FEASIBILITY STUDY

On Promoting Slovak Music In Slovakia & Abroad

DANIEL ANTAL, CFA

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REGISTER

PROJECT SUMMARY

In 2015, realizing the low visibility and income-generating potential of Slovak music, the legislation introduced an amendment to the broadcasting act to regulate local content in radio streams. The Slovak content promoting policy was well-intended but not based on any impact assessment, and it reached its goal only partially.

The Slovak broadcasting quotas in comparison with other national quotas a very simple, and they are impossible to measure, which makes both compliance and enforcement very difficult. Radio editors do not get any help to find music that fits into the playlists and fulfills the quota obligations – in many cases, it is impossible for them to find out if a song actually meets the quota requirements. For the same reason, neither is enforcement possible.

Another deficiency of the broadcasting quotas is that because of its fuzzy target, it is not clear whom it tries to help, and it has few friends. It is unclear how performers, composers, or Slovak music producers can benefit from the system. Furthermore, it only helps a few genres, and it decreases the chances of other Slovak music in instrumental and non-Slovak language genres (for example, classical, jazz, rock) to be heard.
And at last, radio is losing its importance in music discovery. The new generation finds the music during their music discovery age on YouTube and digital streaming platforms. A Slovak content promoting policy that does not work on digital streaming platforms will be obsolete when radio content providers will switch to digital streaming in the foreseeable future.

Our Feasibility Study is the first phase of a granted activity that received only 10% funding from the Slovak Arts Council. In this feasibility study, we show how the funded program could contribute to the creation of a Slovak Music Monitor that makes the monitoring, enforcement, and impacts analysis of the Slovak radio quotas possible. We also show how such a system could be the basis of various modern, artificial intelligence and data-driven applications that would make the Slovak repertoire more visible and used in digital streaming platforms, and discovered by more young people in the critical age group of 15-24 years. And at last, our Feasibility Study could be the basis of a Research Paper that could help refine the Slovak broadcasting quotas with the help of international experience and experience from digital streaming to help Slovak authors, performers, and producers better, and be easier to adopt by various radio stations.

This Feasibility Study proposes to carry out the entire research program with a modified, refined scope:

A Study on Promoting Slovak Music At Home & Abroad: Provided we get the entire funding, we would like to create a comprehensive study with peer-reviewed articles, as suggested in the original grant application. This Study could form the basis of various policy interventions, including the design of a better quota system, a monitoring system to enforce it, and a recommendation system to help radio and voluntary personal compliance.

Comprehensive Slovak Music ReDatabase: Based on our Demo Slovak Music Database in chapter 4.2, we would like to create a comprehensive Slovak music database to support radio editors, digital streaming providers, and the general audience to find Slovak music. As we explain in this feasibility study, this is a crucial investment for both monitoring broadcasting quotas, to help Slovak music to become visible in digital streaming platforms (such as YouTube, Spotify, Apple Music, Deezer) and create evidence-based policy reviews.

Slovak Music Monitor: On the basis of the Comprehensive Slovak Music Database, a joint project of the Slovak collective management societies to report the actual market share of Slovak music productions, compositions, performances, and lyrics in Slovak broadcast media and on key digital streaming platforms. As we show in chapters 2 and 3, the Slovak radio quotas currently are impossible to monitor and enforce.

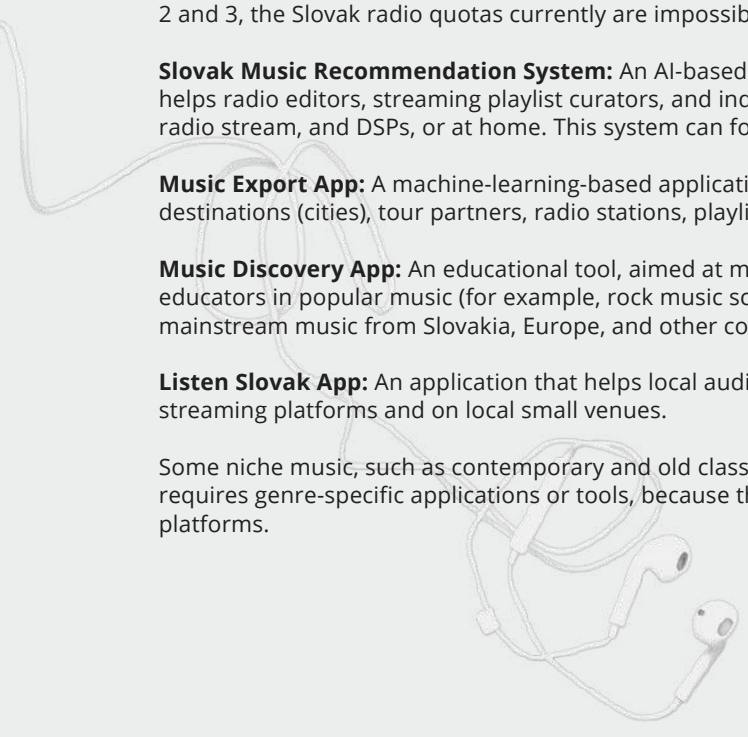
Slovak Music Recommendation System: An AI-based, open-source, transparent music recommendation system that helps radio editors, streaming playlist curators, and individuals to find relevant, Slovak music to be played in their radio stream, and DSPs, or at home. This system can form the basis of various applications.

Music Export App: A machine-learning-based application to help LaLa and artists in finding relevant foreign tour destinations (cities), tour partners, radio stations, playlists, and curators to stage and place Slovak music.

Music Discovery App: An educational tool, aimed at music educators in the secondary school system, and music educators in popular music (for example, rock music schools) and music schools to help the discovery of non-mainstream music from Slovakia, Europe, and other continents.

Listen Slovak App: An application that helps local audiences, cultural tourists, and artists to find each other on streaming platforms and on local small venues.

Some niche music, such as contemporary and old classical music, authentic folk and world music, and Slovak jazz requires genre-specific applications or tools, because their audience is smaller, and can be found on different platforms.



Our Feasibility Study follows the following logic:

In the first chapter, we introduce various **music recommendation systems** in the context of local content promotion policies, like local mandatory content quota regulations.

In the **second chapter**, we consider the market-based or creative industry economy supporting policy goals, measurements, and potential support given to artists and producers.

We then turn in the **third chapter** to content-based local regulations promoting the use of the Slovak language or Slovak music content, irrespective of the performers and producers' nationality, residence, or ethnicity.

We introduce the idea of the **Slovak Music Database**, a comprehensive, mainly opt-in, opt-out database that of Slovak artists and Slovak music that should be supported by the local content regulation and other policies. We also create a **Demo Slovak Music Database** to understand the problem and scope of the creation of the comprehensive version.

The project website contains the **Demo Slovak Music Database.**

VÝSKUMNÉ OTÁZKY

- Why are the total market shares of Slovak music relatively low both on the domestic and the foreign markets?
- How can we measure the market share of Slovak music in the domestic and foreign markets?
- How can we measure the value gap between what some media platforms, most particularly the biggest YouTube, do not payout to the Slovak stakeholders within Slovakia?
- What is the interplay of the various definitions on market share and national quota targets?
- How 'shadow markets of home copying and unlicensed media platforms, such as YouTube impact market shares directly and national quotas indirectly?
- How can modern data science, predictive microeconomics, and statistics help increase the market share of Slovak music in Slovakia and abroad?

1 SLOVAK CONTENT POLICY

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Most of the music and film consumption in the 21st century is based on recommendation systems. Recommendation systems are machine learning applications that provide information to users about content they may like. In the 20th century this role was mainly played by radio editors. In the 21st century algorithms take over this role directly or indirectly: currently radio editors, festival and concert promoters are increasingly using algorithms in their work.

A key difference between broadcasting and streaming music is that in the broadcast stream every user sees or hears the same content.In digital streaming, each user sees a different movie or listens to a different song or radio program. Broadcasters were modelling large demographic groups for their content selection, while streaming providers are exploiting personal information for each subscriber.

Local content regulations, such as 'radio quotas' are obsolete in digital streaming: they are very hard to implement and monitor in a fully personalized streaming model. However, just like radio editors and broadcasters can learn a lot from recommendation systems, local content regulations can be improved by understanding and applying these techniques.

1.1 FOREIGN QUOTA SYSTEMS

Promoting national or locally relevant music has several policy measures, but broadcasting quotas are particularly interesting for our subject. We reviewed some foreign radio quota systems with the help of **On Quotas as they are Found in Broadcasting Music**, (see in bibliography (Stein, Brock, and Inc. 2012)), with some additions and follow up on some markets. Our aim was not to provide an up-to-date literature overview on radio quotas, but to show how complicated radio quotas can get if they have well-defined goals.

1.1.1 CANADA - MAPL

Canada has one of the oldest and most comprehensive radio quota systems which can be transferred to digital streaming, too. To qualify as Canadian content, a musical selection must generally fulfil at least two of the following conditions:

M (music): the music is composed entirely by a Canadian **A** (artist): the music is, or the lyrics are, performed principally by a Canadian **P** (performance): the musical selection consists of a live performance that is recorded wholly in Canada, or performed wholly in Canada and broadcast live in Canada **L** (lyrics): the lyrics are written entirely by a Canadian.

These features can be monitored by the collective management societies, however, the exceptions show that for certain genres these quotas are hard to apply. There are four special cases where a musical selection may also qualify as Canadian content:

- it was recorded before January 1972 and meets one of the above conditions
- it is an instrumental performance of a musical composition written or composed by a Canadian
- it is a performance of a musical composition that a Canadian has composed for instruments only it was performed live or recorded after September 1, 1991 and, in addition to meeting the criterion for either artist or production, a Canadian who has collaborated with a non-Canadian receives at least half of the credit for both music and lyrics – according to the records of a recognized performing rights society, such as SOCAN (Canada) or Broadcast Music Inc. (BMI), American Society of Composers, Authors and Publishers (ASCAP) and SESAC (United States).

1.1.2 AUSTRALIA: GENRE SPECIFIC QUOTAS

In 1992 the new Broadcasting Services Act made local content part of a self-regulatory code for commercial and community broadcasters.

- CHR, Mainstream Rock and Alternative: 25% for stations, of which one quarter (6 ¼%) has to be considered new material local music.
- Lesser quotas for other categories of music exist, the lowest quota being 5% for the broadcast of Jazz.

The quotas apply to music broadcast during daytime hours (between 06:00 and18:00) each business day. However, the enforcement is less than perfect. Currently there is a discussion on to increase the quotas to a uniform 25% (*Donoughue 2019)*

1.1.3 FRANCE: LANGUAGE QUOTAS

The Loi du 1er février 1994 requires that 40% of music broadcast during peak hours be French-language titles, **half of which are required to come from new artists or to be new productions since 1996.** The conditions were modified in 2000 affording stations with different listener demographics different quotas.

The French quota is a very high, and language-based quota that is becoming more and more difficult to fill. Between 2003 and 2011, the number of French-language albums released dropped from 718 to 158, a decrease of more than 75%. Most popular music artists in France sing in English.

In recent years, the French national assembly discussed various modification possibilities. In 2016, a bill was introduced to increase the French-language requirement, which was heavily criticized by both radio stations and artists, given that certain music genres do not produce much French-language music. However, one aspect was modified, which forces a higher level of diversity and limits how much the quota can be filled with the same music.

In 2019, a parliamentary report suggested genre-specific quotas *(Reynaud 2016; 20 Minutes 2019),* similarly to Australia and some other countries, because rock and electro genre station could hardly fill their quotas. The quotas would embrace European music, too, and ask Deezer, Spotify, and other DSPs to enter into consultation on voluntary measures to help the Francophone repertoire.

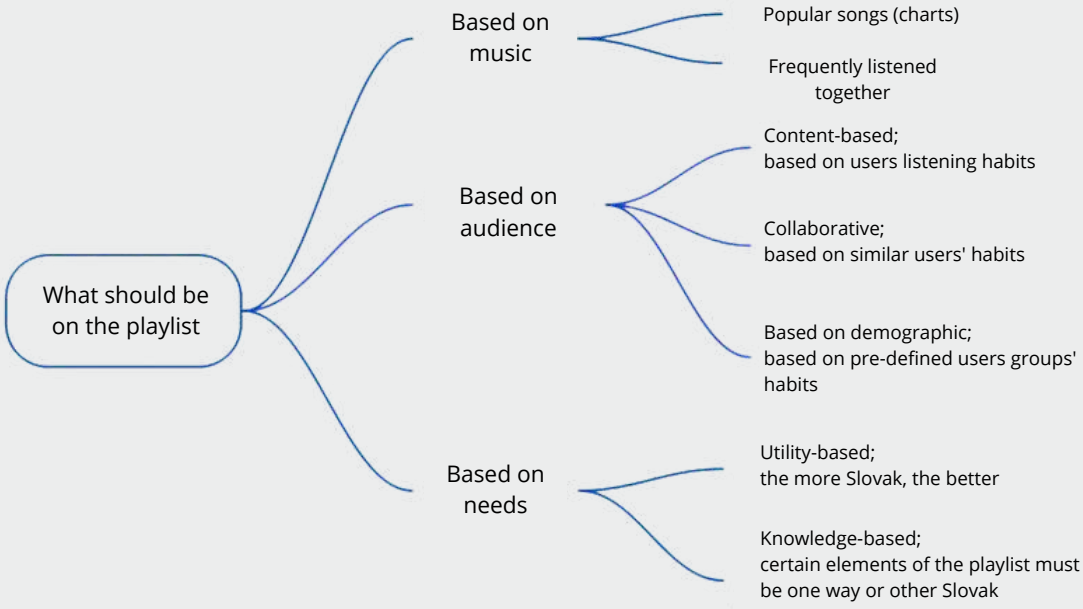
1.1.4 DIFFERENT QUOTAS FOR DIFFERENT RADIO SEGMENTS

- In **the Netherlands,** a quota was introduced for Dutch language music on Radio2 (the public broadcaster) calling for 35% of popular music broadcast between the hours of 07:00 and 19:00 to be produced in the Netherlands.
- In **Ireland**, Independent stations (as opposed to public or state operated stations) comprising national, multi-city, regional and local stations regulated by the Broadcasting Commission of Ireland (BCI) have an obligation to play agreed-to levels of local music – in most cases 30%.
- In **Portugal,** the minimum quota for the broadcast of local music varies between 25% and 40%. At least 60% of that quota must be fulfilled by broadcasting music composed/sung in the Portuguese language by citizens of the European Union. A minimum of 35% of the quota must be fulfilled with music produced in the last 12 months.
- In **Hungary**, the public broadcaster's quota is 35% since 1996, and commercial and community quotas were raised to this level in 2010 (with some exceptions, see (Hargitai 2014).) On an annual average basis, a quarter of the quota must be filled with compositions or sound recordings no older than 5 years.

