ISTANBUL TECHNICAL UNIVERSITY ★ GRADUATE SCHOOL

PAYING FOR PREMIUM: A CRITICAL LOOK INTO TECHNICAL AUDIO QUALITY IN STREAMING SERVICES

Ph.D. THESIS

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Department of Music

Music Programme

AUGUST 2024

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ISTANBUL TEKNİK ÜNİVERSİTESİ ★ LİSANSÜSTÜ EĞİTİM ENSTİTÜSÜ

MÜZİK AKIŞ PLATFORMLARINDAKİ TEKNİK SES KALİTESİNE ELEŞTİREL BİR BAKIŞ

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To my dear Aunt Türkan KUTLUAY, my sister Balkız ÖZTÜRK and my beloved mom Ayten ÖZTÜRK

FOREWORD

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June 2024

Mustafa Kemal ÖZTÜRK
(Musician / Sound Engineer)

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ABBREVIATIONS

Aac	: Advanced Audio Coding
App	: Application
CAGR	**:** Compound Annual Growth Rate
Codec	: Coded – Decoded (A standard used for compressing and decompressing digital media)
dB	: Decibel
GSM	: Global System for Mobile Communications
Hi-Fi	: High Fidelity
IFPI	: International Federation of the Phonographic Industry
ISP	: Internet Service Provider
kHz	: Kilo Hertz
MDADS	: MÜ-YAP Dijital Audio Dağıtım Sistemi
MFIT	: Mastered for ITunes
Mp3	: MPEG Audio Layer 3
Mpeg	: Moving Pictures Expert Group
Mbps	: Megabits per second
MU-YAP	: Bağlantılı Hak Sahibi Müzik Yapımcıları Meslek Birliği Birliği (Phonogram Producers Collecting Society of Turkey)
P2P	: Peer to Peer
PCM	: Pulse Code Modulation
RBT	: Ring Back Tone
SM	: Spectral Manipulation
Spek	: Spesification
SQUAM	: Sound Quality Assessment Material database
WAV	: Waveform Audio File Format

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PAYING FOR PREMIUM: A CRITICAL LOOK INTO TECHNICAL AUDIO QUALITY IN STREAMING SERVICES

SUMMARY

The digital revolution has profoundly reshaped both the production and consumption of music on a global scale. The widespread adoption of mobile music streaming services has facilitated this transformation, offering users a convenient and seemingly boundless access to vast music libraries. These platforms have evolved beyond simply providing music access, offering premium packages that promise not only enhanced audio quality but also a lot of value-added features designed to elevate the user experience. These features include playlist creation capabilities, personalized song recommendations based on individual listening habits, and seamless offline listening functionalities. Moreover, the promise of better sound quality has become a key part of marketing, encouraging users to choose paid subscription models (often called "First Class" or "Premium"), rather than settling for lower audio quality and free-ads users experience.

Recent research, however, building upon a foundation of prior studies, has cast doubt on the universality of this perceived distinction on audio quality. The findings suggest that individuals lacking specialized training or access to high-fidelity sound systems may struggle to notice subtle differences in certain audio qualities. Furthermore, the advancement of compression technologies like MPEG, Ogg-vorbis, and AAC has played a crucial role in ensuring a satisfactory listening experience even at lower compression ratios, further blurring the lines between varying sound qualities for the average listener.

Given that smartphones and similar devices serve as the primary access point for music streaming for a vast majority of consumers, this discrepancy between promised and delivered audio quality warrants critical examination. Specifically, two key concerns emerge:

- Can consumers readily notice deviations from the promised audio quality?
- Are music producers and artists subject to any restrictions regarding the upload of low-quality audio files?

Therefore, this study undertakes a critical evaluation of the veracity of streaming service providers' claims regarding the audio quality delivered through their premium services. Additionally, it assesses the extent to which music producers and artists can upload low-quality audio files without limitations. By focusing on two of the most prevalent global music streaming services world-wide and two local streaming services from Turkey, this investigation aims to shed light on the validity of these claims and the potential disconnect between promised and actual audio quality delivered to consumers. The findings of this study reveal that the premium options offered by these platforms do not consistently deliver the pledged audio quality, and

low-quality audio files can indeed be uploaded without customer notification. Despite this discrepancy, consumers continue to subscribe to paid services, suggesting a potential acceptance or unawareness of the gap between promised and actual audio quality.

MÜZİK AKIŞ PLATFORMLARINDAKİ TEKNİK SES KALİTESİNE ELEŞTİREL BİR BAKIŞ

ÖZET

Dünyadaki müzik üretimi ve tüketimi dijitalleşmenin hızıyla birlikte gün geçtikçe değişmiş ve mobil müzik akış hizmeti veren şirketlerle birlikte çok daha ulaşılabilir bir noktaya gelmiştir. Mobil müzik akış hizmeti veren platformlar, kullanıcıların önceki müzik dinleme deneyimlerini tamamıyla değiştirmiş, ses indirme (download) ve depolama şeklinde oluşan alışkanlıklarını kırmayı başarmıştır. Bu geçiş süreci özellikle büyük müzik şirketleri için oldukça sorunlu olsa da yaklaşık 20 yıllık bir süreç sonunda fiziksel satışta yaşanan kayıplar dijital kazançlarla telafi edilebilmiştir.

Bu 20 yıllık zaman aralığında müzik akış hizmeti sunan sağlayıcılar, dinleyicilere farklı ve bir o kadar yenilikçi seçenekler sunarak pazar paylarını hızla yükseltmişlerdir. Sürecin en başında tamamıyla ücretsiz olarak başlayan ve müzik sektörüne darbe vuran bu anlayış, zaman içinde farklılaşmış ve sundukları servislerine çok yeni özellikler ekleyerek dinleyicileri ücretli olan (Premium) versiyonlara geçişe motive etmeyi başarmışlardır. Bu özellikler arasında çalma listeleri oluşturabilme, dinleme listelerine göre yeni şarkılar önerme, çevirim dışı şarkı dinleyebilme gibi bir çok cazip özellikler eklenmiştir. Bunun gibi özelliklere ek olarak daha iyi ses kalitesi vaadi ücretli (Birinci Sınıf / Premium) seçeneğin tercih edilmesinde çok önemli bir reklam unsuru olarak kullanılmış ve halen de kullanılmaktadır. Ücretsiz kullanıcılar düşük ses kalitesi ve reklamlı dinleme deneyimlerine ulaşırken, dinleyiciler ücretli seçeneğe geçtiklerinde yüksek kaliteli ses vaadine reklamsız ulaşabilmektedirler.

Geçmişteki kalite algısına dair yapılmış çalışmalara ek olarak yapılan yeni çalışmalar göstermektedir ki yüksek kalite ses sistemlerine sahip olmayan ya da bu konuda ileri seviye eğitim almamış insanlar belirli ses kaliteleri arasındaki farkları algılayamamaktadır. Bunda ilerleyen sıkıştırma teknolojisin payı büyüktür. Mpeg formatının yıllar içinde gelişmesi dışında Ogg-vorbis ve AAC sıkıştırma formatlarının algoritmalarının gelişimi de dinleyicilerin düşük sıkıştırma oranlarında bile tatmin edici bir ses deneyimine ulaşmasını sağlamaktadır.

Tüketici Elektroniği Derneği (Consumer Electronics Association) yaptığı bir çalışmada tüketicilerin %90'ının müzik dinleme deneyiminin en önemli parçası olarak ses kalitesini belirttiğini bildirmiştir. ZENNA Araştırma ve Danışmanlık tarafından gerçekleştirilen Türkiye Dijital Dünya Halk Geneli nezdinde “Müzik Dinleme Alışkanlıkları” araştırması 18 yaş ve üzeri 1200 kişi ile 11-15 Ocak 2018 tarihleri arasında online görüşme yöntemi uygulanarak gerçekleştirilmiş ve çıkan sonuçta Türkiye halkının yüzde 80’i genelde cep telefonundan müzik dinlerken diğer müzik dinleme araçları yani bilgisayar, radyo, televizyon, ses sistemi oranları cep telefonuna göre oldukça geride kalmıştır. Türk müzik sektörünün dijitalleşmenin ilk yıllarında geride kalması ve 2005 yılından önceki birçok repertuarın çok kısa bir zaman aralığında ve o günün en yüksek teknoloji standartlarına göre yüklendiği bilgisi de sektörün ileri gelen müzik insanları ile yapılan röportajlar sonucunda ortaya konulmuştur.

Bu ropörtajlarda öncelikli olarak 2005-2012 yılları arasında Türkiye müzik endüstrisinin dijital dönüşüm sürecinde yaşanan zorlukları, sektörün öncü isimlerinden alınan derinlemesine görüşmeler aracılığıyla incelemeyi amaçlamıştır. Çalışmanın odağında, dijital dönüşüm sırasında ortaya çıkan zorluklar, dijital platformlarla yapılan anlaşmalar ve yerel müzik pazarının dijital devrime geçişindeki konularda yaşanan zorluklar yer almaktadır. Nitel araştırma yöntemiyle yürütülen çalışmada, Metin Uzelli, Selim Serezli ve Bora Turan ile gerçekleştirilen görüşmeler temel veri kaynağı olarak kullanılmıştır. Elde edilen bulgular, Türkiye'deki dijital müzik dağıtımının gelişimini şekillendiren faktörleri ve sektörün geleceği için önemli çıkarımlar sunmaktadır.

Bu iki araştırmaya ek olarak sıkıştırma formatlarındaki ilerlemeyi ve yapılan ropörtajları göz önüne aldığımızda önemli bir soru ve sorun karşımıza çıkmaktadır.

- Akış hizmeti sağlayıcıların vadettiklerinden daha düşük kalitede ses sundukları bir durumda, çoğunluk müşterilerin kullandığı ses dinleme cihazların akıllı cep telefonu ve benzeri araçlar olduğu düşünülürse, bu durum dinleyiciler tarafından fark edilebilir midir?
- Ayrıca müzik yapımcılarının ve sanatçıların herhangi bir kısıtlama olmaksızın sisteme düşük kaliteli ses dosyalarını yükleme ihtimali halen mümkün müdür?
- Aktif olarak dinleme yapılan akış sisteminde dijital dönüşüm sırasında yüklenen şarkılardan düşük kalitede ya da vaat edilen kaliteyi sağlamayan repertuar mevcut mudur?

Türkiye müzik endüstrisindeki profesyonellerle gerçekleştirilen derinlemesine görüşmeler, 2005 öncesinde oluşturulan müzik veritabanlarında önemli ses kalitesi sorunlarına işaret etmektedir. O dönemde sınırlı internet altyapısı ve düşük bant genişliği göz önüne alındığında, müzik akış platformlarına yüklenen ses dosyalarının kalitesinin yeterince kontrol edilmeden dağıtılmış olma ihtimali oldukça yüksektir.

Düşük bit hızındaki sıkıştırılmış ses dosyalarının, sistem gereksinimlerini karşılamak amacıyla daha yüksek bit hızlarında yeniden kodlanmasına rağmen, bu durumun mutlaka ses kalitesinde bir iyileşme sağlamadığı bilinmektedir. Örneğin, 128 kbps çözünürlüğünde bir MP3 dosyasının 24 bit/44.1 kHz gibi daha yüksek bir çözünürlüğe yükseltilmesi, dosya boyutunu artırsa da, orijinaldeki bilgi kaybını telafi edemez.

Bu bulgular ışığında, çalışmada şu hipotezler test edilmiştir:

H1: Müzik akış platformları, tüm içerik için vaat ettikleri ses kalitesini sürekli olarak sağlar.

H2: Müzik akış platformları, yüklenen tüm şarkılarda vaat ettikleri ses kalitesi standartlarına uygun olarak yeterli ses kalitesi kontrollerini yapar.

Ses kalitesi literatüründe, insan algısının müzikteki nüansları ne kadar iyi algılayabileceği üzerine yapılan çalışmalar bulunmaktadır. Bu doğrultuda, çalışmaya şu hipotez de eklenmiştir:

H3: Dinleyiciler, aynı müzik parçasının yüksek çözünürlüklü ve düşük çözünürlüklü formatlarını ayırt edebilir.

Bu sebeple bu çalışmada ücretli hizmetleri satın alarak diğer özelliklerin yanında yüksek ses kalitesine eriştiğini düşünen müşterilerin, gerçekten bu kaliteyi alıp alamadıkları araştırılmıştır. Bunun için servis sağlayıcıların sundukları ses kaliteleri teknik analizlere tabi tutulmuştur. Ek olarak, sisteme yapımcılar ve müzisyenler tarafından düşük kalitede ses içeren dosyaların yüklenip yüklenemeyeceği test edilmiştir. Çalışma kapsamına dünyada en çok tercih edilen iki müzik akış servis sağlayıcısı ve Türkiye'deki en popüler iki yerel müzik akış servis sağlayıcısı alınmıştır.

Sonuçlar, bu platformların ücretli seçeneklerinin bazı durumlarda vadettikleri ses kalitesini sağlamadığını göstermiştir. Ayrıca, düşük kalitede yüklenen şarkıların akış servis sağlayıcılarının sistemleri tarafından engellenmediği ve bununla ilgili müşterilerin bilgilendirilmediği tespit edilmiştir. Bunlara ek olarak, müşterilerin vadedilen ses kalitesini tam anlamıyla almamalarına rağmen ücretli hizmetlere devam ettikleri görülmüştür.

