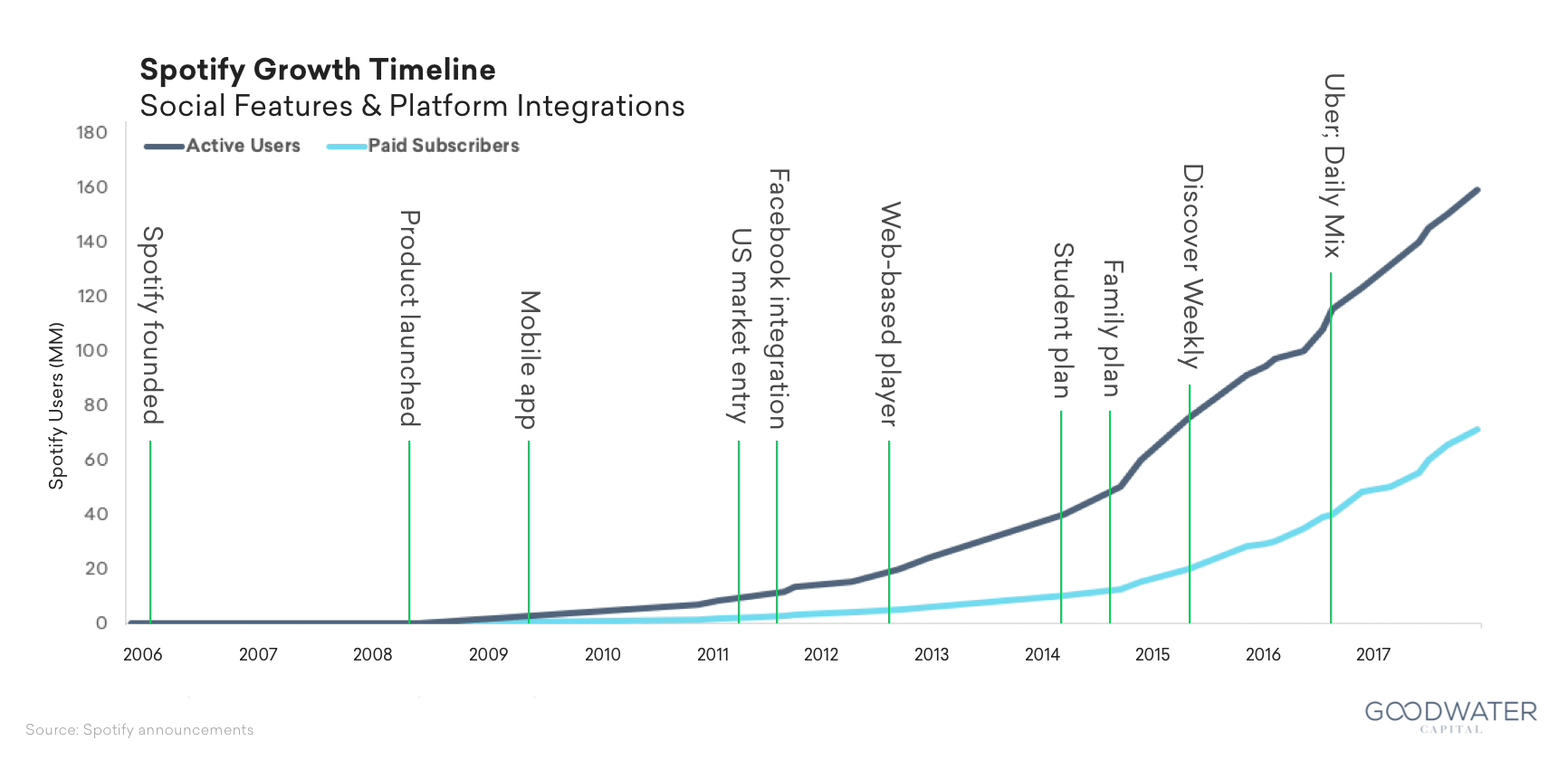
## *Appendix G:*

*The money streaming into the music industry (Cakebread, 2017).*



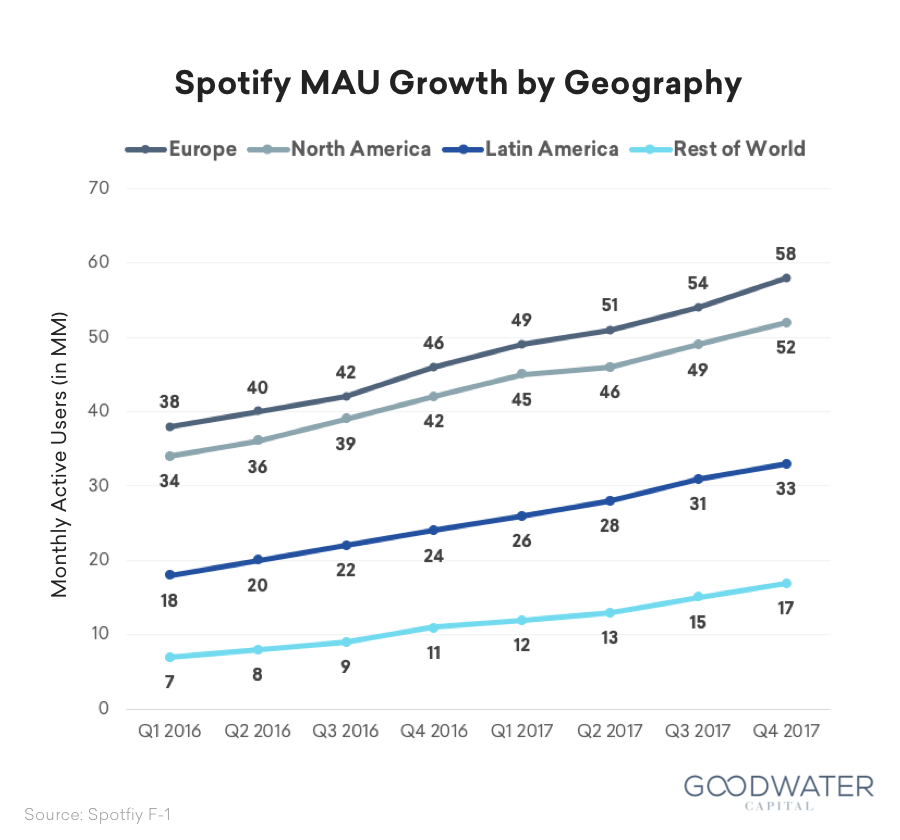
## *Appendix H:*

*Spotify Growth Timeline (Iqbal, 2019).*



## *Appendix I:*

*Spotify MAU Growth by Geography (Spotify, 2017).*



## *Appendix J:*

Music streaming services, their properties and market shares (adapted from: Ingram, 2014).

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Service | Pricing Tiers (Monthly) | Stream Quality | Catalog Size | Desktop Clients | Mobile Clients | Upload Own Library | Market Share (UK) |
| Google Play/ All Access | * Free * $9/99 | * Up to 320 kbps (MP3) | * Over 30 million songs | Google Play Music for Chrome, Music Manager | Android, iOS | 50,000 tracks (free) | 6% (Statista, 2018) |
| Amazon Prime Music | * Free * $24.99 | * Up to 256 kbps (MP3) | * 1 million songs (Prime music) | Web Player, PC, Mac native clients, Fire TV | Android, iOS, Kindle Fire | 250 (free) or 250,000 tracks ($24.99 year) | 18% (Statista, 2018) |