1.2 HOW DO RECOMMENDATION ENGINES WORK?

Recommendation systems utilize knowledge about music content and their audiences while also pursuing the objectives or needs of recommenders.

If the recommendation engine is supported by big data and a machine learning system – or increasingly, a combination of several machine learning algorithms – the general modus operandi is to exploit information about both content and users in order to achieve certain goals. In this respect, they can be similar to a local content regulation that aims to achieve a 15% quota of Slovak music.



The simplest recommendation systems just follow the charts: for example, they select from well-known current or perennial greatest hits. Such a system may work well for an amateur DJ at a home party or a small local radio that just wants to make sure that the music in its program will be liked by many people. They reinforce existing trends and make already popular songs and their creators even more popular.

Spotify's recommendation system *(Jacobson et al. 2016)* is a mix of content- and collaborative filtering that exploits information about users' past behavior (e.g. liked, skipped, and re-listened songs), the behavior of similar users, as well as data collected from the users' social media and other online activities, or from blogs. Deezer uses a similar system that is boosted by the acquisition of Last.fm – big data created from user comments are used to understand the mood of the songs, for example.

YouTube, which plays an even larger role in music discovery, uses a system comprised of two neural networks: one for candidate generation and one for ranking. The candidate generation deep neural network provides works on the basis of collaborative filtering, while the ranking system is based on content-based filtering and a form of utility ranking that takes into consideration the user's languages, for example. *(Covington, Adams, and Sargin 2016)*

These systems offer a high level of personalization and usually, they re-enforce use trends, in turn discriminating users *(Werner 2020; Kraemer and Holden 2020)*. Externally validating, or in YouTube's case even understanding how they work would be impossible – YouTube's system uses so many resources and data that replication is impossible outside Google's systems. Deep neural networks are black-box deep learning systems that cannot be fully interpreted by humans.

What makes these systems common is that they maximize the algorithm creators' corporate key performance indicators. Spotify wants to be 'your playlist to life' and increase the amount of music played during work or sports in the background, during traveling, or active music listening –- i.e. maximizing the number of hours spent using it. YouTube and Netflix have similar targets. They are in many ways like commercial radio targets, which want to maximize the time spent listening to the broadcast stream. Radios and YouTube, in particular, have similar goals because they are mainly financed through advertising. For Spotify or Netflix, their key financial motivation is to avoid users' canceling their subscriptions or changing them to different providers, such as Apple or Amazon.

Local content guidelines in public broadcasting or local content requirements by quotas set for commercial broadcasting are similar to utility or knowledge-based recommendation systems. A utility-based recommendation system, for example, would prefer from two candidates for a playlist the one that has a Slovak composer, or a Slovak performer, or which has Slovak lyrics. A knowledge-based system knows the language or the nationality of the song and creates mixes with a pre-defined Slovak rate.

1.3 GOAL-SETTING AND ENFORCEMENT

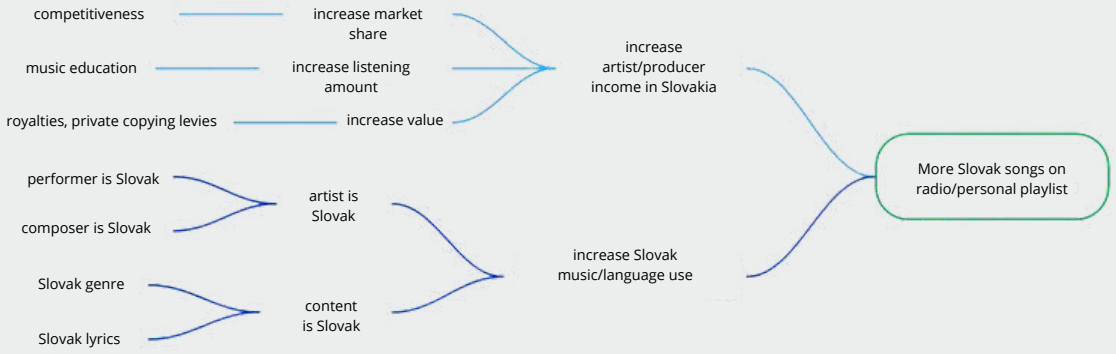
Recommendation engines are great ways to reach goals while maintaining a high level of user satisfaction. A recommendation engine would not only promote Slovak songs, but it would promote Slovak songs that users like. Good recommendation systems are self-enforcing. The aim of Spotify or YouTube to increase active user hours makes sure that the algorithm is always refined to make the user listen to more music.

Local content promotion, as with the case of promoting Slovak music, fits well with the agenda of a public broadcaster because it is set up and financed by public authorities to pursue a specific goal. However, it may lead to conflicts if forced on streaming service providers and radio and television broadcasters. In this case, the target–such as a percentage of Slovak music–will need to be constantly monitored, because there may be an incentive to miss the target.

We believe that the Slovak policymakers can learn a lot from recommendation systems to create a Slovak content promotion system that aligns with the goals of the radio broadcasting industry and make the Slovak repertoire not only more consumed, but also more appreciated. Promoting the Slovak repertoire in a way that takes audience preferences into consideration has the additional benefit of offering guidelines to promoting the Slovak repertoire abroad and to foreign audiences, where regulatory local content guidelines do not apply.

Recommendation engines require a very well-defined goal that a machine, following a pre-defined algorithm, can try its best to achieve. Recommendation engines underscore the need for precise and measurable targets.

The current Slovak regulatory target cannot be easily supported by a recommendation system because it has a very vague goal that is currently impossible to measure. The current system is a mix of policy-maker goals and artist/producer goals.



- Slovak residents should have a higher market share and consequently a higher pay-out share from radio royalties. Because artist residence is protected by GDPR, it is usually unknown, and cannot be monitored. Furthermore, it cannot be applied meaningfully in collaborative compositions or performances, nor for artists who are deceased.
- Slovak language use should be given a preference.

We present here a few aspects of potential goal setting:

- **A** For cultural policymakers' the target should be to increase the visibility of the Slovak repertoire through public broadcast targets or commercial radio quotas or to increase the diversity of Slovak music reaching an audience in Slovakia or abroad. This could be the mission statement of Womusk and Lala;
- **B** For an economic policymaker the aim may be to increase the value of the royalties, the turnover of publishers and labels in Slovakia, the employment in the music business in Slovakia, or to make the music industries trade balance better;
- **C** Slovak businesses want to protect their core Slovak market from the excessive foreign presence and may want to find ways to target the traditional Czech or further regional or global markets;
- **D** Artists usually are aiming for higher visibility because that secures them concerts in venues and festivals; they have a secondary interest in increasing their revenues.
- **E** Competition authorities may be concerned if a media platform or other entity uses its vertical power in the value chain to successfully monopolize the end-market in radios or streaming platforms and to increase/decrease the competitiveness of certain types of music.
- **F** Cultural policymakers or education policymakers may want to promote the values of Slovak cultural diversity and encourage young people to express themselves in the Slovak language of writing, composing, singing, and visual storytelling. In many European countries, education policies are targeting young people to feel at home in the creative processes of their own culture. This is also the key to generating higher value-added jobs in Slovakia, and to combat the effect of robotization, particularly in manufacturing industries such as car manufacturing or some mass retail services like banking.

These viewpoints and policy/business objectives require different market share indicators.

- **Economic policymakers and competition authorities** are targeting market share on a revenue basis. Market revenue = use volume x royalty price. They may be interested in policy tools and strategies that increase both the value and the volume of domestic repertoire use (in Slovakia and abroad.)
- **Cultural policymakers** may target the size of audiences reached by "Slovak" music, the volume of "Slovak" music used in various broadcasting and streaming platforms, or the number/diversity of Slovak artists' works/recordings/performances listened to by the audience.

- The educational experience is particularly important because young people are discovering music in secondary schools and higher education. This is the time when they are developing creative skills, too. **If the target demographic group of 15-24 years olds** in the education system does not become familiar with Slovak music, and they do not learn how to sing, play, or compose, later in their lives they are unlikely to start listening to or producing Slovak music.

- In our experience, the realistically achievable royalty income in some platforms is so low, that artists and their talent managers are targeting the volume of use and not the revenues. For example, placement in an Austrian radio or streaming playlist may help to secure a lucrative concert in an Austrian club or in an Austrian festival after the pandemic. **In rich markets, a single club show has a larger budget than the entire budget of an album of 10 songs.** Many artists treat visibility in radio and streaming platforms as a marketing tool to sell their live performances.

1.3.1 ARTIST GOALS

If the goal is to increase the value-added, income, and employment in the Slovak music sectors, then better defined, observable, and market-friendly targets are needed. It is notable that an increase of use and consequently royalties can be achieved with better playlisting and more listening hours, not only with a higher market share. On the other hand, an enforced music mix that the audience does not like can decrease the income. If the local content guidelines impose a playlist that makes the audience switch to unregulated alternatives, for example, from radios to YouTube, then the policy effectively works against its goal.

Another problem is that a Slovak market share can be monopolized by a single artist or producer, too. A playlisting that decreases the diversity of the Slovak repertoire use will make most of the Slovak artists and producers poorer.

1.3.2 CONTENT GOALS

The current local content regulation uses do not set any goals regarding the language of the music or genre, but it sets goals in the sung language. The use of the Slovak language currently cannot be monitored automatically.

- This generally favors music genres with lyrics (e.g. rock, pop, hip-hop)
- The goal discourages the use of instrumental music, such as classical or art music and many electronic/dance music genres
- It may discourage the use of sub-genres, such as Slovak indie rock, where the genre's audience may expect the song to be sung in English

The research behind this Feasibility Study has made us aware of the vagueness of the language definition. Our search for local listening patterns revealed instances of the use of strong dialectical varieties of the Slovak language.
The fluidity of language barriers between the users of the Slovak, Czech, Polish and Ukrainian languages makes this policy potentially problematic to enforce, for example, in various types of folk music.

1.3.3 DIVERSE AND MEASURABLE TARGETS

Whether using self-enforcing algorithms or via regulatory monitoring, reaching targets requires measurement. Our Feasibility Study presents some ideas along these lines, suggesting that some mechanisms are easier to measure and enforce than others.

New artists and specific audiences face a similar problem: big data algorithms are learning from millions of users and millions of songs that may be very different. For example, both Spotify and Deezer originally relied on the One Million Song dataset, which did not provide much information about specifically Slovak music. Recommending songs to a new user, recommending a new artist, or making recommendations in a new national culture are similar cold-start problems. Since the algorithm does not know the artists or the user's history, it struggles to offer meaningful and valuable recommendations.

Artists that are not "learned" by the algorithm, or artists having too small of a following audience, might be "buried" under recommendations that favor more popular artists or those coming from bigger countries. Understanding the cold-starting problem is important for all policy targets, in part because it is a shared problem with radio playlisting, but also because it can have disastrous short- and long-term consequences for the market presence of the Slovak repertoire in streaming platforms.

Research into this problem suggests that overcoming the cold-start problem can be best done with a combination of bringing in more information about both the artist and the music recording itself. This is hardly surprising: while the recommendation engines are, for practical reasons, mainly artist recommendation systems, providing an accurate description of lesser-known artists and their music helps to better place the artist on recommendation lists *(Oramas et al. 2017).*

Our **Feasibility Study** exclusively uses artists released on Spotify and the Spotify recommendation system. Our choice was based on the fact that Spotify has a very useful and open API that allows for the creation of new recommendation engines *(See for example: (Pérez-Marcos and Batista 2018).)* While YouTube currently plays a bigger role in Slovakia than Spotify, YouTube's recommendation system is mainly a video recommendation system. Understanding the problems of Slovak presence on YouTube brings up further problems. in addition to the ones that we can highlight with Spotify-based examples.

2 TARGETING MARKET OUTCOMES

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About 20 years ago, about 50-100,000 songs and recordings were available in all record shop inventories in Slovakia. The radios and the TV stations played about 20-40,000 songs and music works in a year. The few thousand new recordings released on maybe a few hundred albums that were made in Slovakia each year had to find their audience in this competition.

In 2019, most of the record shops are closed, and media platforms such as YouTube and streaming platforms such as Apple Music, Deezer or Spotify (together: digital streaming providers, DSPs) give access to 50-100 million songs. Radios and individual ever more often base their music choices on the recommendations of algorithms, because no human has the time to review millions of sound recordings. The new Slovak music became a small drop in a vast ocean. In 2015, the cultural policymakers realized this change and introduced mandatory national quotas in one important channel of music distribution: radios.

While our research questions are mainly connected to the impact of the national radio quotas in Slovakia, we consider a wider policy agenda than broadcasting quotas. In our understanding, the radio quotas should be the parts of a broader local content regulation and promotion scheme that do not exclusively target radio broadcasters. Instead, the local content promotion should help the visibility and income-earning potential of Slovak artists and their music in various uses, including broadcasting, re-transmission, streaming and live music.

The music discovery age of people is generally the age of 15-23 years, when people are forming their own identities and discovering new music. Reserach shows that most people keep listening to the music they discovered in these years, or very similar music throughout their lives.

In 2020, new music is mainly discovered on the video streaming platform YouTube and increasingly on DSPs like Spotify, Deezer or Apple Music, and not on radio or music television. Streaming platforms offer fully personalized recommendations. Understanding how these recommendations work are crucial to understand the market position and future prospects of Slovak music. Streaming platforms use machine learning and deep learning algorithms to create a musical programming to their audiences. These big data applications offer a far more nuanced local content promotion scheme than simply creating volume quotas.

Our research is based on both radio broadcasting streams and streaming platforms, because they DSPs are more important for the future market position and audience of Slovak music than broadcasting. Their algorithmic, precise, measurable nature of their recommendation systems can give many good ideas to the creation of a better broadcasting regulation – decreasing the conflict with broadcasters and making an efficient monitoring and enforcement possible.

Our Feasibility Study is a small part of our research proposal made for the Slovak Art Council in 2019. With this Feasibility Study we would like to show the practical policy and music promotion benefits of our research program. We believe that the Feasibility Study itself will create useful input to the business and policy strategy forming in the Slovak music scene.

2.1 LOCAL CONTENT REGULATIONS

Local content regulations that aim to help the local music industry or assist in the cost recovery of subsidized art music must consider economic conditions. To target economic variables, such as the income of artists and producers, (gross) value-added or GDP-contribution, tax-base increase, or the increase of employment requires the use of an economic model to set measurable targets.

Such local content regulation must be compatible with the strategy of the creative and cultural industries and the competition policy.

The Slovak Music Industry Report used the three income-stream model, a model which is generally used in the US and the EU. It includes the publishing, recording, and live music sub-industries, which sometimes have overlapping players. In the 21st century, the recorded music industry has so little revenues that it usually relies on the revenues of the much larger live music segment – the segment that is hit most strongly by the Covid-19 pandemic.