Bu bulgular, Premium müzik akışı hizmetlerinde ses kalitesinin sağlanmasında daha fazla net ve doğru bilgilendirmeye ihtiyaç olduğunu göstermektedir. Bu sayede müşterilerin abone olacakları hizmetler konusunda daha sağlıklı kararlar almaları sağlanacak ve mümkün olan en iyi ses deneyimini alıp almadıkları konusunda net bir bilgilendirme yapılmış olacaktır.

1. INTRODUCTION

Music is a universal language that connects people across cultures, reflecting their values, histories, and emotions. It plays a vital role in rituals, celebrations, and daily life, fostering community and identity. It is perhaps the most powerful element among the arts, which are found in almost all traditions around the world and have the power to unite people. Music touches every aspect of our lives, from festivals and religious ceremonies to our daily routines, from elevator music to enhancing concentration during sports.

Music even offers therapeutic benefits for the human psyche. It has the power to alter anxiety levels and influence functions such as thinking, concentration, attention, and even tactile memory (Cong, et al., 2012). It facilitates the accumulation of knowledge, enabling personal development (Xu, Yuan, Zhernovnykova, & Zelenska, 2020).

All these features of music have led to the creation of a global recorded music market worth USD 28.6 billion in 2023 (Statista, 2024c). In a market of this size, the quest for top-notch sound quality is at the core of music production, shaping every step from conception to consumption. Sound engineers spare no effort and money in fine-tuning their gear and spaces, pouring resources into acoustic treatments, high-quality equipment, and mastering techniques to make music tracks of high sound quality that is suitable, pleasant, and identifiable to their listeners (Guski, 1997).

Confirming this fact, the global music production equipment market has experienced significant growth in recent years. According to industry data, the market size reached USD 9.64 billion in 2022 (Business Research Insights, 2024). Furthermore, projections indicate that the market is poised for continued expansion, with estimates suggesting it will reach USD 12.91 billion by 2031 (Business Research Insights, 2024). This represents a compound annual growth rate (CAGR) of 3.3% during the forecast period of 2022-2031. The Recording Studio Equipment market is also anticipated to grow annually by a CAGR of 13.8% between 2024 – 2031 (Reliable Research IQ, 2024).

Artists are no different from music producers. They persistently put effort and spend money to get the highest sound quality possible from their instruments. As a result, they created a global market for musical instruments of USD 18.63 billion in 2022. It is anticipated that the market will expand from USD 19.25 billion in 2023 to USD 24.53 billion by 2030, demonstrating a CAGR of 3.52% over the forecast period (Fortune Business Insights, 2024a).

Music consumers continue pay for the best possible outcoume from their audio devices. The global market for high fidelity (Hi-Fi) stereo systems was valued at USD 14.93 billion in 2022. It is projected to reach USD 19.6 billion by 2028, with a CAGR of 4.6% during the forecast period (Business Research Insights, 2024b). Consumers also pay premium music streaming services such as Spotify, where a key component of the value proposition is superior audio quality. Spotify generated about 11.5 billion euros from its premium subscriptions in 2023 (Statista, 2024a), with a total market subscriber share of 35 percent (Statista, 2024b). Figure 1.1 shows the growth of Spotify revenues by ads and premium subscriptions.

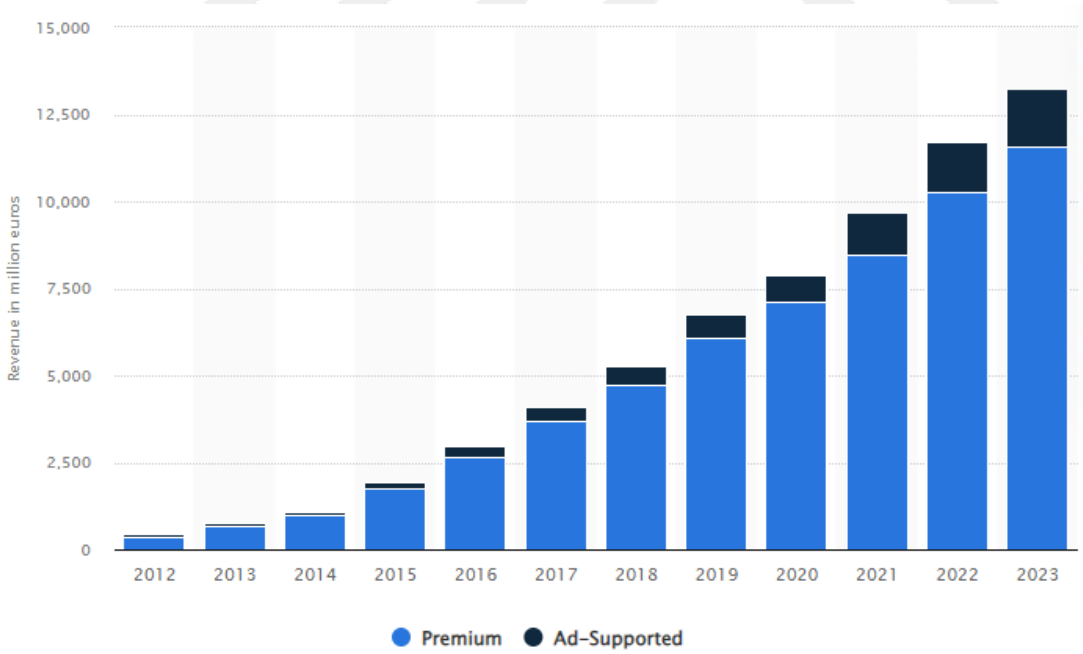


Figure 1.1 : Spotify revenue growth between 2012 – 2023 (Statista, 2024a).

In addition, a landmark development in enhancing audio quality in music streaming is the integration of Dolby Atmos technology. Known for revolutionizing the cinematic audio experience, Dolby Atmos has now made its mark in the music industry in collaboration with Apple Music. This collaboration allows users to experience music in a multidimensional space, using stereo headphones or compatible speakers. By offering a more immersive audio experience, Apple Music not only enhances the enjoyment of its users but also sets a new standard for sound quality in the streaming industry.

In conclusion, the pursuit of superior sound quality remains a driving force across all facets of the music industry, from production to consumption. This is evidenced by the substantial investments made by sound engineers in high-quality equipment and acoustic treatments, as well as the significant growth observed in the global music production equipment market. Similarly, the global market for musical instruments and Hi-Fi stereo systems has shown robust growth, reflecting the continuous demand for exceptional sound experiences by both artists and consumers. Additionally, premium music streaming services, such as Spotify and Apple Music, further underscore the importance of sound quality, generating substantial revenue through their premium and high-quality offerings. This consistent focus on achieving top-notch sound quality across the industry underscores its pivotal role in shaping the music landscape.

1.1.The Research Problem and the Limitations of the Previous Studies

The tens of billions of dollars and substantial effort spent on sound quality raise important questions: Does this pursuit of sonic perfection make a noticeable difference for listeners? Can they discern the subtle differences brought about by expensive microphones, pre-amps, acoustic treatments, advanced digital converters, or even the mastering processes? Even if we assume that listeners can detect small differences in sound quality, another question arises: Are streaming services truly delivering high-quality music files on their platforms, thereby honoring the investments made by musicians, producers, and listeners who have dedicated significant resources?

The first set of these questions, concerning listener perception, has been addressed in the literature, albeit indirectly. Many studies have attempted to predict subjective human perception using objective measures. Specifically, the impact of signal processing on perceived music quality has been extensively researched (Arehart, M. Kates, & C. Anderson, 2011). These studies conclude that perceived quality correlates with objective variables (Wilson & Fazenda, 2016; Kuo Hao, Chen, & Tsai, 2016). Dynamics, distortions, tempo, spectral features, and emotional predictions have shown correlations with perceived audio quality (Wilson & Fazenda, 2013). For instance; increased amounts of clipping and compression result in lower quality ratings given by listeners (Tan, Moore, Zacharov, & Mattila, 2004)

Additional studies have investigated the effects of musical qualities on perceived sound quality. Listeners are more likely to give high-quality ratings to music they perceive as having a happy atmosphere, while lower ratings are given to music associated with anger and slower tempos are linked to higher quality (Wilson & Fazenda, 2013).

Despite the extensive research on the perception of sound quality based on various digital signal processing tweaks, there is a significant gap in understanding the impact of the music distribution process on both objective and subjective sound quality. Finished music products are converted and compressed into different digital formats required by music streaming platforms during distribution. This conversion process risks negating all the music production efforts if an incorrect version of a file is uploaded or if the file is converted without expertise.

Even experts may find it hard to identify a potential loss in an audio file: During a specific mastering course the author of this study participated, a significant event occurred that sparked the idea for this research. The course covered the differences between 24-bit and 16-bit audio and compressed audio formats. By accident, identical samples were provided for analysis. Surprisingly, both the instructor and participants discussed perceived differences in clarity, depth, and overall sound quality. This outcome was unexpected, considering the analysis took place in a top-tier music studio equipped with advanced technology and experienced listeners. This raised an important question: If even experienced sound engineers struggle to discern differences between certain audio qualities, how can regular listeners detect these differences on standard music systems? This question prompted the need for further investigation into how people perceive sound quality, particularly in their own listening environments.

To sum up, the literature currently lacks a comprehensive understanding of how the music distribution process affects the sound quality of music tracks. It remains unclear whether there is a technical loss in sound quality during the transfer from studios to streaming platforms and, if so, whether this loss is perceived by listeners. Given the considerable investments made by all the stakeholders of the music sector, it is imperative to investigate the potential degradation that might occur during distribution.

1.2.Aim of The Study

The aim of this thesis is to investigate the presence of low-quality audio files within the extensive music archives of streaming services, examining the protocols that dictate their inclusion as well as the quality control mechanisms employed to manage their dissemination.

Secondly, irrespective of the existence of audio files with technical quality loss on these platforms, our objective is to investigate whether music listeners can discern these technical degradations resulting from file conversion and uploading processes.

As a result, the aim of the study is to seek answers for the following questions:

1- Do music platforms offer their customers the sound quality they promise?

2- Do music platforms have the necessary mechanisms in place to ensure the technical quality of uploaded music files?

3- Can music listeners tell the difference when they encounter music tracks with technical quality issues?

1.3.Significance of the Study

The significance of this study lies in its potential to enhance our understanding of sound quality perception and delivery in the digital age, an area of critical importance given the rapid advancements in audio technology and the significant investments made by consumers and providers alike. This study addresses key gaps in existing literature by examining several crucial aspects.

Firstly, this study approaches the perception of sound quality from an alternative perspective. While existing literature predominantly focuses on identifying objective quality measures that predict subjective quality assessments, this study examines whether individuals can discern differences between two distinct objective quality levels of the same musical piece. In other words, it specifically investigates whether individuals can recognize the enhanced quality for which they pay extra. This insight is particularly significant given the substantial financial investments made to achieve incremental improvements in audio quality.

Secondly, this study investigates the technical sound quality promised by streaming platforms. There is a noticeable lack of literature focusing on the discrepancies between the technical sound quality that streaming platforms promise and what they actually deliver. This study addresses this gap through a series of carefully designed tests to assess these discrepancies.

Finally, the study examines the mechanisms implemented by streaming platforms to ensure technical sound quality. Current literature does not adequately address the measures that streaming platforms employ to ensure that only musical pieces meeting a specific sound quality threshold are uploaded to their systems. By designing and applying a series of tests, this study aims to understand what measures, if any, are taken by streaming platforms to maintain this quality standard.

In conclusion, this study provides a comprehensive analysis of the perception and assurance of sound quality in the context of digital streaming. By exploring the discernibility of sound quality differences, the reliability of promised technical standards, and the mechanisms ensuring quality control, this research offers significant contributions to the field of audio quality assessment. These findings will be crucial for consumers, audio engineers, and streaming platforms alike, guiding future advancements and investments in audio technology.

1.4.Organization and Methodology of the Study

The organization of this study is designed to systematically address the multifaceted issues mentioned regarding to audio quality in music streaming platforms. By structuring the research into distinct phases, each targeting specific aspects of the problem, the study aims to provide a comprehensive understanding of the challenges and potential solutions in the sound quality domain of the digital music streaming industry.

First, experts in the music industry were consulted to identify potential problems in audio quality about how to upload music archives to steaming, its history and potential problems nowadays. This was followed by two technical evaluations based on the expert insights. The first evaluation examined how artists and producers implement audio fidelity practices for music streamed on the platform. The second evaluation assessed the actual audio quality of existing tracks on the platform.

Second, a survey of over 200 individuals was conducted to gain current insights into which platforms are most preferred.

Third, technical analyses were conducted to determine differences between streaming platforms over WiFi and mobile data, variations between desktop and mobile versions, and the consistency of the codecs.

Fourth, the Turkish-origin repertoire uploaded to streaming service platforms before 2005 was examined to determine whether it falls short of the audio quality promised by these platforms, based on insights from the interviews.

Fifth, a qualitative analysis was conducted on a selection of potentially low-quality, older or nostalgic songs from the global repertoire to assess the prevalence of comparable quality defects.

Sixth, the audio quality control procedures implemented by music streaming platforms for uploaded audio files, if there were any, were examined.

Seventh, the listeners' perception of the sound quality differences was tested.

Through expert consultations, technical evaluations, surveys, and detailed analyses, this study identifies key issues and provides actionable insights.