| Spotify/Spotify Premium | * Free * $9.99 | * 96 kbps * 160 kbps * 320 kbps (Ogg Vorbis) | * Over 30 million songs | Web Player, Pc, Mac native clients, PlayStation 4 | Android, iOS, Windows Phone | N | 42%  (Statista (2018) |
| Tidal Premium/HiFi | * $9.99 * $19.99 | * 96 kbps * 320 kbps * 1411 kbps   (AAC/FLAC) | * Over 25 million songs and 75,000 music videos | Web Player, PC, Mac native clients (in beta) | Android, iOS | N | - |
| Pandora/One | * Free * $4.99 | * 64 kbps * 192 kbps (AAC) | * 1 million songs | PC and Mac (Pandora One) | Android, iOS, Windows Phone, Blackberry | N/A | - |
| Rhapsody unRadio/Premier | * $4.99 * $9.99 | * 64 kbps * 192 kbps * 320 kbps   (AAC#0 | * Over 32 million songs | Web Player, PC native client | Android, iOS, Windows Phone, Sansa Players | N/A | - |
| iHeartRadio | * Free | * Up to 128 kbps (MP3) | * 20 million songs * More than 1500 live radio stations | Web Player | Android, iOS, Windows Phone, Blackberry, Kindle Fire | N/A | - |