Technically, the policy can be selective in helping one of the potential groups, but we believe that all three groups are likely to be impacted positively by any policy that enjoys broad support.

- Producers, i.e. neighboring rightsholders who invested into the fixation (recording) of the performance of music
- Artists, who can be the composers, lyricists, or the performers of the recording
- Small enterprises, freelancers, and employees of the music businesses.

In most cases, artists are self-managed, self-published, and they are small entrepreneurs who are composers, performers, and producers of their music. While this is the case with the majority of artists, this level of self-containment is mainly characteristic of part-time musicians with a relatively small audience and income.

Conversely, more popular acts or full-time professional musicians often have exclusive recording agreements with record labels for performing and recording their music, as well as publishing agreements for the representation of their compositions.

The creation of the recorded fixation of performance is the work of a record producer. It is rather commonplace that Slovak music is produced by a Czech producer – and of course, often Czech music is produced or performed by Slovaks.

Most of the contemporary Slovak music is popular music. In this case, the music usually has at least two authors, a composer of the musical work and the author of the lyrics. These works are put on stage in live performances and usually recorded at least once, but often several times in recorded performances. Sometimes the recorded performances are remixed, adding new layers and elements to the music. In some genres, for example, in classical music, jazz, and some electronic genres, the performers often play music which they did not compose.

2.2 PRODUCERS

Promoting music produced in Slovakia usually promotes Slovak artists. While many Slovak artists produce their music in France, the UK, or the US, there are very few foreign artists who produce their music in Slovakia.

Commercially released song recordings have an international identification for sales and royalty payment purposes, the so-called ISRC (International Standard Recording Code) number. The ISRC number is the international identification system for sound recordings and music video recordings, providing information about the recording's country code, registrant code (identifying a record label, for example), year, and unique identifier ID. [%https://www.usisrc.org/, https://en.wikipedia.org/wiki/International_Standard_Recording_Code%]

Measuring the market share of Slovak production is possible in both the broadcasting streams and their digital streaming competitors. In Slovakia measure the use of Slovak production SLOVGRAM and OZIS.

Our case study shows, however, that this is not a sufficient goal. Our findings suggest that a majority of Slovak language songs and music recorded by Slovak artists is not released in Slovakia.

- Promoting the SK range of the ISRC range will almost exclusively benefit Slovak artists, Slovak producers, and Slovak sound engineers.
- Identifying the use of the SK range can be automated and measurement is relatively simple.
- It is not a sufficient target, because most Slovak artists do not release their music in Slovakia.
- Encouraging more production and release in Slovakia would increase the value-added, employment, and income component of the Slovak music industry.

2.3 PERFORMERS

In the 20th century, recordings were usually financed and managed by record labels, who paid in advance for the royalties of recorded artists and represented the performer's financial interests. In the 21st century, very few artists have an exclusive recording agreement, the standard agreement of the 20th-century music industry. Individual performer rights became a highly contentious area because many artists are self-published, or because labels do not offer a standard exclusive recording agreement or financing of the recording.

Promoting the interests of recorded artists is very difficult because measurement and enforcement are virtually impossible. The nationality, ethnicity, and residence of artists are GDPR-protected personal information, and generally, it is not observable. Furthermore, rightsholder's heirs inherit copyrights and neighboring rights, but even the definition of the deceased artist's nationality, ethnicity, or residence may be very difficult to determine. The artists' nationality and residence, and even the ethnic identity or language use can change over time. Many Slovak artists started their careers as Czechoslovak nationals, for example, or they moved around in different countries.

In most genres, including classical, jazz, folk, and popular music genres, music is usually performed by a group of artists, and the group identity is even more difficult to define or measure. In our view, any policy that aims to help Slovak artists must be optional and allow a clear opt-in and opt-out mechanism for artists – i.e. only artists who want to be identified as Slovak, and have a good reason to identify as Slovak should be promoted by the local content regulation.

2.3.1 COMPOSERS AND LYRICISTS

In radio and television broadcasting (and re-transmission) collective management organizations separately measure and distribute royalties to composers (lyricists) and performers/producers.

This is not the case in digital streaming platforms, where neighboring rights are directly managed by the producers, and the author's rights are optionally managed by collective management – in Slovakia, by SOZA. As described above, in many genres, performers do not play the music they themselves composed. The separation results in diverging market shares and diverging measurable targets.

EXAMPLE	COMPOSER	PRODUCER	PERFORMER
Self-published band	Self-published band	Self-published band	Self-published band
Managed band	Publisher	Label	Band/Label
Classical ensemble		Label	Ensemble/Label

Measuring market shares is not straightforward because composers, producers, and performers may have different market shares. If a Slovak jazz ensemble records in Slovakia foreign jazz standards, and this recording is played on the radio, then the producers' and the performers' market share is increasing, but the composers' share decreasing.

On a more technical level, music has many uses, and the value of music is shared by the composer, the lyricist, the performers, and the producer. Some music is sold directly to end-users, other music is sold to business partners who 'package it' in the form of radio broadcasts, or films, or other products. Some music is performed live, and other music is performed in a recorded format. Following the methodology developed in the US *(Hull et al. 2011)* and adapted to the EU *(Leurdijk and Ottilie 2012*), we have created the necessary mapping and measurement fundamentals to measure market shares *(Antal 2019b).* We will rely on these measurements, but we need to make them more specific for policy and business key performance target setting.

It is very important to form a coalition similar to Music Sweden, Music Australia, Music Estonia, Music Canada for the promotion of Slovak music within Slovakia and abroad because different organizations have different (mandatory) targets and tools. While each organization, i.e. the Ministry of Culture, the Ministry of Economy, the Antimonopoly Office of the Slovak Republic, SOZA, SLOVGRAM, OZIS, Hudobné Centrum, Hudobny Fond, Womusk, Next // Advanced Music Festival, and LALA Slovak Music Export can play a role, their statutes and agreements set different targets.

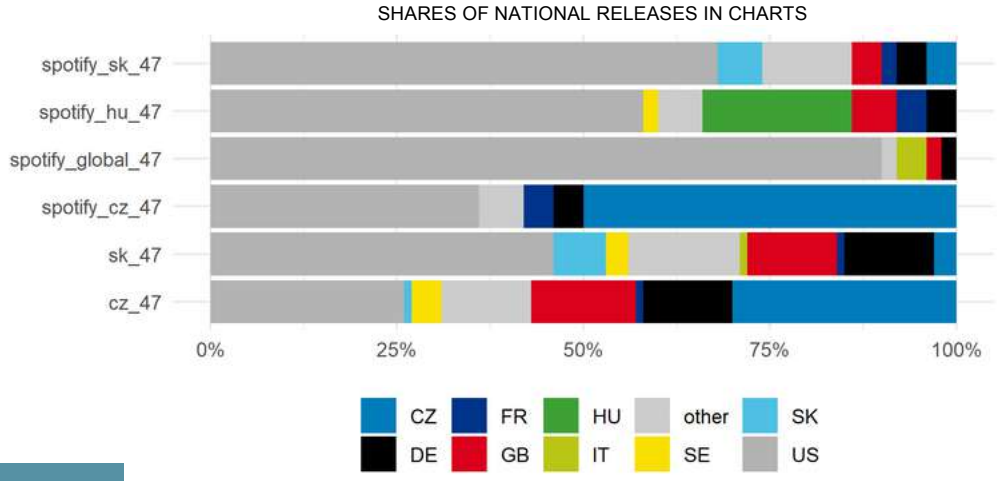
For example, SOZA & SLOVGRAM must represent domestic and foreign music on an equal footing, and their mandate is to increase revenue (with a higher volume of use, and at better prices), which aligns well with the economic ministry's or the competition authorities' toolkits.

The Ministry of Culture, Womusk and **LALA Slovak Music Export,** and various associations of musicians usually target the volume of use (visibility) and diversity of use. One of the most important criticisms of the current local content guidelines (mandatory "Slovak quota") is that it has no diversity component. Technically, the Slovak quota can be filled with a single soundtrack, produced in Slovakia with a partly "Slovak" band. Such an extreme view of the local content guideline does not meet the individual desires and targets of Slovak artists, producers, and publishers.

The future generation's use of the Slovak repertoire, and the future supply of new, fresh Slovak music, critically depends on the 15-24 age cohorts' access to fresh Slovak music. Because this cohort usually discovers music on streaming platforms and on live events, radio quotas alone do not make the position of Slovak music stronger in the long run.

Lastly, classical ensembles often play the music of composers who died before 1950 and their heirs are no longer eligible for the author's (copyright) revenue.

FIGURE 2.1: SHARES OF NATIONAL RELEASES IN CHARTS, 2020, 47. WEEK



Week 47: Slovak share on Spotify chart 6%, radio chart 7%
© Daniel Antal, Reprex BC, 2020

2.4 MEASUREMENTS

2.4.1 MARKET SHARE IN RADIO

We analyzed the IFPI ČR Hitparáda-SK-RADIO-TOP 100 and the IFPI ČR Hitparáda-CZ-RADIO-TOP 100 official charts compiled by *Česká národní skupina Mezinárodní federace hudebního průmyslu*, *z. s., i.e. ČNS IFPI* and compared them with the country charts compiled by Spotify.

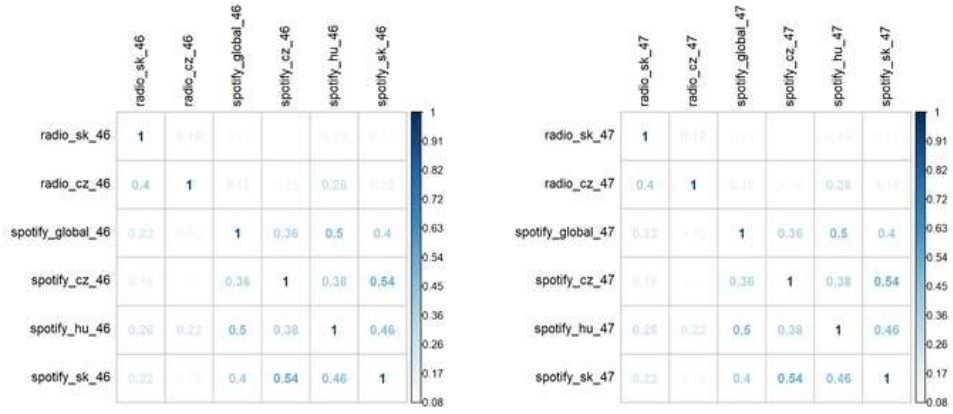
The national releases in Slovakia took about 6-7% of the places on the country's radio and Spotify chart. This ratio is far below the 20-50% domestic release shares in Hungary or Czechia.

In our Feasibility Study, we realized that most Slovak artists do not release in Slovakia. This is in line with our earlier findings in the Slovak Music Industry Report and the Central European Music Industry Report: most Slovak recording artists do not have a label representation, and if they self-publish, they likely publish abroad.

We don't know how much of the royalties eventually reach Slovakia, but the eventual GVA for the Slovak GDP is certainly lower than in Czechia and Hungary, because however we measure the market share, it is lower, and some of the income will remain with foreign entities that register the recording.

The low share of the radio presence is likely to be a chicken and egg problem. Radio plugging or promoting songs on radios is usually a task for a label or a talent manager, and most Slovak artists do not rely on the services of a label or a talent manager. Unless they get help to do this, or radios themselves actively search for Slovak music, the situation is unlikely to change.

FIGURE 2.2: SHARE OF SONGS ON CHART APPEARING ON OTHER CHART



Radio stations still largely rely on human curation, even though human curators are more and more influenced or helped by algorithmic recommendations. The Slovak and Czech radio charts are 40% the same in weeks 36-47, but only overlap with about 20% of the country charts on Spotify.

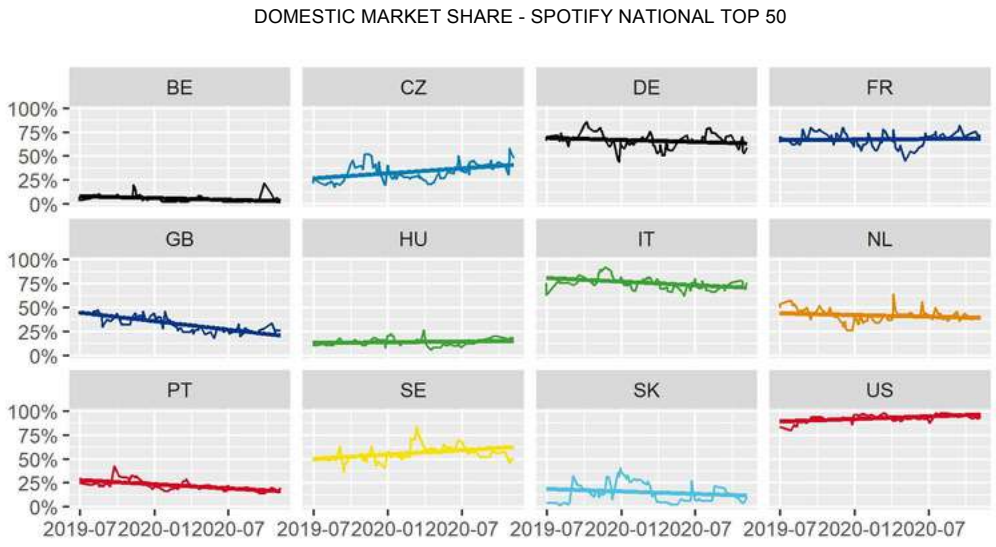
2.4.2 MARKET SHARE IN DIGITAL STREAMING

The market share of the domestic repertoire has been steadily low, and slowly decreasing on Spotify's Slovak Chart. We used a very simple Slovakness definition (see in more detail @(slovakness)): songs with an ISRC code registered by SLOVGRAM.

The market share based on release country underestimates the Slovak market share. In week 47, only 6% of the releases were Slovak, but 15.5% of the artists that we could identify on the basis of our **Demo Slovak Music Reference Database.**

The situation is similar to that in Hungary and Poland and dissimilar from Czechia and Sweden. While this is a rather crude measure of market share, we believe that it is a better definition than it seems.

FIGURE 2.3: DOMESTIC MARKET SHARE ON SPOTIFY NATIONAL TOP 50 CHARTS



Source: Spotify National Top 50, © Daniel Antal, music.dataobservary.eu, 2020.

Music distribution and collective royalty distribution experience say that the top 50 songs may represent 70-90% of the total payouts, so the total payout in Slovakia for all Slovak producers may not be very different.