2. LITERATURE REVIEW

In the literature review chapter, this study will analyze previous audio quality tests, their methodologies, and recent advancements in the field. Concurrently, it will investigate the evolving music consumption habits of listeners in the digital era, exploring their platform preferences and the underlying rationales. Furthermore, the preference of streaming platforms for specific audio file formats and their implications on perceived quality will be discussed. To comprehend the test content, technical aspects including bit rate, sample rate, audio compression formats, and the spectrometer utilized in the analysis method which influence sound quality will be briefly outlined. Next section will give a brief history of streaming platforms both worldwide and in Turkey.

2.1.Streaming Services in The World

Since the late 1990s, the emergence of the internet has precipitated a profound transformation in the production, distribution, and consumption paradigms of music. The emergence of platforms such as Napster and Kazaa, which allowed consumers to easily share mp3 (MPEG Audio Layer 3) files with each other using peer-to-peer network technology (Vaccaro & Cohn, 2004), has led to a significant and rapid decline in physical sales which was once the primary revenue channel for recorded music (IFPI, 2024). While the International Federation of the Phonographic Industry (IFPI) won lawsuits against these platforms, no increase in physical revenues has been achieved as new consumer behaviors have evolved toward digital music consumption (Hughes & Lang, 2003). Traditional record companies have struggled to adapt to the new landscape and introduce a new business model, while technology companies have pursued various strategies.

In April 2003, Apple launched its iTunes service and witnessed significant success, as evidenced by 14 million downloaded songs in the first six months, a figure that surged to 100 million by July 2004 (Vaccaro & Cohn, 2004). Despite this accomplishment, music companies continued to experience losses until the advent of Spotify's software application, which featured a new service model based on streaming technology and was made available on the Apple App Store. Subsequently, in 2010 the US music industry's total revenue began to experience growth for the first time in a decade (Figure 2.1).

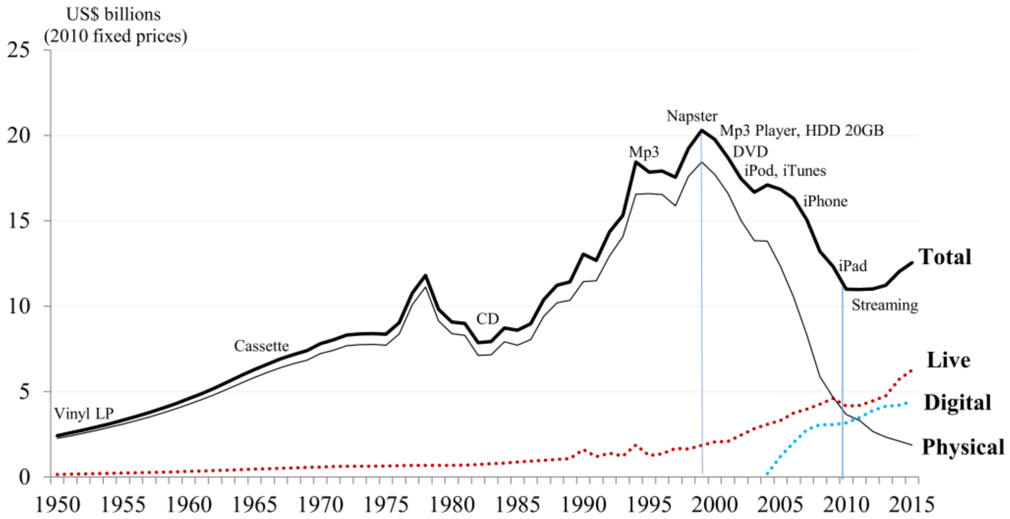


Figure 2.1 : US music industry revenues based on Pollstar and RIAA, 1950-2015 (Naveed, Watanabe, & Neittaanmaki, 2017).

The global recorded music industry suffered a longer decline in total revenues until 2015, as depicted in Figure 2.2. However, a remarkable resurgence ensued, culminating in sales surpassing the 1999's peak sales amount in 2021. This revival was fueled by music streaming revenues which constituted around 65% of the total sales, yielding $16.9 billion in revenue.

Additionally, the physical sales category saw a rise for the first time since 2021, aided by the surge in vinyl sales by collectors. However, this only accounted for 19.2% of the total sales. In 2023, the total sales amount has reached USD 28.6 billion, almost more than 30% of the peak sales experience of 1999. Streaming services were accountable for more than 67% of the sales in 2023.

Considering the substantial rise of the global music industry since 2015, it is essential to highlight that a dollar in 1999 held a value equivalent to $1.83 in 2023 (Federal Reserve Bank of Minneapolis, 2024). This comparison underscores that the peak levels experienced in 1999 have not yet been surpassed in full measure.

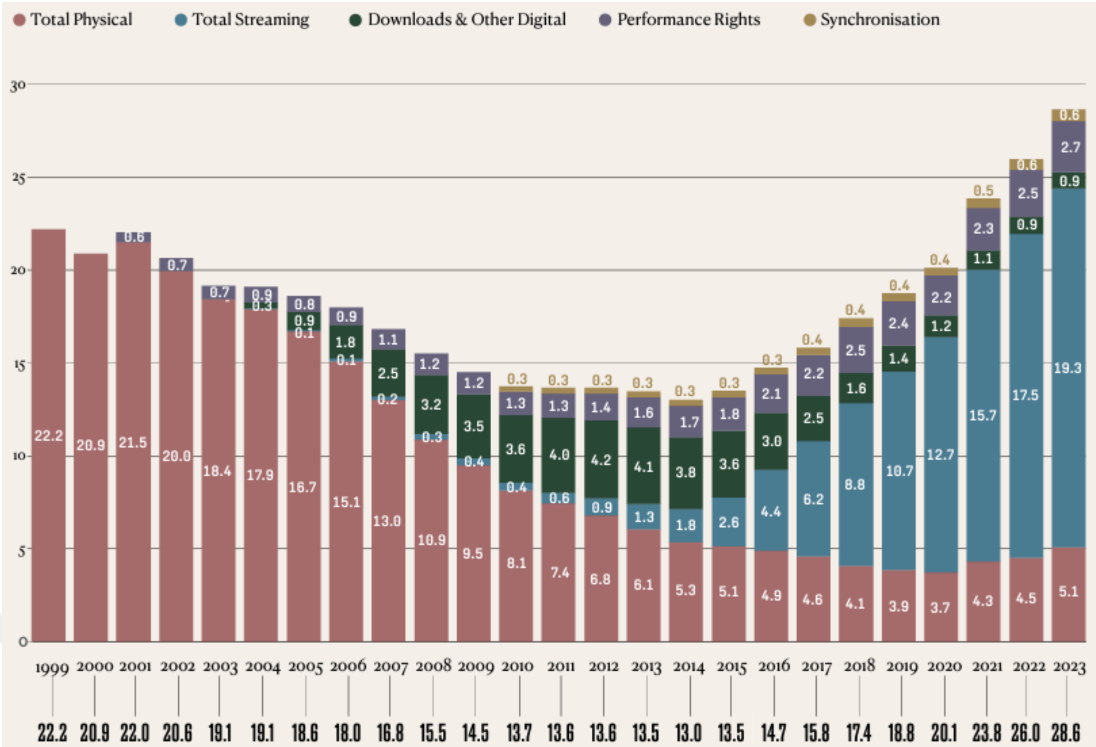


Figure 2.2 : Global music revenues, US$ billions, 1999-2023 (IFPI, 2024).

Since its launch in 2008, Spotify has experienced significant growth in active users, from 15 million in 2012, to 100 million in 2017 and to approximately 525 million in the first quarter of 2021 with an increase of 26.4% due to the addition of 109.5 million new subscribers over the previous year (Mulligan, 2022; Aguiar & Waldfogel, 2018). In terms of global market shares, Spotify (31%) is the leading music streaming platform, followed by Apple Music (15%) and Amazon Music (13%).

To sum up, the digitalization of music industry has grown drastically since the late 1990s. Milestones such as Apple's iTunes and Spotify's rise have marked this change. Although the global music industry has rebounded since 2015, driven by streaming, it has yet to fully match the peak levels of 1999. The next section will examine the impact and growth of streaming services in Turkey.

2.2.Streaming Services in Turkey

The evolution of the music industry has been profoundly shaped by the advent of streaming services, particularly in regions experiencing rapid technological adoption. In Turkey, the rise of streaming platforms has revolutionized the way music is consumed, offering unprecedented access and convenience. Although digitalization of the Turkish music industry lagged global trends, MU-YAP (Phonogram Producers Collecting Society of Turkey) initiated significant efforts to catch up in the mid-2000s.

Music services were launched, which enabled users to download music to their phones in various forms such as “Ring Back Tone” via Internet Service Providers (ISPs). The success of these applications prompted GSM operators to introduce "Real Tone". In 2005, MU-YAP developed this application which contained a digital collection of about 70,000 popular musical works, resulting in a three-fold increase in revenue from the previous year (Saka, 2019). MU-YAP also signed an agreement with Orchard, which has one of the largest digital distribution networks worldwide, to provide iTunes Store, the most extensive music marketing and sales platform at that time, albeit later than its global peers, with an extensive musical archive.

Early music platforms such as PowerClub and Muzi were followed by TTnet music, AVEA music, and GNC play in Turkey, and the sector gained significant popularity with the launch of iTunes Store. However, with the increasing popularity of global streaming platforms like Spotify and Apple Music, many of these local platforms have either gone bankrupt or changed their names. Fizy, founded in 2007, was acquired by Turkcell, and together with Muud, which was renamed from TTnet music, they established themselves as two important local platforms in Turkey.

The Turkish music industry has undergone a radical change, along with all other countries in the world, and listening habits had to change. Listeners have started to use online access options instead of keeping thousands of mp3 archives on hard disks. However, the habit of preparing mixed playlists which dates back to the cassette era and was also used in CD players has also found a very important place in streaming platforms. The possibility of easily accessing the lists they created among thousands of mp3 archives, hundreds of CDs or cassette collections anywhere they want, has become one of the main factors in choosing online music services. These playlists which are the modern version of old mixtapes have also found their place in marketing activities. Algorithms that are created based on playlists and can be specifically adjusted according to users have led to effective new methods such as discovering new songs, suggesting them, and interacting with other users. These algorithms not only scan past playlists and recommend songs to listeners about their own musical tastes, but also allow them to discover artists who are not well-known enough. At the same time, it allows you to create a variety of playlists such as a theme, mood, music genre, or to access playlists created by other users.

In light of these developments, physical revenues have declined; however, total sales have increased significantly from $12.8 million to $63.8 million, reflecting a remarkable fivefold growth. This surge was driven by streaming services, whose revenues soared from $7.4 million to $53.7 million between 2018 and 2022, representing more than a sevenfold increase (Table 2.1).

Table 2.1 : Total phonogram revenues, Turkey, $ million, 2018-2022 (MU-YAP, 2023).

Type	2018	2019	2020	2021	2022
Streaming	7.4	10.1	18.8	31	53.7
Download and other	0.2	0.2	0.2	0.3	0.1
Physical	2.4	1.7	1.5	3.4	3.4
Performance	2.5	3	3.2	4	5.6
Synchronization	0.3	0.4	0.4	0.7	1
TOTAL	**12.8**	**15.4**	**24.1**	**39.4**	**63.8**

Subscription-based audio streaming services, such as Spotify Premium, contributed to digital revenues, reaching a total of $26.3 million in 2022, as detailed in Table 2.2. Additionally, ad-supported streaming services generated $27.4 million in revenues, with $13.4 million coming from ad-supported audio and $14 million from ad-supported video.

Table 2.2 : Total digital revenues, Turkey, $ million, 2018-2022 (MU-YAP, 2023).

Type	2018	2019	2020	2021	2022
Subscription	5.1	6.9	12.5	18.4	26.3
Ad-supported audio	0.4	0.7	2.8	5.6	13.4
Ad-supported video	1.8	2.5	3.5	7	14
Downloads	0.2	0.1	0.1	0.1	0.1
Personal mobile & other	0.1	0.1	0.1	0.2	-
TOTAL	**7.6**	**10.3**	**19**	**31.3**	**53.8**

In conclusion, the Turkish music industry has significantly transformed due to the adoption of digital and streaming technologies. Initially trailing behind global trends, efforts by MU-YAP and the rise of various music services have accelerated the digitalization process. Early platforms and global giants like Spotify and Apple Music have changed listening habits, shifting consumers from physical formats to convenient online music libraries. The popularity of creating and sharing playlists has become central to music discovery and marketing. As a result, despite declining physical revenues, the industry's total sales have seen substantial growth, driven largely by streaming services.

2.3.Consumer Preferences in Streaming Services

The rapid advancement of digital technologies has transformed how people consume media, giving rise to numerous streaming platforms that cater to diverse audience preferences. Streaming services like Netflix, Spotify, and Amazon Prime have become household names, offering vast libraries of movies, music, TV shows, and podcasts. This shift from traditional media consumption to on-demand streaming is driven by various factors that influence users' choices. Understanding these factors is crucial for platforms aiming to capture and retain their audience in an increasingly competitive market. Factors such as content availability, user interface and experience, pricing models, advertising options, reliability, performance, and sound quality all play significant roles in shaping consumer preferences. By delving into these elements, we can gain insights into what makes a streaming platform successful and how users navigate their options to find the best fit for their needs and lifestyles.

One of the key factors influencing the selection of streaming platforms is content availability. Users are interested in platforms that offer a wide variety of content, including movies, TV shows, music, podcasts, and original programs. The breadth and depth of the content library are crucial considerations for users as they seek access to their favorite artists, genres, and programs (Tang & Wei, 2023; Fumić, Rumac, & Orehovački, 2023)

User interface and experience (UI/UX) is also extremely important. A user-friendly platform experience, along with the ability to switch between devices and have a seamless playback experience, are key factors in platform selection (Johnson, 2022). These interfaces, which evolve with the listener experience, also encourage new habits.