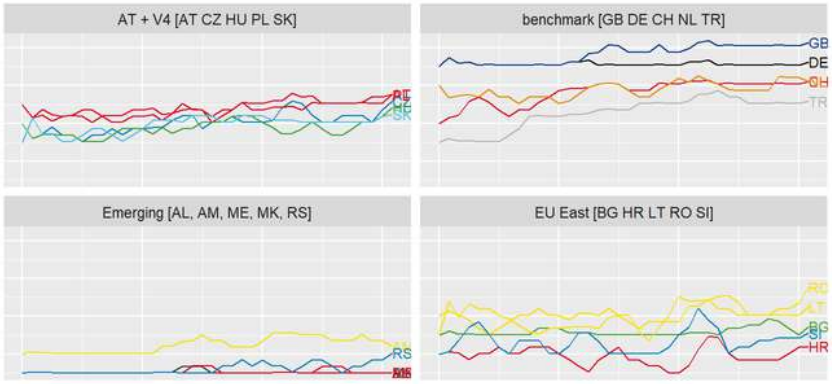
In the **4.2 Chapter** of the **Central European Music Industry Report 2020** we have shown the volume growth for a typical Slovak song in comparison with some developed countries. This chart relates most to the Spotify Top 50 chart because it shows streaming volumes (number of times the song was listened to) and not values (royalty payments – see in bibliography: *(Antal 2020a).)*

For a *Typical Slovak Song,* the number of plays was very slowly increasing and eventually reaching the level of Dutch and Swiss songs. The streaming volume of the *Typical Slovak Song* was growing throughout the period, but so was the actual number of active users and subscribers. Based on the charts released by Spotify and CEEMID-CI Indexes, it is likely that new audiences were less likely to listen to Slovak music on Spotify.

For a Typical Slovak Song, the total payout was flat throughout time. The actual income of a stream depends on many factors: from a cultural policy point of view, visibility (volumes) matters, while from a creative industry policy or competition law perspective, it is the payout and not the volume that is an important consideration.

FIGURE 2.4: STREAMING QUANTITIES FOR TYPICAL SLOVAK SONG IN COMPARISON WITH OTHER EUROPEAN SONGS

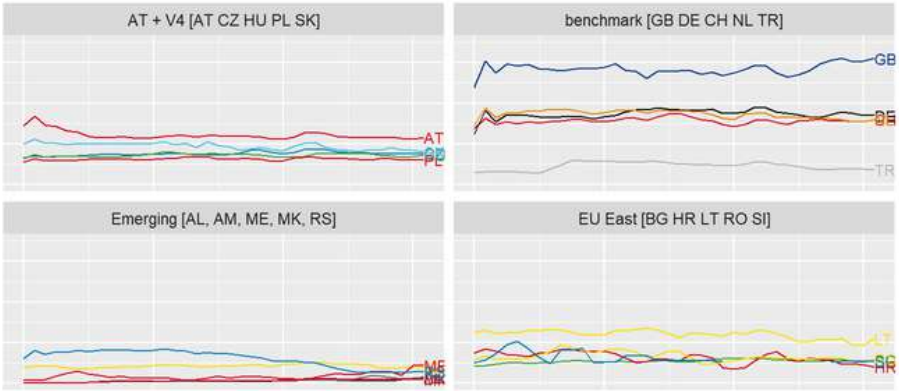
TOTAL STREAMS* OF MEDIAN (TYPICAL) SONG



*Apple Music + Spotify, postupné mesačné sumy v priebehu troch mesiacov
Source: Central European Music Report by CEEMID & state51 © 2019

FIGURE 2.5: STREAMING ROYALTIES FOR TYPICAL SLOVAK SONG IN COMPARISON WITH OTHER EUROPEAN SONGS

TOTAL STREAM INCOME* OF MEDIÁN (TYPICAL) SONG



*Apple Music + Deezer + Spotify, rolling monthly sums of three month
Calculated at reporting and exchange rate in GBP
Source: Central European Music Report by CEEMID & state 51 ©2019

2.4.2 FULL STUDY PLANS

Measuring the market share via charts is a good proxy and first approximation, but says little about the situation of a typical, independently released Slovak sound recording. To provide a better picture, we need to sample a large number of royalty statements from all segments of commercially available repertoire (hits, typical songs, and never played songs.)

We are planning to use CEEMID's indexing methodology, based on the creation of stock and bond price indexes, and find a large enough music distributor to provide reliable indexes for the Slovak market for Apple Music, Deezer, YouTube, and whatever digital platform is relevant in the future.

3 DEFINING SLOVAKNESS

3 DEFINING SLOVAKNESS

Recalling **the recommendation systems** from 1.2, we should focus our attention on utility- or knowledge-based recommendation systems. Both systems require a pre-recorded database that defines various features, or levels of "Slovakness".

A simple system may-be knowledge-based, and identity, monitor, and promote artists', producers' works or released songs from **the Comprehensive Slovak Music Reference Database.** We would recommend this system for the enforcement of Slovak radio quotas as a *minimum requirement*, with voluntary adoption of an *optimal Slovak content promotion program.*

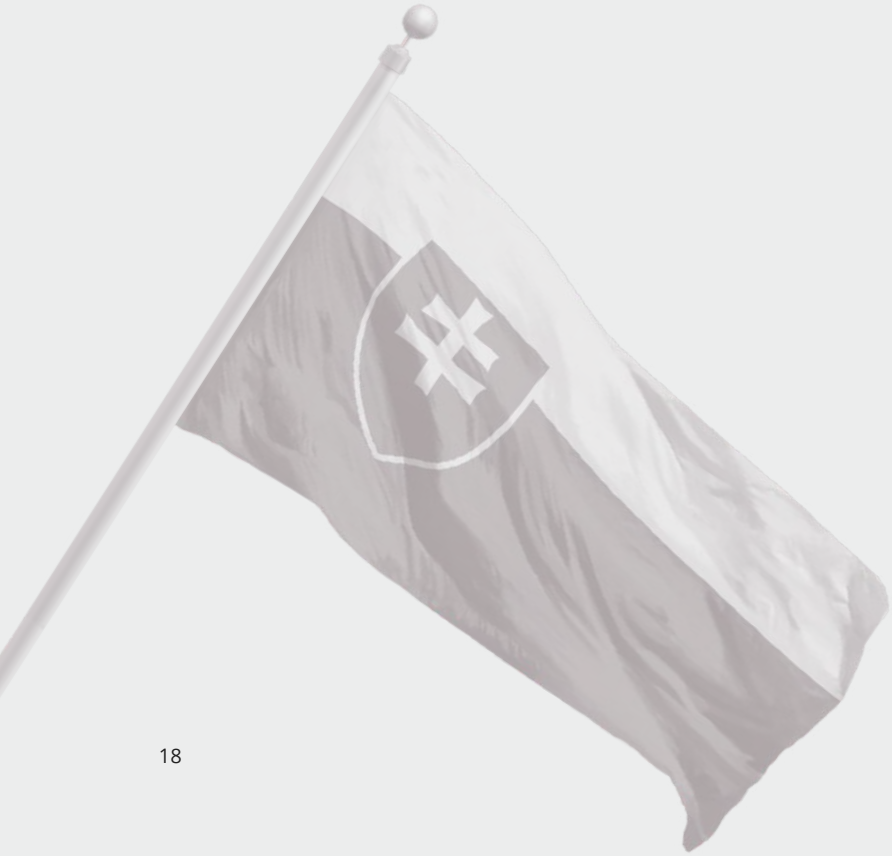
Even a simple system should have a more sophisticated rulebook because there is a risk that it would only promote a single or few Slovak producer's or artist's work. We would therefore be the proponents of the use of utility-based recommendation systems to help new music discovery applications, playlisting in radios and streaming platforms, and setting content guidelines for public broadcasters.

A utility-based system ranks candidates of songs to be played from a playlist on the basis of how much they are useful for pursuing the goal of promoting Slovak music. For example, a song that has a Slovak performer and which is sung in the Slovak language may be preferred over a Slovak performed song sung in English. Or, the system may prefer a Slovak-language song produced in Slovakia over a Slovak-language song produced abroad, because it contributes more to the economic viability of the Slovak music ecosystem.

The utility-based systems should not be made mandatory for radio editors; however, their use should be incentivized. For example, we would like to create an algorithm in our research project that recommends songs that both fulfill the minimal quota-requirements and consider the song's utility from the broadcasters' point of view, i.e. to what extent does the song fit into the general playlist and style of the broadcaster. Radio editors often complain that they cannot fulfill the Slovak quota because they cannot find recordings that their audience likes. Our research shows that Spotify, and probably other DSPs, do find Slovak songs for their audiences that they like with the help of complex machine learning-based recommendation systems. We believe that making such tools available for radio editors would help the self-enforcement of the quota and reduce the conflict between legitimate broadcasting corporate/editorial and cultural policy goals.

The definition of Slovak content is often connected to a Slovak performer or Slovak composer – and implicitly, to Slovak producer – because identifying Slovak music genres from a musicological point of view, or Slovak lyrics from a language use point of view is difficult to measure and enforce.

The current regulation is partly content regulation because it promotes the use of the Slovak language. Slovak artists residing in Czechia or authentic folk musicians of Slovak ethnic minorities abroad (for example in Hungary), are included in the Slovak quota, even though they may not generate any artist or producer income inside the country. Current regulations do not include the production of ethnic Hungarian musicians singing in Slovak or English in Slovakia. Promoting Slovak content usually, but not always, goes hand-in-hand with the goal of creating more taxable income or jobs in Slovakia.



3.1 ARTIST AND PRODUCER FEATURES

3.1.1 PRODUCERS

As described earlier, each commercially released sound recording has an ISCR identifier number, which starts with a country code. We interpret a sound recording to be produced in Slovakia if it starts with the country code SK. Any ISRC number that starts with SK refers to a sound recording producer who is registered with SLOVGRAM. The ISRC numbers, similar to book IBAN codes, are not fully centralized. SLOVGRAM provides a range of possible code numbers to producers that are registered with SLOVGRAM, but they can assign the actual numbers to each new recording themselves. These recordings are usually produced in Slovakia, but nothing prevents Slovak artists to work with a foreign producer or label. While a song that has an ID starting with SK is usually made in Slovakia, many Slovak songs are released abroad – so observing the SK identifier in the ISRC code underestimates the Slovak market share. If SLOVGRAM does not get a mandatory copy of this recording, then we do not know that a particular ISCR code is already used.

3.1.2 PERFORMERS

The potential artist features of nationality, residence, and ethnicity are GDPR-protected personal information. They are not straight-forward for artists who already died (and may have never been nationals of the Slovak Republic, for example.)

Nationality:
IFPI ČNS uses a Czech or Slovak national criterion for its "national" charts. We know (with some level of certainty) the nationality of an artist (or the majority of an artist's group) if they were ever placed on the Slovak or Czech national IFPI ČNS chart.

Residence:
This is a definition used by the Slovak legislation, however, we have no information about this GPDR-protected information, and this information does not make sense for deceased artists (we could use their last known residence, for example, if that information were available.) However, many artists publicly identify with their city or region. If they make this information public, then we can use this criterion. We either explicitly asked artists to reveal this information, or we observed this information from their official Wikipedia biographies.

Ethnicity:
This is another category of GDPR-protected, sensitive personal data. Nationality and residence alone would exclude authentic Slovak folk music from Czechia, Hungary, Poland, Serbia, and Romania – although the current legislative quota implicitly includes it with the language identifier.
Instead of using these three problematic characteristics, we propose the use of an opt-in, opt-out Slovak self-identification with a regulated write-in for artists who not alive at the date of the creation of the database.

3.1.3 COMPOSERS

Connecting sound recordings (which are played on the radio or on a streaming platform) through their ISRC with music works identifiers (ISWC) is far from simple, as it can lead to partial or erroneous connections. We believe that only the manual recording of observations (and artist filled-in, optional information) can be used.

3.2 CONTENT FEATURES

The **linguistic distinction** is often unclear: for example, in hip-hop, artists often produce songs together that have both Czech and Slovak language parts. Many sub-genres of indie, pop, and electronic dance music, for example, are expected to be sung in English, and some classical song forms in German or Latin. Many classical, jazz and electronic genres are instrumental and are thus excluded by a language-based quota.

The same goes for the **musicological.** In classical music, a symphony follows the rules of a symphony, which is universal, not a nationally defined pattern. A string quartet is made of more or less the same four instruments. The extent to which national identity can be extracted from formal musical features alone is at best a matter of contention; at worst, it leads to oversimplifications that verge on caricature.

3.2.1 USE OF SLOVAK LANGUAGE

The *use of language,* though targeted by the quota, is currently not monitored or enforced because there is no technical solution for it. Radios either use fingerprinting technology or composer and producer metadata about the music, which does not record the language. Digital streaming providers distribute income based on ISRC (producer) and ISWC (composer) codes, and they also do not record the language of the song.

Because both sung and musical language use is very difficult to observe automatically (or manually in large quantities), we believe that any content promotion must be connected to pre-recorded data about characteristics of content features, such as the language used (in the cases in which this data has been registered by the producers of recordings) or the genre of the music. In case the music work that is the basis of the sound recording is registered with SOZA, then the language of the lyrics is available in the database. Our [Slovak Music Industry Report 2019] however found that many artists, particularly the lesser-known ones who do not expect radio plays and related revenues, do not register their works.

3.2.2 SLOVAK GENRES & SCENES

The definition of *Slovak music* from a *musicological* point of view would be highly contentious and even more difficult to measure. For example, it may be true that Slovak folk music uses more similar instruments and melody patterns to Czech folk music than Javanese or Japanese folk music, but in classical music, jazz, or popular music, such generalizations would not necessarily work. Certain genres conform to certain formal conventions globally, which makes the identification of national features through musical analysis alone virtually impossible. In popular music, Slovak indie bands may use very similar instruments and melodic patterns to their German or Dutch peers, and very dissimilar from Slovak jazz or Slovak classical music.

Our research shows that Slovak musicians do have identifiable musical language characteristics — we use them in our demo application. But they are only useful in identifying differences within a certain genre. We know that Slovak hip hop can be more easily placed in a Czech context than in an American context. They help make better recommendations, but they are not characteristic enough for a more definitive, quota-like definition. We can say that certain music would be more likely to be loved by a Slovak audience than an Australian, but that is not a strict definition of being "Slovak". Our notion of *Slovakness* is a fuzzy concept where some music is closer and others are further away from music composed, performed, produced, and listened to in Slovakia.

Perhaps one of the less problematic Slovak genres is Slovak folk music, where *Slovakness* is a relatively well-established and described concept. But authentic Slovak folk music is very rarely played on mainstream radio stations or featured on popular streaming playlists – so the regulation should not be very specific for this type of music.

3.2.3 INDIRECT FEATURES FROM ARTIST IDENTIFICATION

The current local content regulation uses both artist and content-based support for Slovak music. This makes the use of the recorded artists' or composers' self-identification a natural proxy for the music content, too.

Content features could, with appropriate legislative and data protection safeguards include the nationality, residence, or probably even the ethnicity of the artists, but this would be highly impractical. Instead, we propose that a voluntary database mainly based on voluntary opt-in, opt-out. We are providing a demo version for this in the next subchapter.