Playlists, algorithms, and this easy accessibility seem to have ended the days of listening to or buying an album from start to finish. Although it has started a very enjoyable musical journey for listeners, it has created great difficulties for some artists and major music companies (Johnson, 2022).

Pricing and subscription methods have also changed in the evolving system. Users care about the length of trial periods, along with offers made in monthly and yearly forms. The attractive offers made by the platforms, such as promotions and family packages, have an effect on the end user (Kalaivani & Rahul, 2023; Fumić, Rumac, & Orehovački, 2023).

Ad-free music or video listening is another important strategy. Platforms sometimes offer their archives to the end user free of charge, but in return they are forced to listen to or watch advertisements. As a result of the free experience, users who acquire platform habits may consider the ad-free option and may choose to pay after this experience. In short, advertising options and having options according to users' budgets have a significant share in their decisions (Kalaivani & Rahul, 2023; Fumić, Rumac, & Orehovački, 2023).

Furthermore, the reliability and performance of streaming platforms are crucial considerations. Users also find value-added services such as sharing playlists, being informed about events through platforms, commenting, and participating in discussions attractive (Small, 2012). A platform that provides ease of use for collective use can increase user participation and pave the way for a sense of belonging by offering options such as accessibility to age group suggestions (Tang & Wei, 2023; Johnson, 2022).

Sound quality is another significant factor that affects user choice of streaming platforms. High-quality audio enhances the listening experience and increases user satisfaction. Research indicates that poor audio quality can lead to distrust in the content and its source, while high-quality audio can improve credibility and enjoyment (Kima, Nama, & Ryu, 2017). Platforms that offer superior sound quality can therefore attract more users who are seeking an optimal auditory experience (Gersema, 2018).

In conclusion, various factors influence the selection of streaming platforms, including content availability, user interface and experience, pricing, device compatibility, reliability, social features, and audio quality. Users can make informed decisions and choose the streaming platform that best suits their preferences, needs, and budget by considering these factors. As the streaming environment continues to evolve, platforms that prioritize user-centric features and adapt to changing consumer preferences are poised for success in this competitive market.

2.4.Turkish Consumer Preferences in Streaming Services

This section is based on the researched conducted by ZENNA Research and Consultancy among 1,200 people aged 18 and over in Turkey using the online interview method between January 11-15, 2018 (Digital Age, 2018). The study was designed a survey to answer the following questions:

- What is the level of interest in music in Turkey?
- When, where, and for how many hours do we listen to music?
- What types of music do we listen to, and where do we listen to it?
- Why do we listen to music?

In the scope of the research, 71% of individuals who express unhappiness state that music makes them happy. When examining the relationship between music and happiness among the general population in Turkey, it is observed that only 5% of the general public does not agree with statements indicating that music adds positive value to their lives. In the research, one out of every four people in Turkey believes that they cannot live without music.

As shown in Table 2.3, 80% of the Turkish population generally listens to music from their mobile phones. Listening rates from computers, radios, televisions, and MP3 players are significantly lower compared to mobile phones. The biggest difference in preferred devices for listening to music between the 18-24 age group and the 45+ age group is related to digitalization. It is noticed that the habits of listening to music from traditional devices like radio and television, which were popular before the year 2000, are very low among young people. While the listening rates for the 18-24 age group are 27% from the radio and 33% from the television, for the 45+ age group, these rates are 61% from the radio and 53% from the television.

Table 2.3 : The survey results for 'Which devices do we listen to music from?'.

Device	Percentage
Mobile Phone	80%
Computer	58%
Radio	41%
Television	40%
Mp3 player	18%
Vinyl Player	2%

The study also looked at how people typically listen to music. Most people said they use their phones the most for music, but some people also listen on computers, TVs, and radios. Young people (18-24 years old) listen to music differently than older people. They listen to music mostly on their phones (around 70% of them) and not much on computers (only about 15%).

The study found that the average person listens to music for about 1.5 hours a day. But, surprisingly, 1 out of 4 people actually listen to music for much longer, like 2-3 hours or even more every day.

When examining the preferred times for music consumption, it is observed that the afternoon hours between 14:00 and 24:00 are the most favored intervals. While the period from 24:00 to 06:00 represents the least active period for music listening, particularly among individuals aged 18-24 and those reporting a daily music listening duration exceeding 3 hours, it is notable that even during these hours, the rate of music consumption remains higher compared to all other age groups. Considering the internet penetration among adolescents aged 15-17 who were not included in the study, it can be inferred that music resonates throughout the country until the early hours of the morning.

When considering where people typically listen to music, the most common locations align closely with the peak hours of music consumption. The majority of music listening occurs at home, with 70% of individuals tuning in there. This is followed by 59% of people who listen to music while in traffic. Additionally, 43% of listeners enjoy music while walking, and 40% do so while working (Table 2.4).

Table 2.4 : The survey results for “Where do we most frequently listen to music?”.

Environment	Percentage
At home	70%
In traffic	59%
While walking	43%
While working	40%
During exercise	33%
With friends	12%

The majority of the general public, about 95%, considers music essential for happiness, and with the increasing use of mobile phones for music listening, especially among the 18-24 age group, there is an anticipation that the current 40% rate of listening to music while working will substantially rise in the future. This suggests a growing significance of corporate music environments and the use of corporate music applications on smartphones.

Among the general population in Turkey, as shown in Table 2.5 it is observed that pop music is the most listened-to genre, accounting for 75%.

Table 2.5 : The survey results for “What genre of music do we listen to the most?”.

Music Genres	Percentage
Pop	75%
Türkü	53%
Turkish Classical	48%
Rock	40%
Classical	38%
Arabesque	34%
Jazz	21%
R&B	16%
Hip hop	16%
Blues	13%
Other	3%

This study investigates music listening habits in Turkey, focusing on preferred digital platforms. The analysis reveals a clear dominance of YouTube across the general population. While alternative platforms like Spotify, Fizy, digital radio, and Google Play Music are available, their usage rates are significantly lower than YouTube's.

Further analysis by age group identifies variations in platform preferences. Spotify enjoys a higher preference among younger individuals (18-34 years old) compared to other age demographics. Conversely, the 45-65 age group demonstrates a stronger preference for digital radio channels.

Interestingly, despite a decrease in preference compared to a broader category encompassing all music platforms (82%), YouTube remains the single most intensively used digital music service in Turkey (Table 2.6).

Table 2.6 : The survey results for “Which platform do we use the most to listen to music”.

Digital Music Services Used	Percentage
YouTube	82%
Spotify	26%
Fizy	24%
Digital radios	22%
Google Play Music	20%
Dailymotion	16%
Apple Music	14%
Deezer	7%
Muud	4%
Sound Cloud	4%

According to the research, 3 out of 4 people indicate that they do not pay monthly for the digital music services they use. We see that the groups showing a tendency to pay monthly for this service are those who listen to music for 2-3 hours or more per day and those aged between 25-34.

Considering that the 18-24 age group consists mainly of students or young professionals, there is an increasing tendency to pay in the 25-34 age group. With Spotify listening rates significantly higher in the 18-35 age group compared to other age groups, it is not difficult to predict that serious competition will emerge in the sector created by digital music services in the coming years.

Seven out of 10 people who listen to music use headphones, and it is observed that the general public, who claim to listen to music everywhere and at all times—at home, at work, in traffic, while walking—generally use headphones while doing so. It is noteworthy that the tendency to use headphones begins to decline after the age of 35.

As expected, using headphones to listen to music is very popular among the 18-24 age group. The two most important factors influencing headphone choice are sound quality and being in-ear. Although brand preference comes in third, its influence rate is much lower at 32% compared to the top 2 features. Factors prominent in headphone preferences shown in the Table 2.7.

Table 2.7 : The survey results for the “Factors in choosing headphones”.

Factor	Preference Rate
Sound quality	65%
In-ear design	58%
Brand	32%
Price	27%
Wireless feature	18%
Noise-cancelling feature	18%

In conclusion, one of the most significant findings from this research is that music listening habits have undergone a substantial shift with a predominant transition towards mobile devices. Particularly, a large portion of the younger generation prefers listening to music on their mobile phones, leading to a complete digitalization of music consumption habits and a heightened interest in streaming music services, surpassing traditional methods. Examining preferred locations, times, genres, and digital service usage provides further insights for the music industry to cater to the evolving needs and preferences of Turkish music listeners. Ultimately, this research serves as a valuable resource for understanding the dynamics of music consumption in Turkey, paving the way for a more informed and strategic approach within the music industry.

2.5. Technical Dimensions of Audio Quality

In the digital era, the transmission of digital data has become increasingly crucial, leading to the development and continuous evolution of various compressed audio file formats designed for data transfer. As file sizes decrease, sound quality can suffer, resulting in perceptible losses and deteriorations. Consequently, a primary goal in utilizing compressed files has been to minimize the impact of file size on sound quality. Alongside the widely-used MPEG (Moving Picture Experts Group) format, newer compression formats like AAC (Advanced Audio Coding) by Apple Music and

Ogg-Vorbis by Xiph.org have emerged. The decision by some music streaming companies to avoid using compressed files underscores the importance of these formats on the listener experience (Jackson, 2015).

The algorithms in compressed files reduce audio file sizes by eliminating inaudible frequencies, but they can also introduce artifacts, subtle distortions, and unwanted sounds. However, tests indicate that not all listeners perceive these distortions, and studies on their perceptibility show varied results. These compression formats considered essential by streaming services can be complex for listeners and industry professionals who use high-fidelity equipment. The perception of differences or distortions depends on factors like the listening environment, equipment used, and individual sensitivity (Mandal, 2003).

With many listeners using smartphones and headphones today, discerning the quality of a compressed format is challenging. Nevertheless, streaming platforms continue to promise high quality to premium users and offer archives with lossless high-quality audio files, disregarding storage space and download speed limitations, which serves as a significant marketing strategy to attract new users.

Formats like FLAC (Free Lossless Audio Codec) and WAV (Waveform Audio File Format) preserve all original audio data, closely representing the artist's intended sound. Beyond compression formats, other factors influencing listening experience include source material quality, conversion quality (bitrate and sample rate), and the choice of listening equipment. The quality of the original recording (source material) significantly impacts the final audio output with higher bitrates in compressed formats typically resulting in better-perceived quality. The choice of equipment, such as headphones or speakers, greatly affects how sound quality is perceived (Pohlmann, 2000).

Streaming services continually innovate with spatial audio formats like Dolby Atmos promising immersive listening experiences, enhancing the sonic landscape. While high-fidelity options cater to audiophiles, the average listener may find high-quality compressed formats perfectly enjoyable. Understanding the significance and position of the most widely accepted audio formats is vital for comprehending audio streaming quality. This section will provide a brief overview of quality components, including audio formats, codecs, and sound quality analysis methods.

2.5.1. Compressed and uncompressed (lossless) audio

In terms of preservation, audio formats can be classified as either compressed or uncompressed. Uncompressed or lossless audio formats maintain the original quality of the digitized audio by preserving the data without any compression (Behl, 2015). While mainly used in industry, these formats are also used by consumers.

The history of the first digital uncompressed files is based on the invention of PCM (Pulse Code Modulation). The Wave files, which are widely used today, were developed in the 1980s through a collaboration between Microsoft and IBM and became an industry standard. WAV files are notable for their uncompressed nature, making them ideal for applications demanding high-fidelity audio, such as music production, sound editing, and professional audio recordings. The inherent flexibility of WAV files lies in their ability to store audio data at various bit depths and sample rates. This allows for capturing and reproducing audio with a spectrum of fidelity levels, catering to diverse audio needs. WAV (Waveform Audio) which was developed by Microsoft and IBM for Personal Computers (PCs). The second most widely used uncompressed format is the Audio Interchange File Format (AIFF), developed by Apple Machintosh.

Compressed audio files, as the name suggests, are files that have been compressed and result in a certain degree of loss in sound quality (Firmansah & Setiawan, 2016). Although they result in a loss in quality, they are commonly used to reduce the size of the audio data, which in turn reduces the file size. Certain non-essential audio data that would not typically be noticeable to the human ear is ignored. As a result, when these files are listened to by non-experts, the reduction in sound quality is not easily discernible (Lopez, 2021). Therefore, although the sound quality may be slightly reduced, the significant reduction in file size is worth the minor quality reduction and these files are made available for use in audio streaming applications.

MPEG is a popular compressed audio format that is capable of reducing file size by up to 90% (Pan, 1995). It is widely used and supports many digital applications. The most common version of MPEG is the mp3 (MPEG1 Audio Layer3) format. In contrast, the Ogg Vorbis format is an open source and patent-free compression format that has emerged as an alternative to mp3 (Moffitt, 2001). It is the preferred format of

Spotify. Another compression algorithm, designed by Apple as an alternative to mp3, is the AAC format (Herre, J.; Schultz, D., 1998).

Audio codecs are an additional component that plays a significant role in sound quality in addition to audio compression formats. Codecs are sets of algorithms used to encode or decode a data stream or signal (Jayant & Noll, 1984). High-quality algorithms used in codecs can increase the speed of data transfer, leading to savings in data band capacity. Audio codecs enable the decoding of compressed audio files in real-time, allowing for greater performance of computer components such as data storage space and processor, and ensuring usability across different platforms.