It would be difficult to imagine a Slovak music quota that does not include the works of Eugen Suchoň, Alexander Moyzes, Alexander Albrecht (who was born in current Romania and died in the Slovak Republic of Czechoslovakia), or the recordings of Marian Kochansky or Peter Dula. An exception to the opt-in, opt-out mechanism should be made for artists who died before the introduction of the system. In this case, GDPR protection does not apply, but the opt-in and opt-out must be exercised by others. We believe that either the heirs, representative organizations of artists, or musicologists should have a mandate to write-in not living artists or works into the database.

3.3 VYTVORENIE PRÍPADOVÝCH ŠTÚDIÍ RÔZNYCH DEFINÍCIÍ "SLOVENSKOSTI"

Using various **measurement methods** and **Slovakness definitions**, applied in the **reference database** we will create short market studies of the market shares and competitive position of the various definitions of Slovak music in radios, streaming and media platforms, and in concerts as a reference point.

4 COMPREHENSIVE SLOVAK MUSIC REFERENCE DATABASE

4 COMPREHENSIVE SLOVAK MUSIC REFERENCE DATABASE

Originally, we tried to get support for this project in a Visegrad region context project, because the entire Slovak music repertoire is not large enough to solve some of the problems that we are describing in this Feasibility Study. The Slovak repertoire is a drop in the ocean of global music, competing with 50-100 million foreign tracks. To understand the problems and solutions, we must not only focus on the trivial differences of the Slovak repertoire and the American or Latin-American global hits, but also on the more subtle differences between Slovak and Czech, or Slovak and Polish, or Slovak and German music.

Because a regional, larger project was not funded, we relied on volunteers and our own team to build a larger testing database than our Demo Slovak Music Reference Database. For the purposes of our case studies and the Demo app, we added the non-Slovak Listen Local Databases to our testing database. (The Slovak Listen Local volunteers were added to the Demo Slovak Music Reference Database automatically.)

4.1 LISTEN LOCAL DATABASES

We downloaded the biographies of all biographies of Czech, Slovak, and Czechoslovakian English language biographies from the English version of Wikipedia, together with some randomly selected artists from other countries, with a heavy emphasis on some European small nations, including the Visegrad countries, Belgium, Estonia, the Netherlands, and Switzerland. We selected those artists where we had access to relatively full biographies, and whose music was released on Spotify.

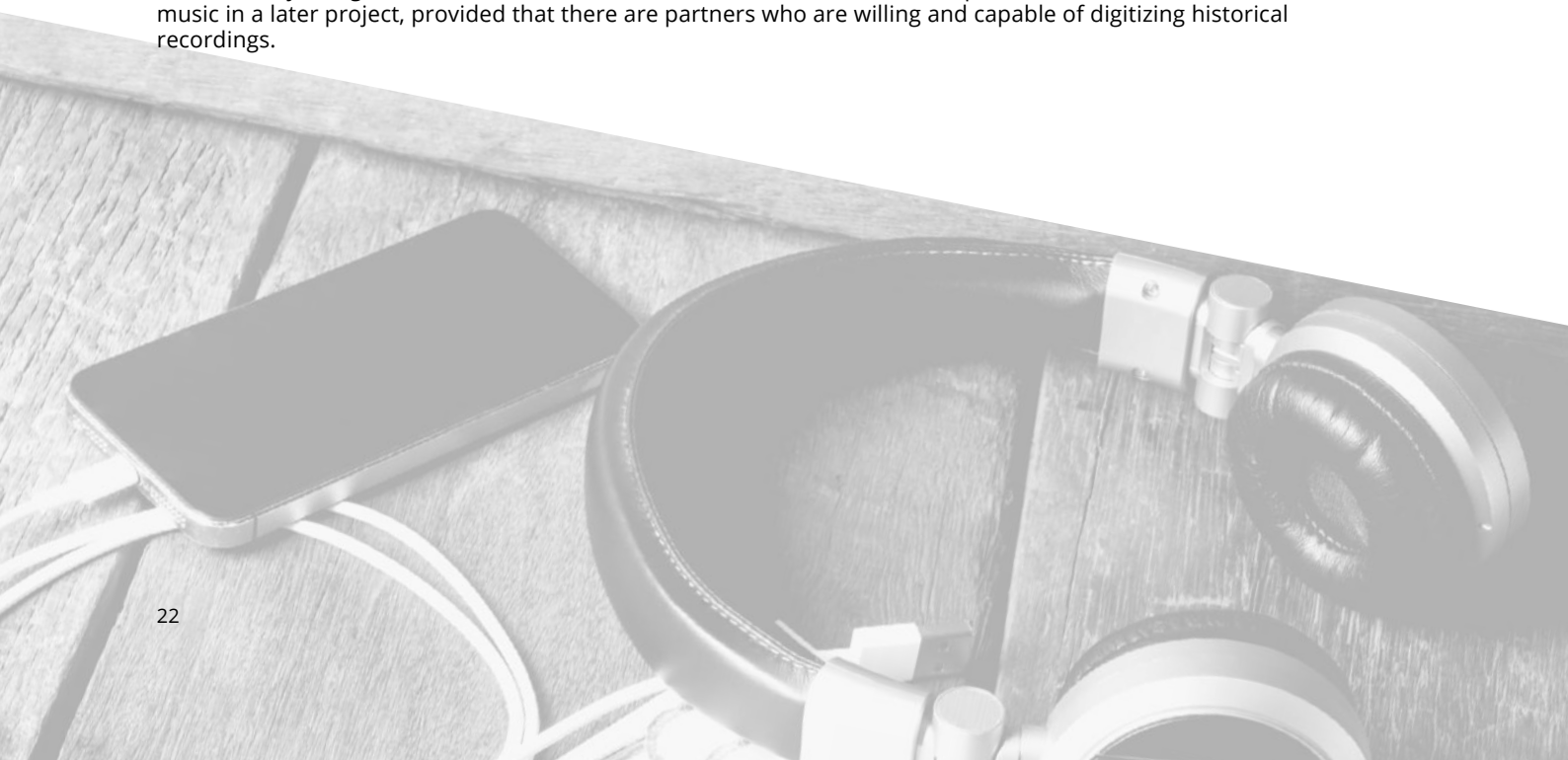
We asked volunteering artists and bands and their labels to fill in a simplified biographical form, including the language of their act and their self-ascribed genre labels if it was not an instrumental act.

4.2 DEMO SLOVAK MUSIC REFERENCE DATABASE

Compiling a music reference database enriches our study, as it aggregates dispersed data and places it in one place for analytical research. While this phase of the project is still in its nascent stage, we envision putting this reference list to multiple purposes, allowing:

- A demonstration of various aspects of **“Slovakness”**
- A demonstration of the **richness** of Slovak works, performances
- A demonstration of the peculiar taste and identification of Slovak audiences in comparison with foreign audiences (what are the musicological differences between Slovak, Czech, Austrian, German music, and audience preferences).
- Various measures of popularity of each music, for example, number of streams or interactions on various digital platforms

Importantly, this database will be used as an input for further experimental stages of this project. The reference database will not be aimed to be comprehensive, i.e. we will not aim to include music that is currently not available commercially in digital format. However, the database can be further developed to archive the entire Slovak recorded music in a later project, provided that there are partners who are willing and capable of digitizing historical recordings.



4.2.1 ARTISTS

- A voluntary opt-in table filled out by Slovak artists. We believe that this should be the best way forward, with a few more questions added in the comprehensive version.
- We tried to machine-read (scrape) several Wikipedia categories–including “Slovak male singers”, “Slovak female singers”, “Estonian male singers”, “Estonian female singers”, “Hungarian male singers”, “Hungarian female singers” among others–and manually paired artists with their Spotify identifiers and other related information.
- We queried a large number of Slovakia-relevant playlists and tried to identify potentially Slovak artists on the basis of release country (SK or not), the language of song titles, and the artist(s). A very high number of queries were narrowed down and manually controlled by a native Slovak-speaker musicologist at SOZA, Dominika Semaňáková.
- The voluntary part of the database contains some biographical elements and some target elements (e.g. where artists would like to find new audiences.)
- The comprehensive database should contain more features, including international identifiers–such as the International Standard Recording Code (ISRC), the International Standard Musical Work Code (ISWC), the Global Release Identifier (GRid), the International Standard Music Number (ISMN), and the Global Trade Item Number (GTIN)–that make it possible to find the artists in various databases, libraries, and sheet music repositories, among others.

4.2.2 SOUND RECORDINGS

- In the demo version, we chose the 10 most popular songs of each artist in November 2020. This should be extended to all commercial releases in the comprehensive version.
- We identify the recordings with their ISRC codes as well as with their Spotify track IDs.

4.2.3 MUSIC CONTENT

- We used a normalized self-description of genres, attempting to create the largest number of links between the genres artist identify with and those which are used by streaming platforms.
- We used audio features for each track extracted from the Spotify API (Application programming interface)

4.2.4 LYRICS

- We used to titles of the songs in the database to identify the language of the song. In the comprehensive database, a more thorough identification should be used.

4.3 DEMO APP

Recommendation engines used by DSPs, radios, festival promoters use machine learning. The machine learning algorithms are trained on well-documented training databases. In our view, these training databases are lacking in detail for the non-prominent, locally relevant repertoires like the Slovak.

Our approach builds on the well-documented experience with the **Million Song Dataset** of **Labrosa at Columbia University** and the former EchoNest, a music research company acquired by Spotify in 2014 *(Bertin-Mahieux et al. 2011; Bertin-Mahieux 2011; Lasar 2011).*

- We wanted to understand what brings certain music to Forgotify. Forgetify is a playful application that only recommends listening to songs on Spotify that have never been played – not even by the artist's brothers and sisters, daughters, mother. Our aim is to avoid Slovak music **ending up on Forgotify.**

- We started a reverse-engineering of the existing Spotify recommendation engine, trying to iteratively reach existing Slovak or global hit lists (or mainstream user demand) via a series of Similar Artist Recommendations starting from items in our **Demo Slovak Music Reference Database**. We realized that much of the Slovak database is either a closed system, or it is unknown to the Spotify algorithm, so we had to design a mapping between the global, mainstream database and the Slovak database.

- We created an opt-in database with a slightly subjective write-in process to create a training database of Slovak music, i.e. the Demo Slovak Music Database. (See in Annex: **opt-in process, write-in process**.)

- We created several iterations of a reverse-similarity procedure, technically changing the direction with certain parameters the Spotify artist-based recommendations (See in Annex: **similar artists.**)

- Using the genre classification system used in Every Noise at Once (Johnston 2018), we used a relatively consistent, and Spotify-based English language genre description system. We created a distance matrix for "Slovak" genres and other genres. (See in Annex: **recommendations based on genre.**)

- Using Spotify's analytics system derived from the former EchoNest database, we accessed the quantitative musicology features of the artists' entire repertoire. We added these features as recognized by the analytics machine learning application.

- We only recommend the 10 most popular tracks of each artist in the Demo Slovak Music Database (See in annex: **popular tracks**). Our recommendation engine at this point does not utilize all the information about the tracks — we will refine the recommendations as soon as we have more music available.

Our approach did not aim to be comprehensive – it was meant to create a useful experience for the creation of a comprehensive, national sound recording database. Our aim was to create an algorithm that gives a reasonable chance for all artists in our Demo Slovak Reference Database to be recommended to a typical user.
The use of Slovak language in lyrics can be an important aspect. A reference list of all Slovak language works and recordings is necessary; otherwise, measurement in local, regional, and national radios is almost impossible, and it is also unviable on YouTube or streaming platforms.

In our simple experiment, we used Spotify's built-in developer feature to recommend a 'Similar Artist' to all Slovak artists recognized in our system. Recommendation tended to remain within a "Slovak bubble". **Experimenting with 585 small nation artists, including Slovak, Czech, Hungarian, Estonian, Dutch artists, we found that in about 15% of the cases the Spotify algorithm could not even name a single similar artist. Because most recommendations are based on artist similarity, we believe that these artists are at a competitive disadvantage when it comes to algorithm-driven sales, given that the algorithm just does not know them.**

4.3.1 TRY DEMO APP

First, you need to log in to your Spotify account with the app. The demo app only works with Spotify playlists. We have imported to our blog's own account the latest Slovak, Czech and Hungarian radio hitlists for comparison.

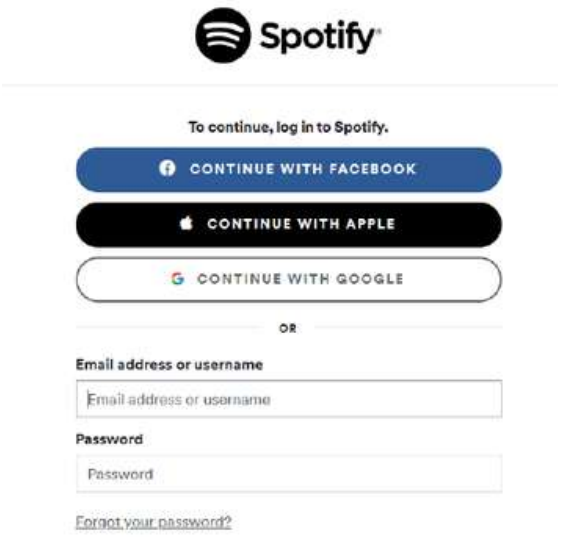


Figure 4.1: You are prompted to log in to your Spotify account

You can base your recommendation on any playlist you want – you can create a playlist to search for similar Slovak music, or use your pre-existing playlists, or import any playlist, for example, from our blog's **account.**

In this example, we have imported a Slovak indie playlist from ***"ahoj its anna".***

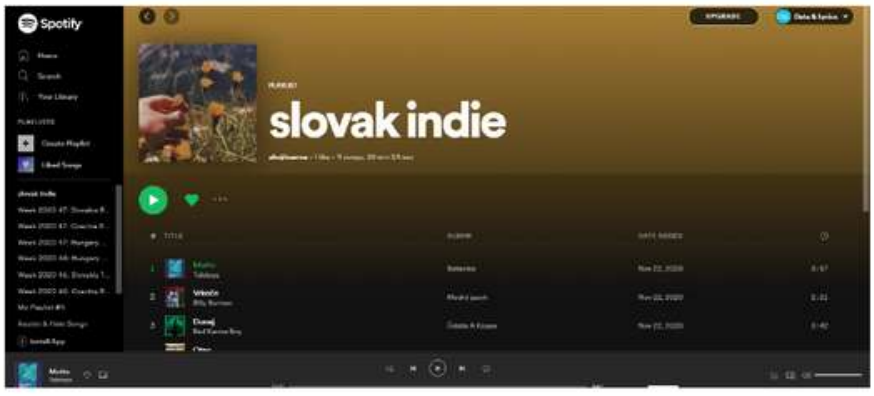


Figure 4.2: Import or create your base playlist, or use your existing playlists.

In our app, after login you will see your playlists. If you want to import more or create new playlists, you can do it in your browser or in your Spotify app on computer, tablet or smartphone. After doing so, press Refresh on the left-hand side menu in our app to see your latest playlists. You should select one of these playlists as a basis of the recommendations.

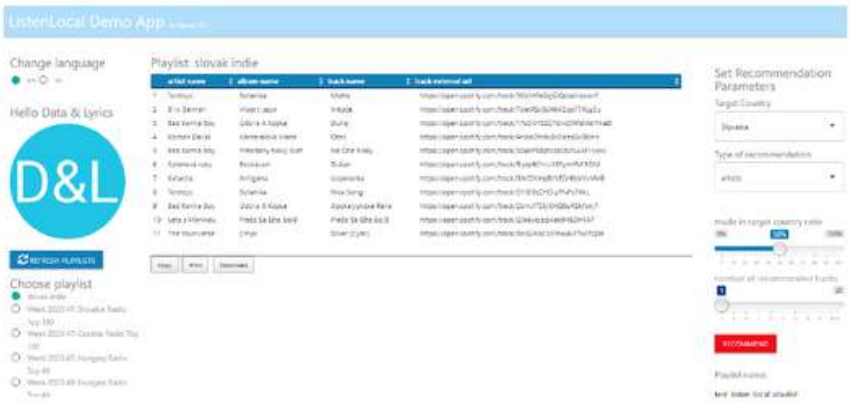


Figure 4.3: Load a playlist to the Listen Local App.

Figure 4.4: Create a recommendation

- The target country is where you want recommendations from – this demo app only works with Slovakia.
- The recommendation type is the type of 'personal' quota definition – should local (Slovak) songs be released in Slovakia, or they should be performed by Slovak artists or both?

Figure 4.5: Upload your recommendation to your Spotify account

If you are happy with your recommendations, you can upload the new list to Spotify to listen to it, or you can export the new playlist for documentation or further analysis purposes.

4.4 USE CASE: THE YOUNIVERSE

We interviewed Tammy Nižňanska for this Feasibility Study. Her band, formed with Jerguš Oravec, is a Bratislava-based Slovak band with aspirations to play abroad. You can read a part of the interview on our **blog.**

4.4.1 RECOMMENDATIONS AT HOME AND ABROAD

Tammy is a bilingual Slovak, who is more comfortable in the English language due to her upbringing than in the country's language, and against what she feels to be the expectation of the local audience, she sings in English. She feels that this is a disadvantage in Slovakia, where the audience relates more easily to a Slovak-language performance. It is, of course, an advantage abroad, but it is unclear where.

As we briefly introduced in Chapter @rep(recommendation-systems), the Spotify recommendation system uses information about the audience who listens to the songs of the Youniverse, similar artists to them, and various information that it finds on the internet or on the artist profiles.

This method is helpful to recommend Youniverse to Slovak Spotify listeners who listen to Slovak music, or who follow the Bratislava scene. In our experience, the Spotify algorithm tends to cluster The Youniverse with other Slovak artists. Conversely, this means that they hardly appear in foreign recommendations, and they are mainly recommended to the small audience of Slovakia-based Spotify subscribers.

We must recall again that Spotify's recommendation system (or YouTube's, or Apple's) sets goals that maximize the key performance indicators of Spotify, Google, or Apple. We do not exactly know what are these goal settings. Our Demo App, on the other hand, recommends The Universe to any listeners, regardless of where they subscribe to Spotify – our app is designed to recommend artists from a target country, in our case, Slovakia.

4.4.2 DESCRIBING THE MUSIC IN THE ENGLISH LANGUAGE

The Spotify recommendation system utilizes natural language textual information about The Universe. The most important, and less intuitive textual information about the Youniverse is the genre description. As Tammy Nižňanska says, it is not rock, pop, blues, hip hop, or RnB – it is a bit of all. One journalist once named it "dope pop" and she really liked that. However great a metaphor dope pop is, a machine learning algorithm will not get the joke.

We do not know what languages Spotify's system speaks, but we inclined to believe that it does not understand Slovak well. This means that Spotify will cluster The Youniverse on the basis of self-description and whatever information it finds about the band in English. Our Listen Local app utilizes genre descriptions only, but nonetheless, it does not understand dope pop. One of the most important tasks of the Demo Slovak Music Reference Database is to describe all commercially available Slovak music in English, so that other recommendation systems will make sense of it. We started this work with our musicology team, and we cannot emphasize enough the importance of this task. Artists, their managers, and labels do not necessarily have the skills to describe their music properly to be understood by the robots of Google, Apple, Amazon, or Spotify.

Figure 4.6: The Youniverse volunteered to present their data in this study.

4.4.3 DESCRIBING THE MUSICOLOGY AND AUDIO ENGINEERING FEATURES OF THE MUSIC

The Spotify recommendation system is based on the EchoNest systems which uniformly describe the contents of the music of The Youniverse. This information can also help The Youniverse if properly managed.

With the help of the Spotify/EchoNest system, we have analyzed the properties of the 10 most played Youniverse songs to understand how Spotify sees their music, and we contrasted this analysis with the distinctive song tracks of several hundred European cities. All over Europe, the most listened to tracks are the same global, mainly North and Latin-American hits, but each city has some distinctive favorites that local people listen to far more often than audiences elsewhere.

- We found that the most popular Youniverse songs fit in with the distinctive playlists of the audiences in Dresden and Potsdam in Germany, Kortrijk in Belgium, Brno in Czechia, and Lithuania.
- Clustering the distinctive songs of the cities and the Youniverse popular tracks, we found that their music is a very good fit in Flemish-Belgium, Lithuania, and potentially a contestable tour route could involve Bratislava, Brno, Kolín, Dresen, Potsdam, Hannover, the Ruhr, Utrecht or Gouda, Breda, Antwerpen, Ghent, and Kortrijk.
- At home, the music of The Universe fits relatively well with the Bratislava scene, where they come from, and Banska Bystrica, but it is very far from the listening habits of most of the Slovak countryside.

This information is particularly important because festival promoters and concert promoters were basing increasingly their booking decisions on the local social media and streaming strength of the acts before the pandemic. To get booked in Antwerpen, The Youniverse must show that it has a local audience, which can be reached on local radios and local playlists, or via recommendation systems that do not close them into a Slovak bubble.

5 PROMOTING SLOVAK MUSIC

5 PROMOTING SLOVAK MUSIC

5.1 STUDY ON PROMOTING SLOVAK MUSIC AT HOME & ABROAD

A very large part of the global music sales is driven by algorithms trained on big data through the recommendation engines of Spotify, YouTube, and other services. Radio stations and even festival promoters increasingly rely on recommendation engines directly, or metrics based on social media and streaming service popularity indirectly.

For demonstration purposes, we started the development of a recommendation algorithm and application that helps radio editors or interested individuals to create recommendations based on an existing radio or personal playlist and achieve a Slovak quota of 0-35%.

Recommendation systems and algorithms follow goals set by the creator of the algorithm. In the case of DSPs and YouTube, this goal is proprietary and not fully revealed, or in some cases, kept entirely opaque. Recalling from 1.2, we must emphasize again that the **recommendation systems** used by DSPs often reinforce, for example, the loss of domestic market share, as we have seen in 2.4.2 **Market share in digital streaming**. Recently, Spotify announced that it is going to recommend higher frequency artists that are willing to forego a larger share of their royalties *(Spotify 2020)*. This approach just reinforced suspicion in the industry that the recommendations of the market's leading licensed streaming platform have never been fully "neutral" in the sense that they only relied on listening history. In cases of conflict of interests, it is not guaranteed that the algorithms are not manipulated.

To Spotify's credit, its algorithm is better documented and more accessible than the recommendation engines of Apple Music or YouTube. Our experience with the Spotify algorithm shows that it is generally unfamiliar with the Slovak repertoire. As we stated in 4 **Creating a reference database**, we believe that many Slovak artists are at a competitive disadvantage when it comes to algorithm-driven sales, given that the algorithm just does not know them.

Not knowing an artist is a self-reinforcing problem. When a DSP provider enters a new market, in our experience the local market share is very low, because the recommendation engines do not know the local audience's listening habits and know only a small part of the local repertoire. Because Slovak music is mainly played in Slovakia, the algorithm cannot learn from the experience of *mainly Slovak audiences selecting Slovak sound recordings.*

Our proposal in this Feasibility Study focuses on the creation of a well-documented **Comprehensive Slovak Music Reference Database** that allows newer and newer algorithms to get familiar with the Slovak repertoire, use machine learning to understand its features and create new recommendation tools that actually recommend them to the relevant radio editor, festival curator or personal user.

5.2 COMPREHENSIVE SLOVAK MUSIC REFERENCE DATABASE

Our approach is to publish an opt-in, opt-out **Comprehensive Slovak Music Reference Database**, similar to the publicly accessible **Million Song Dataset** that allows musicologists, tech startups, and interested parties to train new recommendation engines or self-curated their radio playlists.

At the same time, we would like to publish in a peer-reviewed scientific journal our experience and our, transparent algorithm-building methodology, and make accessible online at least one good recommendation engine for the use of Slovak music educators, radio editors, and interested private persons.

We would like to create an opt-in database and website that shows all Slovak language songs and musical works that are currently available on licensed platforms. Not all Slovak music is sung in the Slovak language. In popular music, the use of the English language, in classical music, the use of German, Italian or Latin language is frequent. *(See in Annex: opt-in process, write-in process.)*

Similarly, with opt-in features for performers and bands, ensembles, choirs, we would like to give them the opportunity to *identify* as being Slovak, and we would like to use their domestic residence (with their approval) as another reference point.

At last, we would like to connect these reference databases with existing lists of music industry identifiers, such as ISRC codes of the recordings and ISWC codes of the works. Furthermore, we will use musicological features (key, tempo, genre) and some quantified features (loudness, engineering quality) extracted from the waveform of the recorded music to further classify "Slovak" music.

One of the most important tasks of the database is to describe all commercially available Slovak music in English, so that other recommendation systems will make sense of it. We started this work with our musicology team, and we cannot emphasize enough the importance of this task. Artists, their managers, and labels do not necessarily have the skills to describe their music properly to be understood by the robots of Google, Apple, Amazon, or Spotify (See our **Youniverse Case Study**, particularly about analyzing the **self-description** of the band.)

5.3 SLOVAK MUSIC MONITOR

On the basis of the Comprehensive Slovak Music Database, a joint project of the Slovak collective management societies to report the actual market share of Slovak music productions, compositions, performances and lyrics in Slovak broadcast media and on key digital streaming platforms. As we show in chapters 2 and 3, the Slovak radio quotas currently are impossible to monitor and to enforce.

5.4 LISTEN SLOVAK APP: INCREASE DOMESTIC MARKET SHARE

Using modern statistical and data science tools, and the tools developed recently in music analytics and computer-aided musicology, we will show the current market shares and listening probabilities of various, smaller segments of Slovak music in Slovak radio and on DSPs among Slovak users.

We will create a similar algorithm(s) that are used by some radio stations, and which are used by DSPs and media platforms to personalize music promotion to users. This way we will demonstrate some theoretically important mechanisms of music discovery and music use and empirically important differences of Slovak and foreign audiences. From a music industry research point of view, we will show how automatization and robotization are affecting music sales, marketing, and the music business in general.

We will create machine learning / AI algorithms that will show how research project partners **Hudobné Centrum, Hudobný Fond, Womusk, Next // Advanced Music Festival**, and **LALA Slovak Music Export** can play a role, their statutes and agreements set different targets., or market players like tour promoters can select more appropriate touring and promotion destinations for any music featured in the reference database. The demonstration tools will be tested by our partners, and their experience will be added as case studies to the research website.

5.5 MUSIC EXPORT APP: BUILDING AUDIENCE ABROAD

Using modern data science and analytics, we will analyze which Slovak music features in the 'reference database' has a lower and higher probability of being listened to in some select countries, such as Austria, Czechia, Germany, and a few other countries that will show the highest likelihood of receiving Slovak music abroad.

Using modern statistical and data science tools, we will show the current market shares and listening probabilities of various, smaller segments of Slovak music in select foreign markets.

Please see our **Youniverse Case Study**, particularly about analyzing the foreign and domestic music fit of the band.

5.6 MUSIC DISCOVERY APP: MUSIC EDUCATION FOR THE MUSIC DISCOVERY AGE

Within the Granted project, we would like to build a tool specifically aimed at the 14-19 years old cohort, who play the most important role in the future market share of the Slovak repertoire. Scientific research shows that most people develop their music taste and listening habits between the age of 15 and 23 years when they are together with their cohort all day long in secondary and tertiary education institutions. Currently, the favored platforms of this age group give very little chance to discover Slovak music.

We would like to develop an application that would allow educators, music teachers, art's teacher, and even bands to playfully encourage the discovery of Slovak and diverse repertoires – because learning the appreciation of diversifying and familiarization with the local and Slovak repertoire is the only guarantee to long-term market share growth.