2.5.2. Sample rate

In the context of quality audio coding, the sample rate is an important consideration that extends beyond just the encoding and decoding process. The Audio Sample Rate, also known as the Sampling Frequency, quantifies the number of discrete samples captured per second from a continuous analog audio signal (Lévesque, 2014; Watkinson, 2013). This can also be viewed as the rate at which the digitized audio data is transmitted. The conversion from analog to digital and vice versa is achieved through dedicated Analog-to-Digital Converters (ADCs) and Digital-to-Analog Converters (DACs), respectively. The unit of measurement for sample rate is Hertz (Hz), signifying the number of samples taken each second.

A critical factor in the fidelity of digital audio reproduction is the accuracy of the analog-to-digital conversion process. A higher sample rate which translates to a greater number of samples captured per second, leads to a more realistic representation of the original analog signal. This enhancement in fidelity results in improved sound quality characterized by increased detail and precision. However, this advantage comes at the cost of increased resource requirements. Higher sample rates result in larger file sizes, which can translate to increased storage space needs, higher computational demands during processing, and potentially longer recording times.

The standard sample rate employed for CD audio is 44.1 kHz, which is considered sufficient to capture the entire range of human hearing. (Kester, 2005) This rate has remained the prevalent choice for many consumer audio applications. In professional audio production environments and for video applications, a sample rate of 48 kHz is often preferred due to its slightly wider frequency capture. While sample rates exceeding 48 kHz, such as 96 kHz and 192 kHz, offer the potential for even higher fidelity, their adoption among standard listeners remains limited. These higher rates necessitate specialized playback equipment and create even larger file sizes, hindering their widespread use.

2.5.3. Bit depth and bitrate on compressed audio files

The second dimension of audio quality when sampling is bit depth, which represents the number of data bits per unit of audio sampling (Brown, 2021; Ciesla, 2022). Similar to the sampling rate, a higher bit depth more accurately represents the actual sound source. For instance, an audio CD offers uncompressed digital audio with 16-bit and 44.1 kHz. A 16-bit field can contain 2^{16} or 65,536 pieces of information.
Bit rate on the other hand is an important quality measure in compressed audio formats, as it represents the amount of data that can be processed in a given time (Burns, 2020; Lavry, 2004). Units such as Kbps and Mbps are used to express the bit rate. When encoding an audio file to a compressed format like Mp3, a higher bitrate means that more data is used to represent the sound per second. This leads to better sound quality because more detail is preserved. A higher bitrate allows for less audio compression, which means that the sound retains more of its original fidelity. However, a higher bitrate also means a larger file size, because more data is required to accurately represent the sound. This can affect storage space and file transfer times.

Bitrate variation in encoding standards is not necessarily constant and may vary according to encoder preferences (Rashid, 2021; Camberlein & Philippe, 2005): Instead of using a constant data rate, variable bitrate analyzes how much the sound changes over short periods of time. VBR tries to determine the "best" bitrate that can accurately represent that signal within a specified minimum/maximum bitrate range. In this manner variable bitrate can provide better sound quality, smaller file size and more efficient usage of storage space than constant bitrate, especially for audio files with a lot of dynamic range. However, variable bitrate also has some disadvantages, including complex encoding and having less compatibity with some devices. Graphical explanation will be given in the spectrum analyzer section.

2.5.4. Measurement of sound quality with spectrometer

The audio spectrum analyzer, also known as a spectrometer, is a tool that facilitates the visualization and the analysis of frequency components within a sound recording over a given time period (Mlearnere, 2021; Liu, Liu, Kong, Wang, & Plumbley, 2022). Figure 2.3 depicts an image of a musical piece encoded at a fixed bit rate of 128 Kbps as displayed on the spectrometer. The frequency measures are on the left y-axis, while the color chart of the sound intensity, measured in decibels (dB) are located on the right y-axis. The x axis represents the time (in seconds / minutes) of the given audio example.

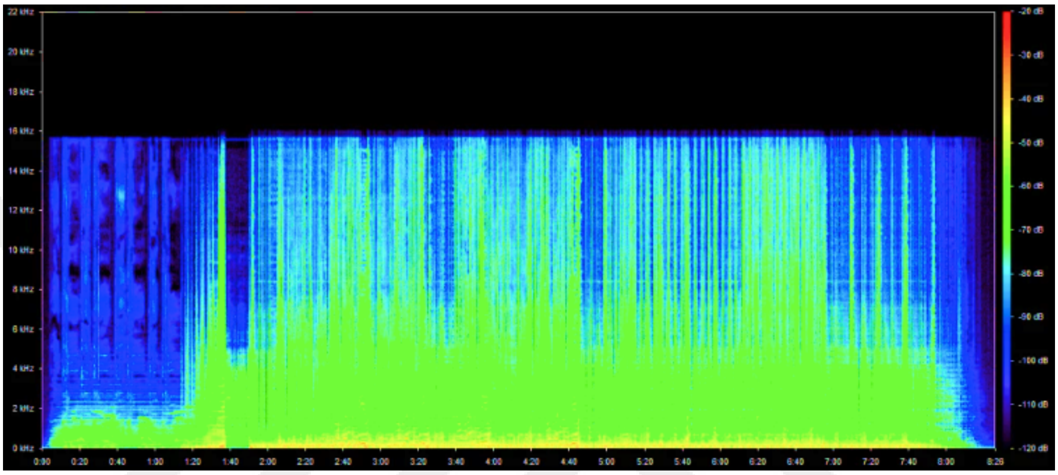


Figure 2.3 : A 128kbit CBR audio file

In audio recording analysis, the bit rate of a recording can be estimated approximately by observing the intensities of the sound in the time and frequency axes. The horizontal axis of the spectrum analyzer indicates the time interval, while the vertical axis indicates frequency and the coloring of the graph represents sound intensity (decibel-dB), respectively. By observing the frequency range in the graph where it cuts off, the bit rate of the recorded audio can be estimated. For instance, a cut-off at 11kHz indicates a bit rate of 64 Kbps, while a cut-off at 16kHz indicates a bit rate of 128 Kbps.

Similarly, a cut-off at 19kHz suggests a bit rate of 192 Kbps, and at 20kHz, a bit rate of 320 Kbps. Finally, a cut-off at 22kHz implies a bit rate of 500 Kbps. In the absence of interruption, bit rates are higher than 1,000 Kbps and indicate a lossless audio format (such as WAV, FLAC). In Figure 2.3, the frequencies are cut off around 15kHz to 16kHz, indicating an approximate bitrate of 128 Kbps for the analyzed audio.

Figure 2.4, on the other hand, shows the use of variable bit rate (VBR), with different frequency peaks appearing at different time intervals.

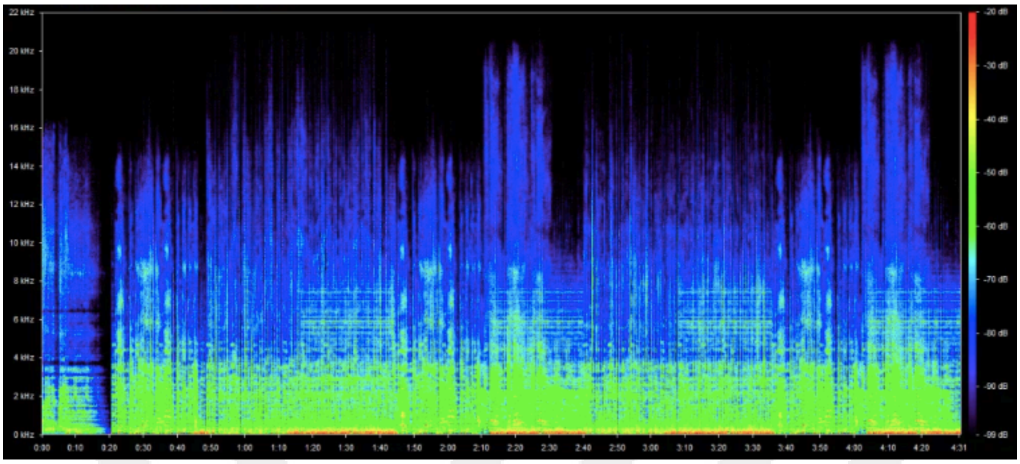


Figure 2.4 : A 256Kbps VBR audio file

Despite being recorded at 256 Kbps, the recording exhibits frequency increases up to 20-21 kHz, indicating the possibility of a high-quality sound recording originating from the original studio recording.

In conclusion, the audio spectrum analyzer is essential for measuring and visualizing sound quality. By analyzing frequency components and their intensities, one can estimate bit rates and assess audio fidelity. Higher bit rates indicate better sound quality. This method is crucial for evaluating audio recordings and understanding the factors that influence digital sound quality.

2.6. Human Perception of Audio Quality

The use of lossy compression techniques remains prevalent in music streaming services, online television audio, and digital audio broadcasting. The degree of quality degradation is directly tied to the compression ratio; higher compression ratios result in smaller file sizes but a more significant loss of audio fidelity. This approach prioritizes faster transmission and smaller file sizes, albeit at the expense of potentially diminished audio quality.

Listeners' awareness of audio quality has been explored in a number research efforts. Olive (2011) conducted a controlled listening experiment about how teenagers perceive sound quality. Eighteen high school students, new to such evaluations, participated in two separate tests. The experiment involved playing music for them in two different ways. In the first part, the students listened to the same songs in two formats: a compressed MP3 format, which is the kind of file you might find on a typical music player, and a high-quality, lossless format that captures all the details of the original recording, like the ones used on CDs. In the second part, the students listened to the same songs again, but this time through four different sets of speakers commonly found in homes. These speakers varied in quality, with some being more accurate and neutral in their sound reproduction than others.

Overall, the teenagers preferred the way the music sounded in the high-quality, lossless format compared to the compressed MP3 format. This suggests that even without any prior experience listening critically, they could still tell the difference between higher and lower quality sound. Additionally, the teenagers showed a preference for the music played through the most accurate and neutral speakers. This indicates that when given a chance to compare directly, they were able to appreciate the clearer and more natural sound reproduction offered by higher quality equipment. These findings provide new evidence that teenagers, just like adults, are capable of noticing and enjoying the benefits of better sound quality.

Olive (2011)'s study with inexperienced teenagers (67.1% preference) and another research by Pras, Zimmerman, Levitin, & Guastavino (2009) with experienced listeners (72% preference) both demonstrate a clear trend: listeners, regardless of prior experience, gravitate towards high-fidelity audio. This highlights the importance of prioritizing audio quality during compression. Ideally, lossy compression techniques should minimize the introduction of audible artifacts. This ensures that the compressed audio retains a high degree of fidelity, resembling CD-quality as closely as possible, and maintains a level of quality that remains preferable to listeners even after compression.

Rogowska (2015) investigated how the human ability to discriminate between lossy compressed and uncompressed audio is affected by different factors. These factors included:

- **Bit Rate:** The experiment examined how easily listeners could distinguish compressed audio from the original at various bit rates (32 Kbps, 48 Kbps, etc.).
- **Instruments:** The study tested a variety of instruments (viola, oboe, saxophone, etc.) to see if their inherent sound characteristics influenced discrimination difficulty.
- **Audio Codecs:** Three different codecs were used for compression: MP3-LAME, Opus, and Ogg Vorbis.

The source audio files came from a recognized sound quality assessment material database (SQUAM). Listeners participated in a test where they had to identify whether the presented audio was compressed or uncompressed. The difficulty of discriminating compressed audio from the original varied depending on the instrument and codec used. Instruments like viola and saxophone were easily distinguishable from their uncompressed counterparts at the lowest bit rate (32 Kbps) when compressed with MP3-LAME. Conversely, instruments like the French horn remained difficult to distinguish even at the lowest bit rate. Generally, discrimination became progressively harder as the bit rate increased. By 128 Kbps, most instruments (except viola and saxophone) became indistinguishable from the uncompressed versions. Codec choice also impacted discrimination ability. For example, a saxophone compressed with Ogg Vorbis at 48 Kbps was harder to distinguish from the original than the same instrument compressed with MP3-LAME at the same bit rate (showing 97% discrimination).

Rogowska's experiment confirmed that the ability to discriminate the effects of audio compression decreases as the compression ratio increases (i.e., higher bit rates make compressed audio more indistinguishable from the original). Additionally, the study found that MP3-LAME codecs were generally more easily distinguished from the original audio compared to Ogg Vorbis and Opus in the listening tests.

Pras et al. (2009) investigated the impact of music genre on listeners' perception of audio quality in compressed MP3 files. They used five music genres - pop, metal rock, contemporary, orchestra, and opera - encoded into MP3 files at bit rates of 96, 128, 192, 256, and 320 Kbps. Listeners, including sound engineering professionals, sound engineering students, researchers, and musicians, compared these MP3 files to uncompressed CD-quality versions (44.1 kHz, 16 bits) and indicated their preferences.

For analysis, genres were grouped as "electric clips" (pop and metal rock) and "acoustic clips" (contemporary, orchestra, and opera). Results showed that sound engineers generally preferred CD-quality over MP3 files and could distinguish between all compressed qualities except the highest two-bit rates (256 and 320 Kbps). Musicians, however, exhibited less preference for CD-quality compared to sound engineers. The study also included a listening test followed by a questionnaire for participants.

Pras et al. (2009) explored listener preferences for compressed and uncompressed music, focusing on perceived differences such as high-frequency variations, general distortion, reverb, and transient artifacts. The study found a stronger preference for CD-quality among sound engineers and musicians for "electric clips" (pop and metal rock) compared to "acoustic clips" (contemporary, orchestra, and opera), suggesting that prior listening experience enhances discrimination ability. Sound engineers, trained to identify artifacts were more sensitive to compression issues than musicians who prioritize overall sound fidelity. The study also highlighted that MP3 files require more "headroom" than uncompressed audio, making compressed electric clips easier to distinguish. The authors suggested that dynamic compression, more common in electric music, might explain these differences and recommended considering this during mastering to optimize audio quality for compressed formats.

In examining the nuances of audio compression, a study by Pocta and Beerends (2015) compared AAC and Ogg Vorbis at very low bitrates, finding that Ogg Vorbis outperformed AAC despite a lower bitrate for the latter. Rogowska (2015) further noted that different codecs affect instruments uniquely, with perceived quality influenced by both the codec and the type of audio. This aligns with Pras et al. (2009), who found that MP3 compression impacts various music genres differently and that audio with heavy dynamic compression and limited headroom exhibits more noticeable artifacts in compressed formats. These findings underscore the complexity of audio compression, questioning whether advancements in psychoacoustic models alone can minimize artifacts or if specific genres and instruments might need dedicated encoding strategies to avoid quality degradation.

In the light of these previous works and also the fact that there exist many songs uploaded in low quality to streaming archive, listeners may have difficulties to hear differences in sound quality. The results also indicate that different codecs can make also small differences in perception. These include listening environment and the acoustics of the listening space that can significantly impact perceived quality. Playback equipment is also very important since the selection of headphones, speakers, and sound systems can limit or enhance audio fidelity. Also recording quality is one of the key factors. The initial recording quality also contributes to the final perceived quality of the audio.

The collective research underscores the nuanced complexities in human perception of audio quality, particularly concerning lossy compression. While listeners, regardless of experience, often show a preference for higher fidelity audio, the degree of perception varies based on factors such as bit rate, codec, instrument type, and genre.

3. METHODOLOGY AND EXPERIMENT DESIGN

3.1.One-to-One Interviews

Industry professionals have talked about the difficulties faced by Turkey's music sector during its digital transformation. For situations that have occurred or are believed to have occurred, it was decided to first gather opinions from professionals who directly experienced this transformation and then proceed with the study accordingly. Following this rationale, interviews were conducted with Metin Uzelli, who played a crucial role in the digital transformation between 2005-2012, Selim Serezli, who worked in various capacities during the same period, and Bora Turan, who founded Turkey's first domestic digital distribution company. This section will provide brief summaries of these interviews. The full transcripts can be found in the Appendix section.

3.1.1. Interview with Metin Uzelli

Metin Uzelli is a prominent figure in the Turkish music industry, serving as the second-generation leader of Uzelli Music. He is also the founding member of MÜ-YAP and Vice President at The Orchard / Turkey (Digital distribution company World-wide). With 50 years of experience, he grew up around his father's cassette factory established in 1977 and remained operational until 1997. Uzelli Music is a leading Turkish music company involved in recording, pressing, and distributing music by artists. They have published works by some of the most important names in Turkish music history.

Metin Uzelli holds expertise in music archiving and digital music distribution. He is also a founding member of MÜYAP (Music Producers' Association) and the regional director for "The Orchard" in Turkey. Uzelli is recognized for his role in the music industry and known for his innovative approaches within the sector. He is actively engaged in preserving and transmitting Turkish music to future generations, a multifaceted endeavour that draws on historical contexts and personal insights. This exploration delves into the complexities of the Turkish music industry, with a particular focus on the practices of Uzelli Music, a company operating within a unique transnational framework.

Metin Uzelli, in the initial part of the interview, elucidates his family's deep-rooted involvement in the music industry, tracing back to his father's establishment of a cassette factory in 1979. Unlike many Turkish companies that failed to maintain their archives, Uzelli Music founded in Germany meticulously preserved their master files and visual materials, showcasing a commitment to archival integrity that was not widely adopted within the industry.

The importance of preserving studio recordings is emphasized, alongside the challenges associated with transferring them to digital formats. Despite the technological advancements facilitating the conversion from analogue tapes to CDs and subsequently to MP3s, many companies struggled due to a lack of technical expertise, resulting in damage to original recordings. Uzelli Music, influenced by international standards, adopted rigorous preservation practices, ensuring the meticulous maintenance and regular backups of master files and visual materials.

However, physical tapes, as the primary archival materials, present significant preservation challenges due to their susceptibility to deterioration. The transition to digital formats further complicated the landscape with issues surrounding inconsistent quality transfers and limitations inherent in MP3 formats, despite their widespread adoption. The digital transformation in Turkey, managed by MU-YAP, involved the centralized uploading of MP3s to combat piracy, but issues with maintaining high-quality digital transfers persisted. Despite MU-YAP's efforts in centralizing the digital music catalogue and licensing, technical and quality issues arose due to limited industry expertise.

To sum up, the preservation and transfer of music archives in Turkey have encountered significant challenges stemming from technical limitations and inadequate archival practices.

3.1.2. Interview with Selim Serezli

Selim Serezli is a highly experienced professional within the Turkish music industry, boasting over 27 years of work life (as of 2024). His career path seems to have traversed various facets of the music world, including radio production and hosting, marketing and management within music companies, concert organization and music production partnerships. He has also held leadership positions like digital distribution director and music publishing company manager. Selim Serezli's participation as a judge in music competitions suggests a well-rounded understanding of the industry, encompassing production, distribution, marketing, artist management and staying up-to-date with the current digital music trends. While details remain scarce, it's evident that Selim Serezli is a multifaceted player in the Turkish music industry, fostering new talent and contributing across various sectors.

In this detailed interview segment, Selim Serezli provides a comprehensive overview of his extensive involvement in the music industry, delving into his multifaceted career trajectory that encompassed roles ranging from production and artist management to concert organization and digital distribution. Through his narrative, Serezli not only chronicles his personal journey but also offers valuable insights into the broader landscape of the Turkish music industry, particularly during its pivotal transition to digital distribution.

Serezli's narrative begins with his entry into the professional music arena, initially starting at a record label before branching out into various sectors such as artist management, concert organization, and ultimately, digital distribution. His account offers a glimpse into the diverse array of responsibilities and experiences he accumulated over the years, highlighting the dynamic nature of the industry and his adaptability to its evolving demands.

Central to Serezli's discussion is the transformative impact of digital distribution on the music landscape, with a specific focus on Turkey's journey in this realm. He recalls the advent of iTunes in 2005 and its subsequent introduction to the Turkish market, underscoring the significant implications this had for both record companies and artists alike. Serezli elaborates on the collaborative efforts between entities like MU-YAP and digital distributors such as The Orchard, shedding light on the strategies employed to navigate the complexities of digital music dissemination in Turkey.

However, amidst these endeavors, Serezli paints a picture of chaos and disorganization prevalent within the Turkish digital music ecosystem. He recounts instances of incorrect album listings, missing metadata, and overall discrepancies in content quality, underscoring the challenges encountered during this transitional phase. By contrasting the situation in Turkey with the more structured environment in the United

States, Serezli emphasizes the critical role played by regulatory oversight and standardized practices in ensuring the integrity of digital music platforms.

Moreover, Serezli reflects on the broader implications of these challenges, particularly in terms of royalty collection and artist compensation. He elucidates the legal loopholes and regulatory gaps that perpetuated uncertainty and hindered the effective distribution of royalties to rights holders. Through his nuanced analysis, Serezli underscores the pressing need for regulatory reform and industry-wide standards to address these systemic issues and foster a more equitable environment for artists and stakeholders alike.

In essence, Serezli's narrative serves as a compelling testament to the intricate interplay between technological innovation, industry dynamics, and regulatory frameworks within the context of the Turkish music industry's digital evolution.

3.1.3. Interview with Bora Turan

Bora Turan founded Eğlence Fabrikası (Entertainment Factory) in 2011 after gaining extensive experience in the technology field, both in Turkey and Silicon Valley. He previously held executive positions at Apple, Microsoft, and EY. He is a graduate of Dz. Lisesi, Dz. Harp Okulu, Naval PostGraduate School, and Stanford University.

Bora Turan elucidates the meticulous standards upheld by Eğlence Fabrikası, emphasizing their insistence on "lossless" formats for music uploads. While most platforms demanded MP3 files, Eğlence Fabrikası prioritized maintaining the integrity of studio recordings by sending wave files. Turan recalls the specific requirements of Muud (platform owned by TTnet), noting that they typically requested MP3 files without distinctions in quality levels.

The conversation delves into the technical specifications of MP3 files, with Turan discussing the bit rates and quality standards prevalent during different periods. Despite the transition to digital formats, the industry faced challenges in ensuring consistent quality transfers, particularly with the proliferation of lower-quality conversions.

Turan reflects on the current preferences of platforms like Fizy and Muud for lossless formats, underscoring the evolving landscape of quality standards within the industry. However, he acknowledges that not all platforms adhere to the same rigorous standards, leading to potential discrepancies in audio quality across different platforms.

The dialogue also touches upon the challenges posed by user-generated content and the importance of automated systems in verifying file quality. Turan outlines the automatic processes employed by Eğlence Fabrikası, highlighting the use of software library to check sampling rates and bit rates, ensuring compliance with quality standards.

Furthermore, the conversation addresses the historical context of music archive uploads, with Turan attributing the prevalence of low-quality archives to the lack of proper metadata and content curation during the early stages of digitalization. However, with the emergence of quality-focused platforms like Apple Music, Turan predicts a shift towards higher standards and the eventual removal of low-quality repertoire from platforms.

In conclusion, the dialogue sheds light on the multifaceted challenges and evolving standards within the Turkish music industry, underscoring the importance of quality preservation practices and standardized protocols to ensure a consistent and high-quality listening experience for users across various platforms.

3.2.Hypothesis Development

Interviews with Turkish industry professionals pointed out issues with the sound quality of the collectively created database before 2005, given the internet bandwidth, download, and upload speeds that were available during that time. In the context of music streaming platforms, it is concluded that it is highly possible for low-quality audio files to be uploaded and distributed without a proper audio quality check, while appearing to meet the file and data type requirements. For instance, an mp3 file with a 128Kbps resolution may be upgraded to meet the system's audio file requirements and create a 24bit 44.1kHz audio file without any actual increase in audio quality. Therefore, two hypotheses are formulated based on preliminary interviews:

H1: Music streaming platforms consistently deliver the audio quality promised for all content.

H2: Music streaming platforms conduct adequate audio quality checks on all uploaded songs, in accordance with the audio quality standards they have promised.

Additionally, literature on human perception of audio quality highlights the importance of determining whether people can actually identify any potential issues with streaming platforms. Consequently, a third hypothesis is formed:

H3: Listeners can distinguish between high-resolution and low-resolution formats of the same music track.

To test these hypotheses, several different analyses were performed and the results are presented in the subsequent sections.

3.3.Selection of Streaming Platforms

Building on the results of Zenna Research (Digital Age, 2018) regarding music consumer preferences, a separate survey was conducted with over 200 participants, who were not included in the other analyses of this study. This survey aimed to gather additional data and obtain more current results, helping to identify which streaming platforms should be prioritized for the technical analysis.

The average age of participants, ranging from 11 to 60 years old, fell mostly within the 25-40 age range. In the group consisting of 58% females and 42% males, particular emphasis was placed on the effects of sound quality on music preferences.

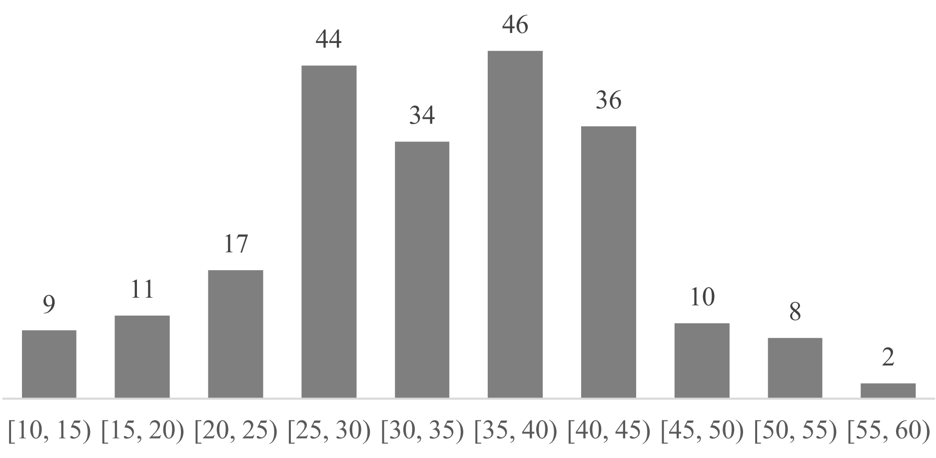


Figure 3.1 : The age range of survey participants.

When asked if they cared about sound quality, 80% of the participant said they did pay attention to sound quality to some extent (Table 3.1).

Table 3.1 : Attention to sound quality while listening to music.

Level of Attention	Percentage
A lot	25.1
As much as possible	63
Not much	11
Not at all	0.9

They were also asked about their preferences for music streaming platforms. The results aligned with Zenna's study, except that no users of Google Play Music were identified (Table 3.2).

Table 3.2 : Music Platform Preference.