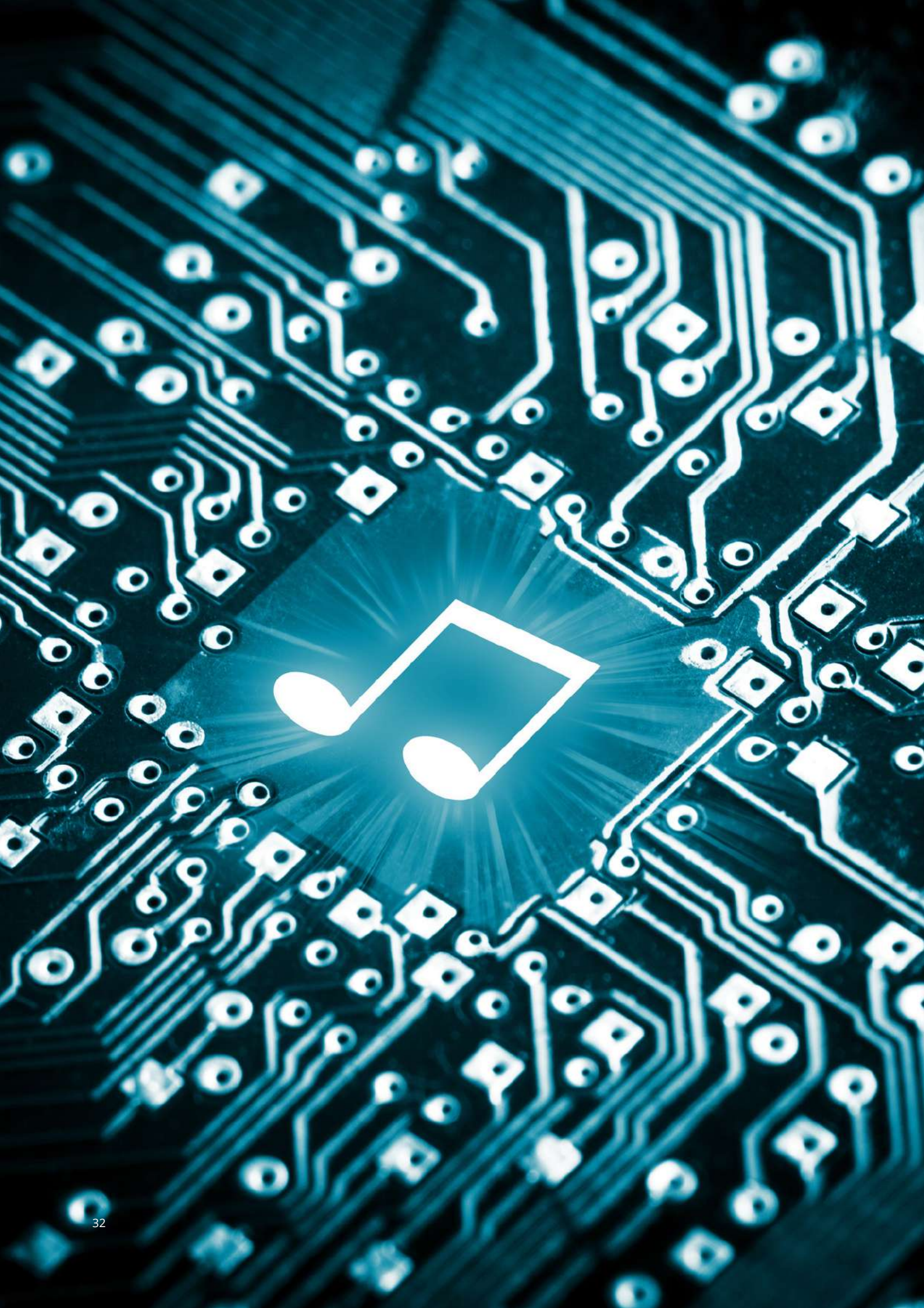
5.7 COOPERATIVE APPROACH

Big data requires lots of data. The competitive advantage of DSPs that drive most of the streaming data is that they have access to the listening histories of hundreds of millions of users, and can analyze at least 100 million song recordings.

We would like to finalize the Grant Research Program in an international collaboration with the **Listen Local Initiative** to create a large enough repertoire and user database. We find it particularly important to understand the nuances in differences between Slovak, Czech, Polish, Hungarian, and other European small-nation repertoires.

Within this collaborative approach, we would like to join the **Comprehensive Slovak Music Reference Database** with a similar database under the umbrella of the *Listen Local Comprehensive Music References Databases*. We believe that the Slovak database will be large enough to work in an international contest, and help to target foreign markets. To promote well the Slovak repertoire in Slovakia and abroad, we do not only need big data on Slovak and related repertoires, but we also need to collect data on the user experience.

Listen Local is aiming to build applications and games that playfully encourage the discovery of various repertoires, including the Slovak one. We would like to use these applications to transparently gather user data about how Slovak and foreign audiences make their choices about listening to a certain sound recording and not listening to another one.



6 ANNEX

ANNEX: DEMO SLOVAK MUSIC DATABASE

ARTISTS

OPT-IN PROCESS

The opt-in process was based on a voluntary questionnaire that SOZA and Reprex sent to various Slovak artists and labels. We asked age, performance maturity, language use and location specific questions about the artists.

WRITE-IN PROCESS

The write-in process was necessarily subjective, because we could not, and did not want to use GPDR protected personal information. The current broadcasting quota defines Slovak artists by residence, which is personal data that we do not have, and which is not applicable for deceased Slovak artists.

As an alternative, we created a long list of candidates to the database based on listening habits in Slovakia. We considered artists who appeared on radio charts, or who appeared on various, Slovakia-specific playlists on Spotify, or who described their music with the 'Slovak' adjective, like 'Slovak rock' or 'Slovak hip hop'. We read-in all the biographies of the English language Wikipedia in the Slovak female and Slovak male music performer categories.

We narrowed down this long-list with the help of a Slovak native-speaker musicologist, Dominika Semaňáková, to identify artists who should be 'considered Slovak'. The criteria of inclusion were publicly available city affiliation (where the artist or group works), birthplace, place of death, language of lyrics when applicable, language of the song or work titles and publicly available information about the artist.

The table SK_Artist_Recommendations_Analytics.csv summarizes the results of this process with our sample of [502] Slovakian artists. The following features are attached to each artist's Spotify ID:

- *popularity:* A number between 0 and 100 describing the artist's popularity based on stream counts.
- followers: An artist's total number of subscribers.
- *total_reccomendations:* The number of recommendations associated with each artist after three iterations of our algorithm.
- *genres:* Up to three genres associated with each artist.
- *any_slovak_release:* A value of 1 is assigned if the artist has released some work in Slovakia, 0 otherwise.
- *slovak_release_pct:* The percentage of works released in Slovakia.
- *any_slovak_title:* A value of 1 is assigned if the artist has some work with a title in Slovakian, 0 otherwise.
- *all_slovak_title:* A value of 1 is assigned if all of the artist's work is in Slovakian, 0 otherwise.
- *all_english_title:* A value of 1 is assigned if all of the artist's work is in Slovakian, 0 otherwise.
- *known_slovak_city:* Slovakian cities associated with the artist.
- *considered_czech:* A value of 1 is assigned if the artist is also considered to be Czech.
- *popular_song_titles:* A short selection of the artist's most popular songs.
- *latest_popular_releases:* The date of the artist's most recent popular releases.
- *url_1:* The artist's Spotify URL.

PROBLEMS

The Spotify engine knows no similar artist in the case of 76 artists (15.1% of all artists in the database). They are unlikely to be recommended to anybody in Spotify's system. The significance of this result cannot be overstated: these artists have virtually no chance of ever reaching new listeners via Spotify. These artists have a typical (median) popularity of 7 and a typical 13.5 followers.

Spotify's recommendation engine accepts three different types of "seeds" from which to generate recommendations: 1. Artists: An artist can be a seed that yields similar artists. 2. Tracks: A track seed can yield similar tracks. 3. Genres: A limited number of genres can be used as seeds that yield tracks (and consequently artists) related to that genre.

As stated above, our empirical exploration of Spotify within a small world of Slovak artists reveals that around 15% of the artists are not related to any other artists, and thus are closed from the greater universe of Spotify artists. Conversely, the tracks of this 15% of artists are unviable seeds: they do not yield any recommendations and are thus never recommended.

Our approach attempts to multiply the number of other artists to which an individual artist is related by attaching artists not only to their recommended artists (see fig. A) but also to the recommendations of its recommendations (see fig. B). We hypothesize that there are various reasons that might make a seed unviable for recommendations:

- This happens to artists with no tracks that are entirely their own (i.e. their only credits are as "appears on" guests in other artist tracks).
- This happens to artists with a low popularity score, which is dependent on stream counts. This an instance of a self-fulfilling prophecy: if you are unpopular to start with, you are likely to stay that way.
- There appears to be some genre-based bias: For instance, the artist Spievankovo *[https://open.spotify.com/artist/6EGqiGJnMfHsc0t3tTvOuR]* has a popularity score of 45 and as of 1 December 2020, 14,765 monthly listeners. At first blush, it appears that what could work against this band is that their genre is 'detske pesnicky', or children's music. Or consider the soprano, Luba Organosova *[https://open.spotify.com/artist/5fF0IYnGppi99zXfyYUoXq]*, with a popularity score of 28 and 16,347 monthly listeners as of 1 December 2020; her genre is listed as 'classical soprano.' As stated above, this is a preliminary hypothesis that we will continue to monitor as we further develop this project.

SOUND RECORDINGS TRACKS

The Demo Slovak Music Database contains up to ten sound recordings associated with 0 Slovakian artists, comprising a total of 3937 unique tracks. When the Spotify API is queried for top track recommendations, 19 artists do not yield any results. For each other artist, the following features are included:

• *popularity:* A number between 0 and 100 describing the artist's popularity.
• *followers:* The total number of subscribers the artist has.
• *genre:* Up to three genres associated with each artist.

For each track, the following features are included [Footnote 2: A full list of the data Spotify keeps for each track can be consulted at https://developer.spotify.com/documentation/web-api/reference/tracks/get-audio-features/]:

• *danceability:* An approximation to how suitable a track is for dancing, considering musical elements such as tempo, rhythm stability, beat strength, and overall regularity. A value of 0.0 is least danceable and 1.0 is the most danceable.
• *energy:* A perceptual measure of intensity and activity aggregating features including dynamic range, perceived loudness, timbre, onset rate, and general entropy.
• *key:* An approximate overall key for the track. Spotify expresses this in pitch notation, and here this is converted to the notation's tonal counterparts.
• *loudness*: Average loudness of a track in decibels (dB).
• *mode:* An approximation to a major-minor modality: 0 is minor, 1 is major.
• *speechiness:* Detects the presence of spoken words in a track on a scale between 0 and 1.0.
• *acoustics:* A confidence measure from 0.0 to 1.0 of whether the track is acoustic. Values above 0.5 are intended to represent instrumental tracks, but confidence is higher as the value approaches 1.0.
• *liveness:* A confidence measure from 0.0 to 1.0 of whether the track is live depending on the detection of an audience in the recording.
• *valence:* An approximate measure from 0.0 to 1.0 describing the musical positiveness conveyed by a track. Tracks with high valence sound more positive (e.g. happy, cheerful, euphoric), while tracks with low valence sound more negative (e.g. sad, depressed, angry).
• *tempo:* The overall estimated tempo of a track in beats per minute (BPM).
• *duration (ms):* Track length in milliseconds.
• *time_signature:* An overall approximation to the track's beats per measure.

We use this table to find suitable recommendations that link to Slovakian artists and consider a wide range of audio features, once coincidence based on artist similarity and/or gender similarity has been determined. One of the problems we encounter is that some artists are either entirely absent in the Spotify database or underrepresented in terms of findable songs and in terms of the likelihood an artist will ever be recommended.

ON RECOMMENDATIONS

RELATED ARTISTS

We created a reverse-recommendation of the Spotify algorithm. The original algorithm's concept is known to us (Jacobson et al. 2016) but not its details. Starting from a radio editor's playlist or any (personal or public) streaming playlist, the algorithm is likely to recommend less, and not more Slovak tracks. Our goal is, however, to reach a target ('quota') of Slovak recommendations, which, in many cases, requires an increasing number of Slovak tracks, often starting from 0 Slovak recordings in the starting playlist.

We followed a rather resource-intensive and simple reverse engineering process: we created the most similar artists for each Slovak artist in our database. Then we created a second iteration of the similar artists of the first similar artists. Then we created similar artists of similar artist's similar artists. Our hope was that the exponentially developing tree of similar artists will at one point find a match for a reference artist in the users' original playlist. If we did, then we started to replace the reference artist's songs with the Slovak artists' songs on the recommendation chain.

The file SK_Lookup_Table.csv contains data we generated by sending the Spotify IDs of 502 to the Spotify API (Application programming interface) in order to observe how many unique recommendations we could yield for each artist. We iterated through this process three times, in the following manner:

- For all 502 artists, we obtained the first round of up to ten recommendations from the Spotify API.
- For each of those recommendations acquired on the first round, we then obtained up to ten more recommendations.
- We repeated step #2 one more time.

The idea behind our process is that one criterion Spotify uses to recommend new songs is based on how similar an artist is to other artists. We wanted to examine what an iterative, exponential process would produce starting from Slovakian artists and fanning out to other similar artists according to Spotify.

This process has its limits. For example, starting with a Czech genre-specific playlist, we received many similar Slovak artists. Starting with a Dutch indie playlist, we found one Slovak indie artist in the chain. And starting with a French post-rock playlist we did not find anybody in the chain.

In the final application, it should be tested how far this resource-intensive mapping is worth pushing. While every new iteration increases the chances that we find reference artists in the user's playlist, the artist similarity will be less and less direct, and eventually, it will be useless.

The Youniverse is related to 8 artists:
MIDI Lidi, Billy Barman, Le Payaco, Don't Trust Butterflies, Vec, Medial Banana, Vidiek, and Tolstoys.

The Youniverse is related secondarily to 47 artists:
Wohnout, Zrní, Monika Načeva, Tata Bojs, Raduza, Sunshine, Kašpárek v rohlíku, Karel Kryl, Hrdza, Hex, Smola a hrušky, I.M.T. Smile, Bad Karma Boy, Katarzia, Ivan Tásler, Heľenine Oči, Robo Grigorov, Miro Žbirka, Samey, Vi3e, Karol Duchoň, Emma Drobná, Alan Murin, Taomi, Martin Matys, Richard Müller, Rytmus, DMS, Prago Union, Grimaso, Paulie Garand, Reznik, Kontrafakt, DJ Wich, Iné Kafe, Boy Wonder, Separ, Horkýže Slíže, Ego, Gleb, Gladiátor, Desmod, Elán, Sima Martausová, Jaroslav Filip, Chiki Liki Tu-a and Zvíře jménem Podzim.

The Youniverse is related thirdly to 122 artists:
Kabát, Mig 21, Harlej, Tomáš Klus, DIVOKEJ BILL, Tři Sestry, Lucie, Vypsaná Fixa, Buty, Hana Hegerová, Sto zvířat, Xavier Baumaxa, Mnaga A Zdorp, Vladimír Mišík, Lenka Dusilová, AG Flek, Traband, Zuzana Navarová, Vlasta Redl, Priessnitz, David Koller, Kryštof, J.A.R., Monkey Business, Jaromír Nohavica, Vltava, Aneta Langerová, Wanastowi Vjecy, Support Lesbiens, Dan Barta, Chinaski, Jana Kirschner, Slobodná Európa, Daniel Landa, Adam Ďurica, Rybičky 48, Michal David, Pavol Habera, Peha, Para, Korben Dallas, Fallgrapp, Polemic, Bert and Friends, Milan Lasica, Saténové ruky, Dara Rolins, Nocadeň, Helena Vondráčková, Team, Brontosauri, Hana Zagorová, Kollárovci, Hasan, Nerieš, Smack, Yzomandias, Porsche Boy, Nik Tendo, CA$HANOVA BULHAR, Dame, Shimmi, SpecialBeatz, Karlo, Pil C, Frayer Flexking, Radikal Chef, Miro Jaroš, Ľudová hudba Slančíkovci, Mária Podhradská, Jakub Dčkan, Marek Ztracený, No Name, SuperStar 2020, Poetika, Dominika Mirgová, Rida Radar, Moja Reč, True Gabe, Strapo, Konex, KHANS, Fobia Kid, Momo, Jiří Schelinger, Marie Rottrová, Majk Spirit, Vladis, MadSkill, Marpo, Ektor, Dalyb, Suvereno, Hugo Toxxx, Rakby, H16, Bow Wave, Refew, Redzed, Vladimir 518, Supercrooo, Arakain, Skwor, Renne Dang, Olympic, UDG, Tezkej Pokondr, Aleš Brichta, Zayo, Viktor Sheen, Sergei Barracuda, Janek Ledecký, Dalibor Janda, Karel Gott, Katarína Knechtová, Zóna A, Tublatanka, Amelie Siba, Post-hudba, Mutanti hledaj východisko a Jananas.