Platform	Percentage
Youtube	81.6
Spotify Premium	41.5
Spotify	30.9
Apple Music	14.3
Fizy	11.1
Fizy Premium	2.3
Muud	1.8
Muud Premium	0.9
Online radio	0.5
Others	0.5

After analyzing the results, the focus was narrowed to four platforms: two local companies targeting the Turkish market and two global streaming service providers. Spotify was chosen due to its position as both a global leader and the market leader in Turkey, along with Apple Music, known for its long-standing presence and technological leadership in the industry. Additional questions were posed to survey participants who preferred paid music services, exploring both the extent of their usage and their reasons for preference. As shown in Table 3.3, the majority of participants use Spotify, followed by Apple Music, while the preference for local services is relatively minor.

Table 3.3 : Subscribed / Pre-Paid Music Platform Preference.

Platform	Percentage
Spotify Premium	70.8
Apple Music	15.3
Fizy Premium	9.7
Muud Premium	3.2

At this stage, participants were asked why they opted for paid music services over free ones and what factors influenced their choice of a specific paid service. As shown in Table 3.4, ad-free music is the primary reason for their preference, followed by other factors such as price, offline listening, playlist usage, and sound quality. While sound quality is a concern, it is not as significant as the other factors mentioned.

Table 3.4 : Reasons for choosing subscribed / pre-paid music platforms.

Reason for choice	Percentage
Add-free music	73.1
Off-line music	52.9
Playlist usage	41.3
Family Package / Price	20.2
Sound Quality	18.3

After inquiring why users prefer paid music services, participants were asked about the reasons behind their choice of platform. Factors such as recommendation, user-friendliness, playlist functionality, and a rich archive were mentioned, though less frequently, compared to those who prioritized higher sound quality. 9.6% of survey participants indicated that higher sound quality influenced their choice (Table 3.5).

Table 3.5 : The reason behind chosen subscribed / paid platform.

Reason for choice	Percentage
Being the first recommended	53.6
Being user friendly	52.9
Playlist functionality	36.5
Foreign Music Library	30.8
Turkish Music Library	18.3
Sound Quality	9.6

In conclusion, the follow-up survey successfully provided updated insights into music streaming preferences among a diverse age group, highlighting the dominant positions of Spotify and Apple Music in the market. The survey reaffirmed the significance of ad-free listening as a primary factor for choosing paid services, while sound quality, although important, was secondary to other features such as offline listening and playlist management.

3.4. A/B Testing the Effect of Technical Environment on Sound Quality

In this section, differences between streaming platforms over WiFi and mobile data, variations between desktop and mobile versions, and the consistency of the codecs used by platforms will be checked to determine the method to be used for archive scanning.

3.4.1. A/B Testing: Wifi and Cellular

The objective of this test is to examine whether the bit rate, a significant factor in determining the audio quality of musical works on streaming platforms, varies between cellular data and wireless network (Wi-Fi) usage. To achieve this, the bit rates of musical works were measured separately with cellular and wireless data usage and then compared with each other. The frequency analyses conducted on the musical works provided by all streaming providers revealed that there were no significant differences between audio formats delivered over cellular and audio formats delivired via wireless networks.

A frequency analysis of the song "Sen Ağlama" from the album of the same name which was released in 2005 by the Turkish band Badem is shared in Figure 3.2 as an example.

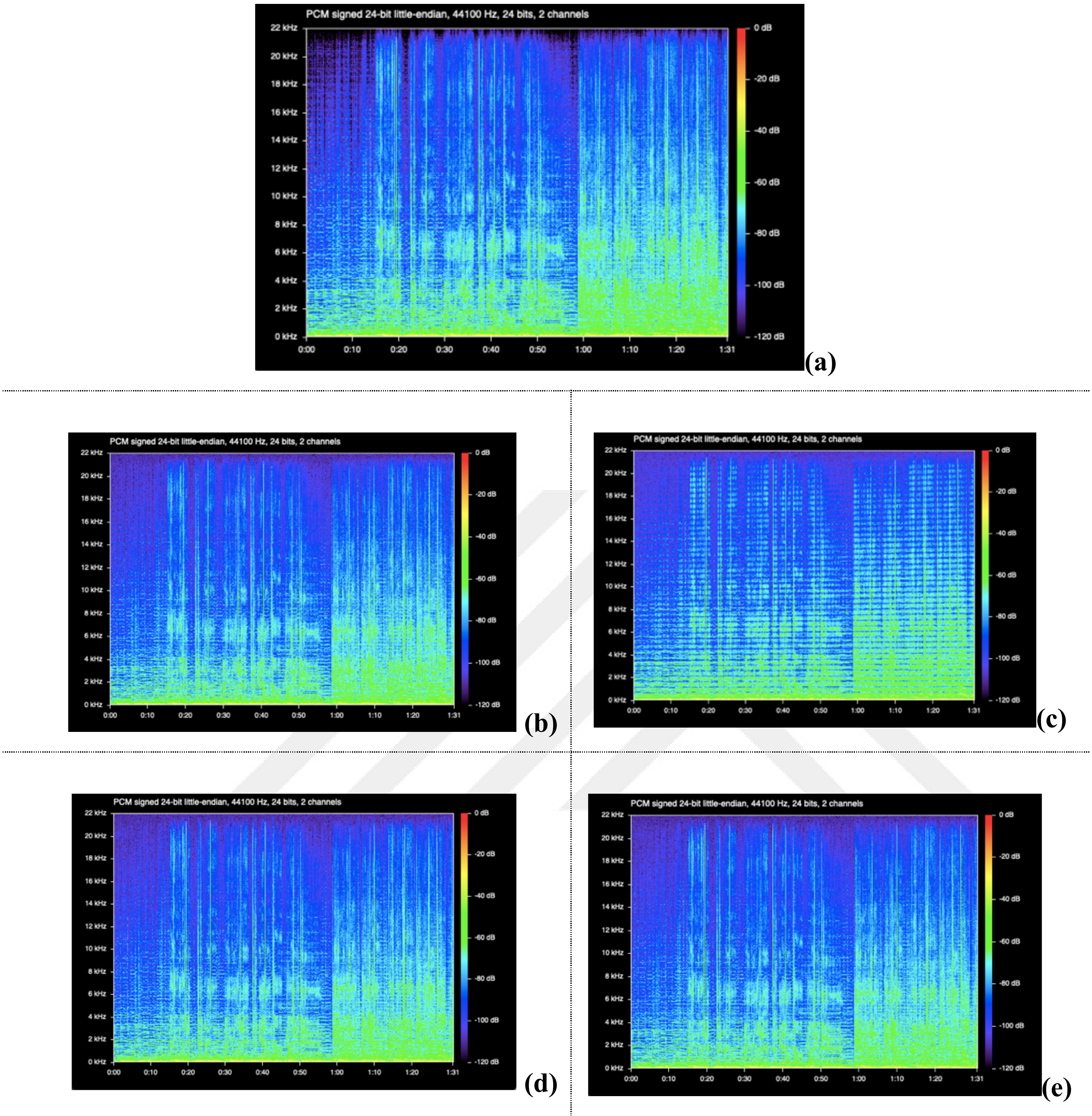


Figure 3.2 : Wireless & Cellular A/B testing for the song “Sen Ağlama (Badem)”: (a) Original CD 16bit 44.1Khz. (b) Apple Music – Cellular Data. (c) Apple Music – Wireless Network. (d) Spotify – Cellular Data. (e) Spotify – Wireless Network.

Audio data up to almost 22 Khz on the left Y-axis of the graphs shows that the audio files from Spotify and Apple Music are loaded in high quality (256 – 320 Kbps) using both cellular data and wireless network. Because there is no significant difference in quality between cellular and wireless networks, the wireless connection will be used for data transfer in the subsequent phases of the study.

3.4.2. A/B Testing: Mobile and Desktop

The aim of this test is to investigate the bit rate differences between the mobile and desktop versions of music streaming platforms. To achieve this, analog signals from mobile phones were converted to a digital format using a headphone output → 1/8-inch TRS Y cable → Pre-amp → DAW instrument input signal line. Although background noise occurred during the signal transfer and analog/digital conversion process, it was detected in the spectrum analyzer and removed from the original audio file. The noise was recorded while no signal was being transmitted, and X-Noise (Waves Audio) software was used to teach and remove the noise from the transmitted signals.

The results of the frequency analysis indicated that the mobile and desktop versions of music streaming platforms have similar frequency graphs for musical works. In other words, the frequency spectra of the audio formats available on both platforms are nearly identical.

Nevertheless, considering potential losses and noise additions that could occur during the transfer from the analog system to digital, it was decided to continue the research with the desktop versions of the streaming services to ensure the study is more reliable and stable.

3.4.3. A/B Testing: Compression of lossless format on CD and compressed audio files uploaded to music streaming platforms

The aim of this study is to investigate the consistency of lossless audio obtained from CDs and compressed via codecs with audio files obtained from streaming service applications. To this end, the original CD audio file was directly converted to AAC (Apple) and Ogg Vorbis (Spotify) formats and compared with the corresponding audio files from the streaming applications. The frequency analyses of the song "Merhaba" by Efkan Şeşen, from his 1997 album, are presented in Figure 3.3 as an example.

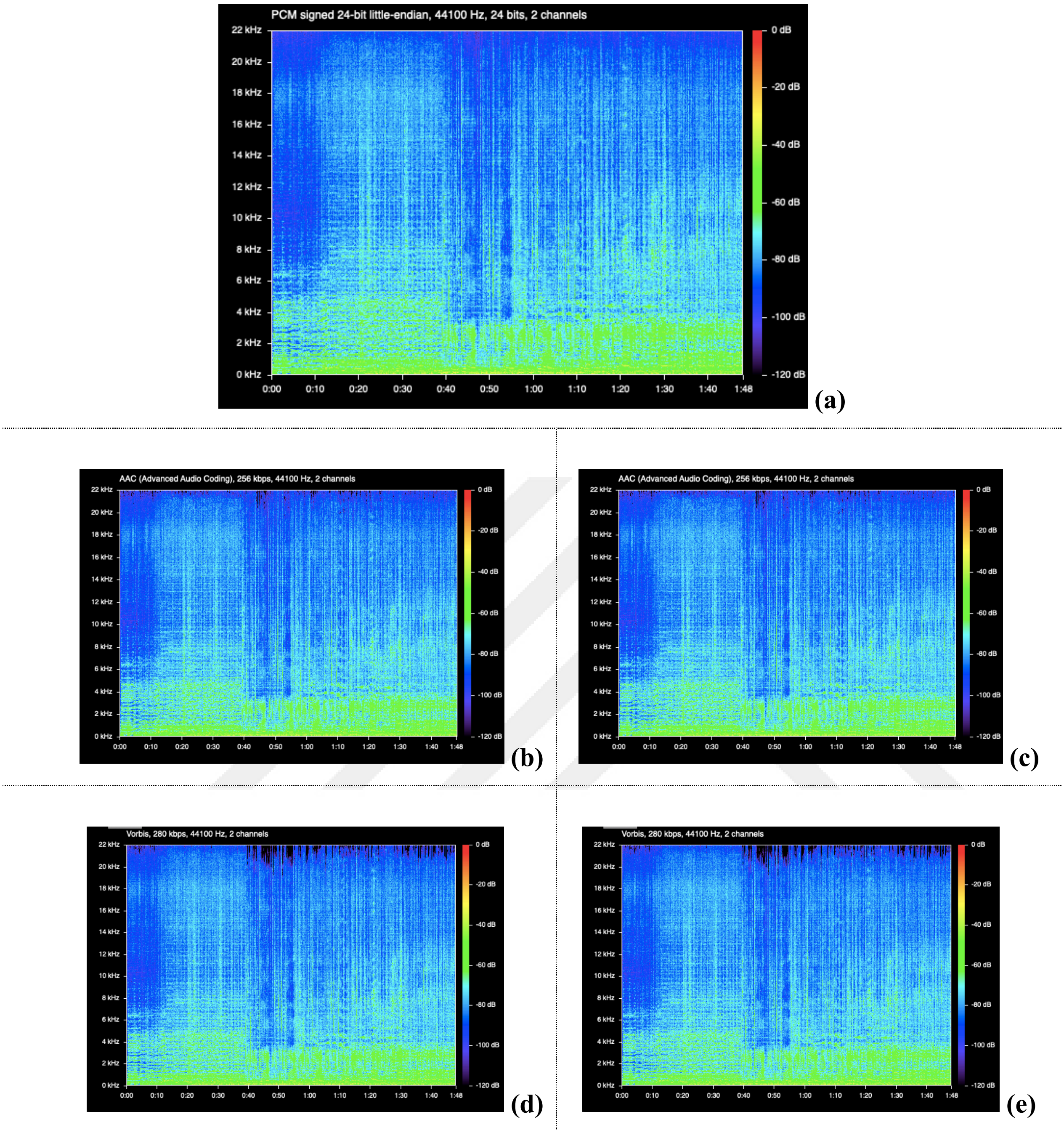


Figure 3.3 : AAC & Ogg Vorbis A/B testing for the song "Merhaba (Efkan Şeşen)": (a) Original CD. (b) CD to Apple's AAC (256Kbps). (c) CD to Spotify's Ogg-Vorbis (320Kbps). (e) CD to Spotify's Ogg-Vorbis (320Kbps).

During critical listening sessions, technical aspects of sound including frequency response, dynamic range, tone, and instrument cohesion were examined to determine whether any significant differences exist between lossless audio ripped from CD and compressed through codecs, and audio files obtained from streaming services. The spectrum analysis conducted revealed that musical works provided by Spotify and Apple Music, with bit rates of 256Kbps and 320Kbps respectively, exhibit consistency with musical works created using codecs from original files. Analysis of the Y-axes on the left side of the graphs (data rates reaching 21 to 22 khz for Spotify and Apple Music) indicates a match between the audio files extracted from CD and the streaming services' audio files generated with their own codecs.