The Youniverse is all together related to 177 artists:
MIDI Lidi, Wohnout, Kabát, Mig 21, Harlej, Tomáš Klus, DIVOKEJ BILL, Tři Sestry, Lucie, Zrní, Vypsaná Fixa, Buty, Hana Hegerová, Sto zvířat, Xavier Baumaxa, Mňága A Zdorp, Vladimír Mišík, Monika Načeva, Lenka Dusilová, AG Flek, Traband, Zuzana Navarová, Vlasta Redl, Priessnitz, Tata Bojs, David Koller, Kryštof, J.A.R., Raduza, Monkey Business, Jaromír Nohavica, Vltava, Sunshine, Aneta Langerová, Wanastowi Vjecy, Support Lesbiens, Kašpárek v rohlíku, Dan Barta, Karel Kryl, Chinaski, Billy Barman, Hrdza, Jana Kirschner, Slobodná Európa, Hex, Daniel Landa, Smola a Hrušky, Adam Ďurica, Rybičky 48, I.M.T. Smile, Michal David, Pavol Habera, Peha, Bad Karma Boy, Para, Korben Dallas, Fallgrapp, Polemic, Katarzia, Bert and Friends, Milan Lasica, Saténové ruky, Ivan Tásler, Dara Rolins, Nocadeň, Le Payaco, Heľenine Oči, Robo Grigorov, Don't Trust Butterflies, Miro Žbirka, Helena Vondráčková, Team, Brontosauri, Hana Zagorová, Kollárovci, Samey, Hasan, Nerieš, Smack, Yzomandias, Porsche Boy, Nik Tendo, CA$HANOVA BULHAR, Vi3e, Dame, Shimmi, SpecialBeatz, Karlo, Pil C, Frayer Flexking, Radikal Chef, Karol Duchoň, Miro Jaroš, Ľudová hudba Slančíkovci, Mária Podhradská, Emma Drobná, Jakub Dčkan, Marek Ztracený, No Name, SuperStar 2020, Poetika, Alan Murin, Dominika Mirgová, Rida Radar, Moja Reč, True Gabe, Strapo, Konex, Taomi, KHANS, Fobia Kid, Martin Matys, Momo, Richard Müller, Jiří Schelinger, Marie Rottrová, Vec, Rytmus, Majk Spirit, Vladis, MadSkill, Marpo, DMS, Ektor, Dalyb, Prago Union, Grimaso, Suvereno, Hugo Toxxx, Rakby, H16, Paulie Garand, Bow Wave, Reznik, Refew, Redzed, Vladimir 518, Kontrafakt, DJ Wich, Supercrooo, Medial Banana, Iné Kafe, Arakain, Skwor, Boy Wonder, Separ, Renne Dang, Horkýže Slíže, Olympic, UDG, Tezkej Pokondr, Aleš Brichta, Ego, Zayo, Viktor Sheen, Gleb, Sergei Barracuda, Vidiek, Gladiátor, Janek Ledecký, Dalibor Janda, Desmod, Elán, Karel Gott, Tolstoys, Sima Martausová, Katarína Knechtová, Jaroslav Filip, Zóna A, Tublatanka, Chiki Liki Tu-a, Zvíře jménem Podzim, Amelie Siba, Post-hudba, Mutanti hledaj východisko a Jananas.

RECOMMENDATIONS BASED ON GENRE

Genre-based recommendations are limited insofar as there is a finite number of genres that are able to be used as seeds: *acoustic, afrobeat, alt-rock, alternative, ambient, anime, black-metal, bluegrass, blues, bossanova, brazil, breakbeat, british, cantopop, chicago-house, children, chill, classical, club, comedy, country, dance, dancehall, death-metal, deep-house, detroit-techno, disco, disney, drum-and-bass, dub, dubstep, edm, electro, electronic, emo, folk, forro, french, funk, garage, german, gospel, goth, grindcore, groove, grunge, guitar, happy, hard-rock, hardcore, hardstyle, heavy-metal, hip-hop, holidays, honky-tonk, house, idm, indian, indie, indie-pop, industrial, iranian, j-dance, j-idol, j-pop, j-rock, jazz, k-pop, kids, latin, latino, malay, mandopop, metal, metal-misc, metalcore, minimal-techno, movies, mpb, new-age, new-release, opera, pagode, party, philippines-opm, piano, pop, pop-film, post-dubstep, power-pop, progressive-house, psych-rock, punk, punk-rock, r-n-b, rainy-day, reggae, reggaeton, road-trip, rock, rock-n-roll, rockabilly, romance, sad, salsa, samba, sertanejo, show-tunes, singer-songwriter, ska, sleep, songwriter, soul, soundtracks, spanish, study, summer, swedish, synth-pop, tango, techno, trance, trip-hop, turkish, work-out, world-music*

While some of these genres make an explicit reference to locality (e.g. *brazil, cantopop, chicago-house, detroit-techno, french, indian, mandopop, iranian, k-pop, Latin, or swedish*), this list is far from comprehensive; in the study case at hand pertaining Slovakian genres, the genre-based recommendation is not a viable way for Slovak artists to be discovered. In more general terms, a genre-based recommendation will not work for artists with genres outside of the narrow list presented above.

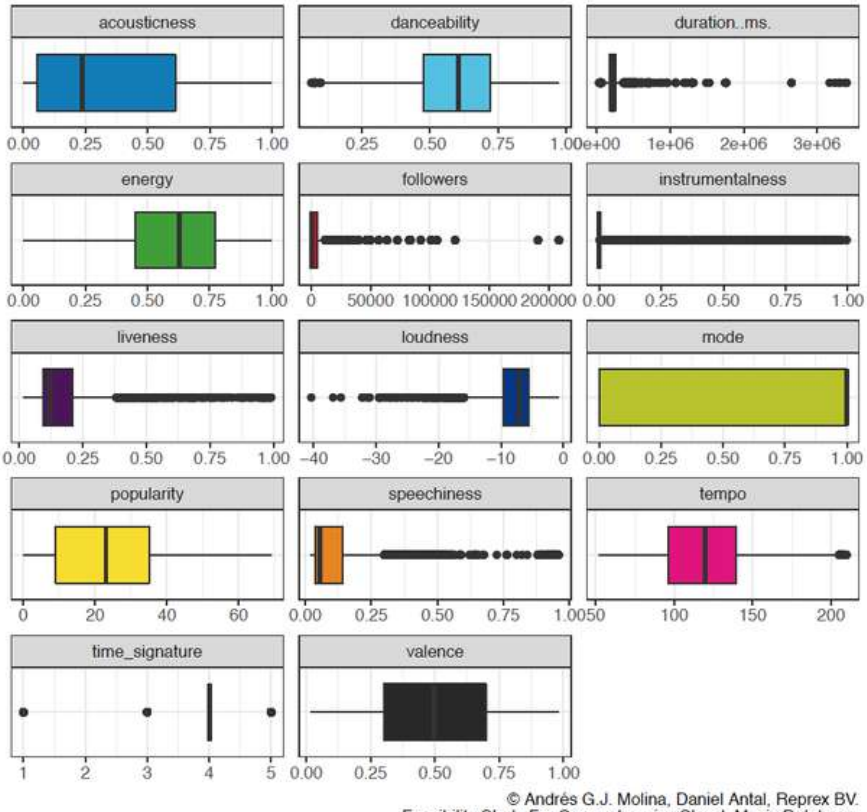
As a manner of example, what follows are the genres present in our sample of 502 Slovakian artists:
acoustic, ballet class, christian metal, christian power metal, classic czech pop, classical soprano, czech folk, czech hip hop, czech indie, czech pop, czech punk, czech rock, czsk hip hop, czsk reggae, detske pesnicky, dronescape, drum and bass, electronic trap, instrumental, liquid funk, manchester indie, melodic progressive metal, mluvene slovo, orchestra, radio symphony, slovak classical, slovak electronic, slovak folk, slovak hip hop, slovak indie, slovak jazz, slovak metal, slovak pop, slovak rock, turkish hip hop, uk dnb, world

In order to address this recommendation gap, we have used our musicological knowledge to manually create a table that links the genres in the Slovakian universe with those in the wider Spotify universe.

Fig C: Some of the associations made with 'Slovak pop', along with an approximate "distance" between the genres.

For the purposes of this feasibility study, we have linked [37] genres present in the Slovakian universe to [679] non-Slovak genres. It is our goal to ultimately estimate the distance between all genres in an effort to increase discoverability for underrepresented artists through genres and similar artists.

Features Of Popular Slovak Tracks



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Feasibility Study For Comprehensive Slovak Music Database.

ANNEX: TEAM CREDITS

Daniel Antal is quantitative economics with a degree in Economics, in Economic Regulation and Competition Policy, and he is a Chartered Financial Analyst. He had been researching and consulting in the music industry since 2012.

He created the first mapping of the Slovak Music Industry *(Antal 2019b)*, the Hungarian Music Industry *(Antal 2015a),* and the quantitative assessment of the Croatian home copying and value transfer *(Antal 2019a)*. The methodology of this work was exhibited *(Antal 2015b)* then published *(Antal 2017),* and some economic assessment tools related to these earlier research were released for data science peer-review as open-source code *(Antal 2020b).*

MUSICOLOGY TEAM

- **Andrés García Molina, PhD** is a data scientist and an ethnomusicologist. He is an experienced international researcher with interests that lie at the intersection between data science and the humanities. Andrés designed and created the supporting tables of our demo recommendation system.
- **Stef Koenis** is a musicologist, musician, and producer. He helped to create the training datasets, data collection that formed the long-list to the write-in process.
- **Kátya Nagy** is a music journalist, promoter, and research assistant of the CEEMID surveys. She helped to create the training datasets, data collection that formed the long-list to the write-in process.
- **Dominika Semaňáková** is a musicologist who helped in connecting to Slovak artists and managed the write-in process.
- **Tammy Nižňanská** shared the dilemmas of a Slovakia-based band with us, contributed to the making of the case studies and examples with her band, **The Youniverse** – one of the first bands in the opt-in process.

DATA SCIENCE & PROGRAMMING

The recommendation system was programmed by Daniel Antal in R, and the supporting musicology tables were created programmatically in Python by Andrés García Molina, PhD.

The Demo Application and Website were programmed by **Sándor Budai** in R on behalf of Consolidated Independent (state51 music group), with the supporting tables programmatically created by Daniel Antal.

PROJECT MANAGEMENT & TRANSLATION

- **Zuzana Gombíková** supported the project with organization and translation to Slovak.
- **Dáša Bulíková** helped with the translation to Slovak.

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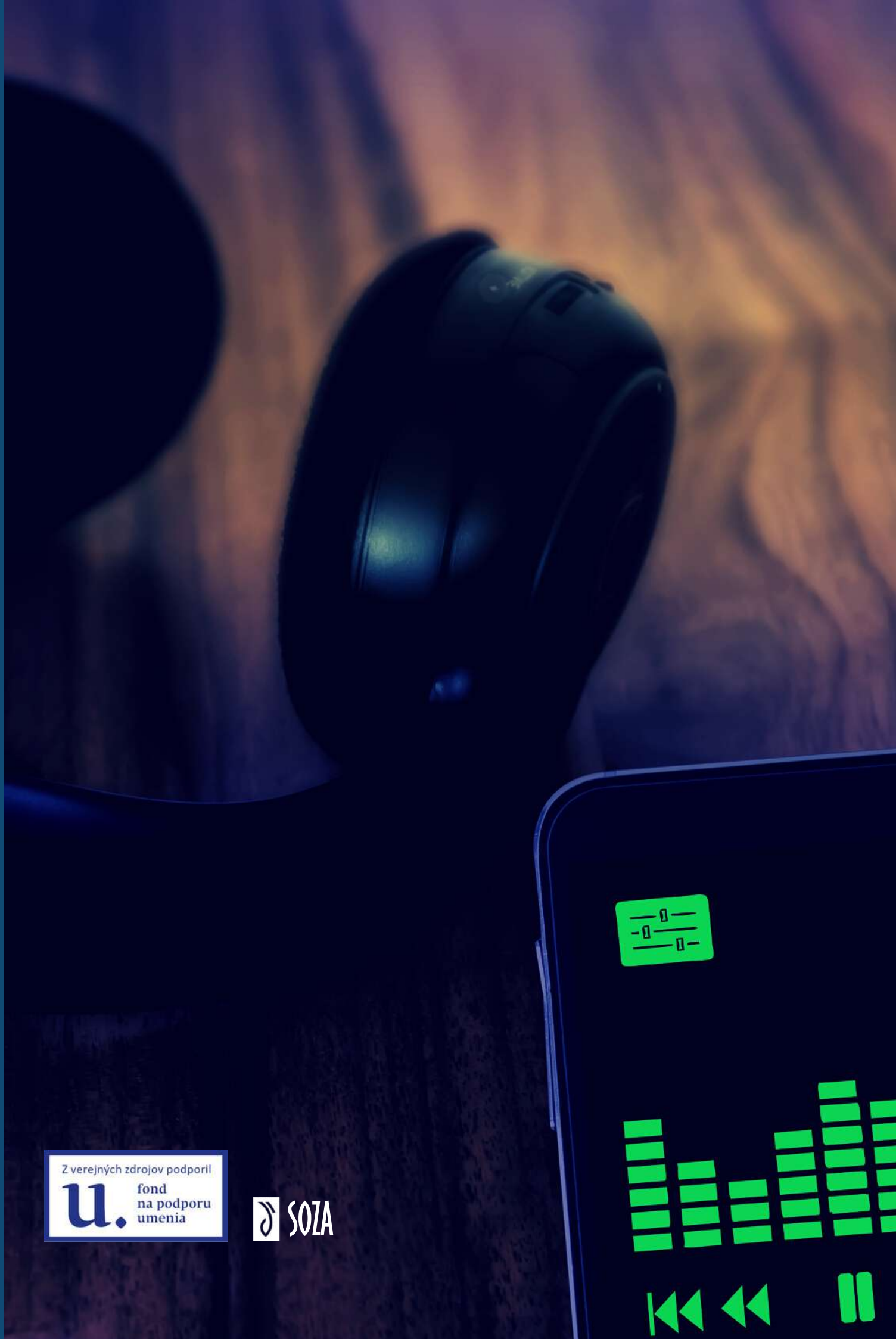
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