3.5.Examination of Compressed Audio Files Uploaded to Streaming Platforms Before 2005 in Turkey

Based on information gathered from one-to-one interviews with music industry experts, this study investigates whether the Turkish-origin repertoire uploaded to streaming service platforms prior to 2005 falls short of the audio quality promised by these platforms. To assess the audio quality of a representative sample of this repertoire, 20-30 second sections of randomly selected tracks were extracted and subjected to frequency analysis. Figure 3.4 presents a comparative spectrum analysis of 13 Turkish-origin tracks obtained from Spotify, revealing visible differences in frequency (Kbps) between the musical pieces, some of which feature frequency cut-off below 16 kHz.

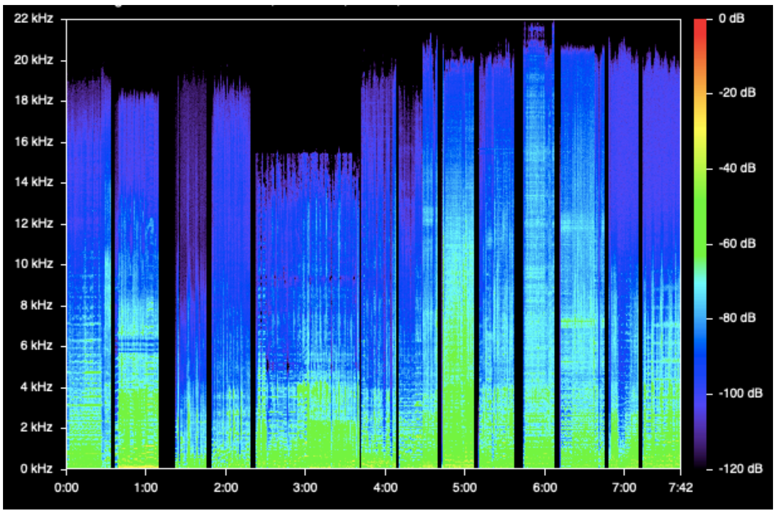


Figure 3.4 : Randomly selected Turkish songs on Spotify uploaded before 2005.

Similar to Spotify, the spectrum analysis of 16 Turkish songs selected from Apple Music reveals significant differences in bit depth and bit rate. The analysis shows cut-offs around 9 to 10 KHz, corresponding to a bit rate of 128 Kbps. The cut-off at this point which corresponds to a bitrate of 64 Kbps falls below the lowest quality standard accepted today and suggests the possibility of lower quality audio in the Turkish repertoire uploaded to the system prior to 2005.

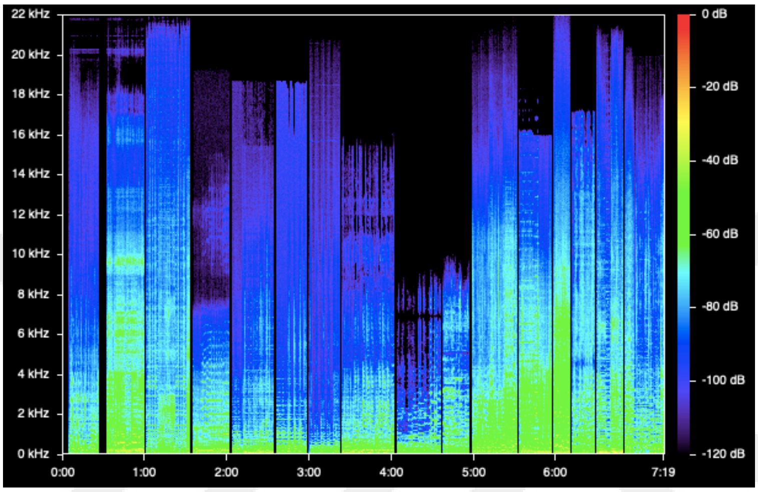


Figure 3.5 : Randomly selected Turkish songs on Apple Music uploaded before 2005.

Based on this initial analysis, it was decided to conduct a more in-depth study. First, top ten songs of artists on Spotify who are still popular and likely to have low-quality uploads are targeted. Second, if any songs were found to be below the promised quality, the entire album containing that low-quality track was examined.

This top-down approach demonstrated that many songs by still-popular artists, despite high play counts, were uploaded in quality below the promised standard. A total of 1.078 songs were examined, of which 754 met the promised quality standards. The remaining tracks, including songs with bitrates below the promised 256 Kbps, revealed that albums containing these low-quality songs also exhibited the same inferior quality.

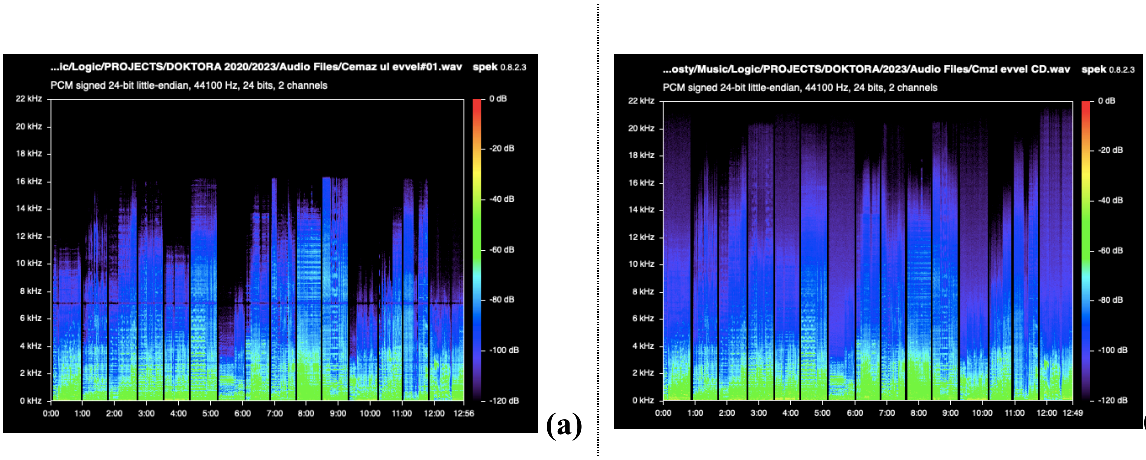
Third, an additional analysis was conducted across other streaming platforms. The same music tracks, where available, were analyzed on Apple Music, Fizy, and Muud. The results were identical: each platform, like Spotify, contained the same tracks with low quality.

Fourth, an important subsequent inquiry was made to determine whether the quality degradation occurred during system upload or was inherent to the original CD release. Audio spectrograms from original CDs and their Spotify counterparts were compared. CDs from 15 still-popular and frequently listened-to artists were analyzed, revealing that, except for one instance, the CDs possessed higher quality (16 bit) than the uploaded compressed versions. Table 3.6 illustrates the monthly listening counts of these artists on Spotify from highest to lowest. In Appendix A, a selection of spectrometer comparisons between CDs and Spotify conversions is shown.

Table 3.6 : Monthly listening counts of selected popular artists on Spotify.

Artist	**Album Name**	**Year**	**Monthly Listeners on Spotify** (approx. in millions)
Sezen Aksu	Firuze	1982	5.6
Tarkan	Aacaipsin	1995	4.4
Sertab Erener	L'AL	1994	3.9
Müslüm Gürses	Senden vaz geçmem	1994	3.6
İbrahim Tatlıses	Klasikleri	1995	2.9
Ajda Pekkan	'93	1993	2.4
Ahmet Kaya	Dokunma Yanarsın	1992	2.4
Şebnem Ferah	Od	2013	2.0
Cem Karaca	Cemaz-Ül-Evvel	1994	1.9
Nazan Öncel	Ben böyle aşk görmedim	1994	1.6
Neşet Ertaş	Gönül Dağı	1999	1.2
Levent Yüksel	Medcezir	1993	1.2
Fikret Kızılok	Zaman zaman	1983	0.7
Aşık Veysel	Klasikler	2016	0.3
Bülent Ortaçgil	Oyuna Devam	1991	0.2

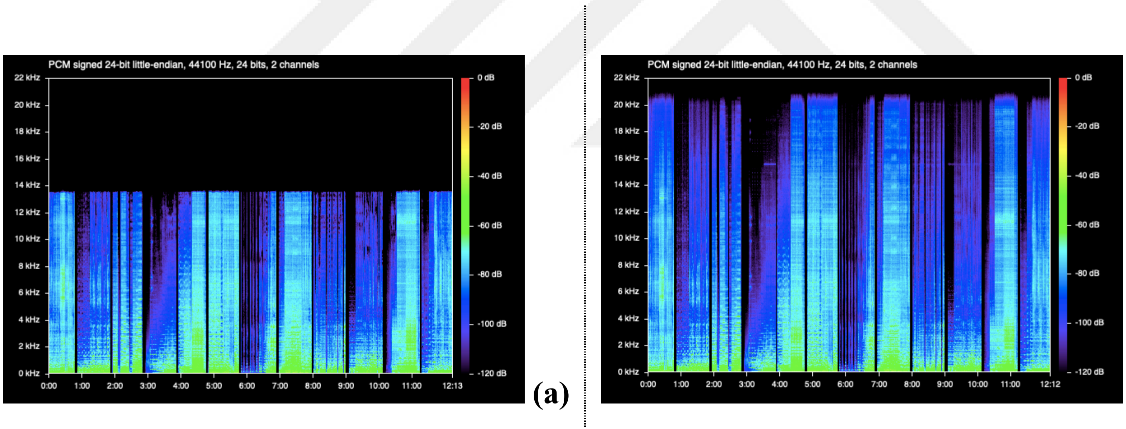
As an example of this examination, Figure 3.6 depicts a spectrum analysis of Cem Karaca's top ten songs on Spotify, revealing that nearly half of Cem Karaca songs have poor sound quality.



(a) (b)

Figure 3.6 : Frequency analysis of the song "Cemaz-ül Evvel (Cem Karaca)": (a) Spotify. (b) CD Audio.

Another example is shown in Figure 3.7. Tarkan's album "Aacayipsin", one of the best-selling albums of its time, was uploaded in extremely low sound quality.



(a) (b)

Figure 3.7 : Frequency analysis of the song "Aacayipsin (Tarkan)": (a) Spotify. (b) CD Audio.

Figure 3.8 illustrates the total results of the examination of CD – Spotify frequency analysis comparison results of 15 popular Turkish artists' music tracks. As the research continues towards less-listened-to artists, the rate of finding low-quality samples increases. The low-quality samples of these artists and many similar artists with a significant number of listeners seem problematic from a sectoral perspective and require further research.

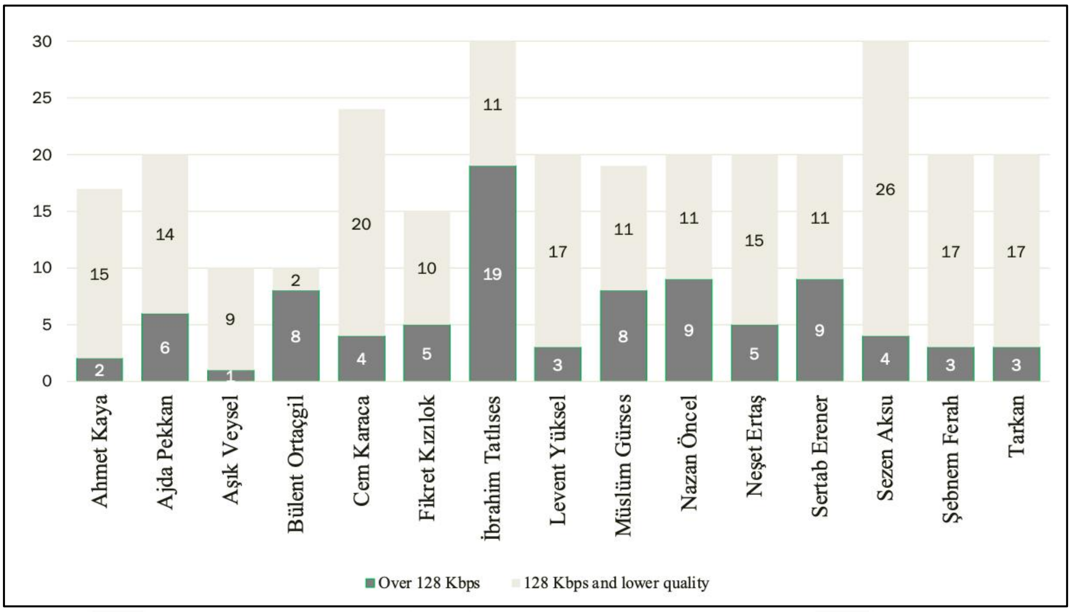


Figure 3.8 : CD – Spotify frequency analysis comparison results of 15 popular Turkish artists' music tracks

In 2021 Apple Music, a global giant operating in Turkey, has introduced a next-generation experience in audio quality through its partnership with Dolby Atmos, which aims to elevate listeners' music experiences to a different level in higher quality listening experience through Spatial Audio and distinguish itself from other platforms (Apple, 2021). However, like Spotify, it struggles to deliver the promised quality, as evidenced by the low-quality examples found in the research, which nearly match the results of Spotify investigation when checked on the Apple Music versions. To give a specific example, it was observed that two songs from Sertab Erener's album Lâl were uploaded in Dolby Atmos format and offered in lossless (i.e., uncompressed) format as illustrated in Figure 3.9.

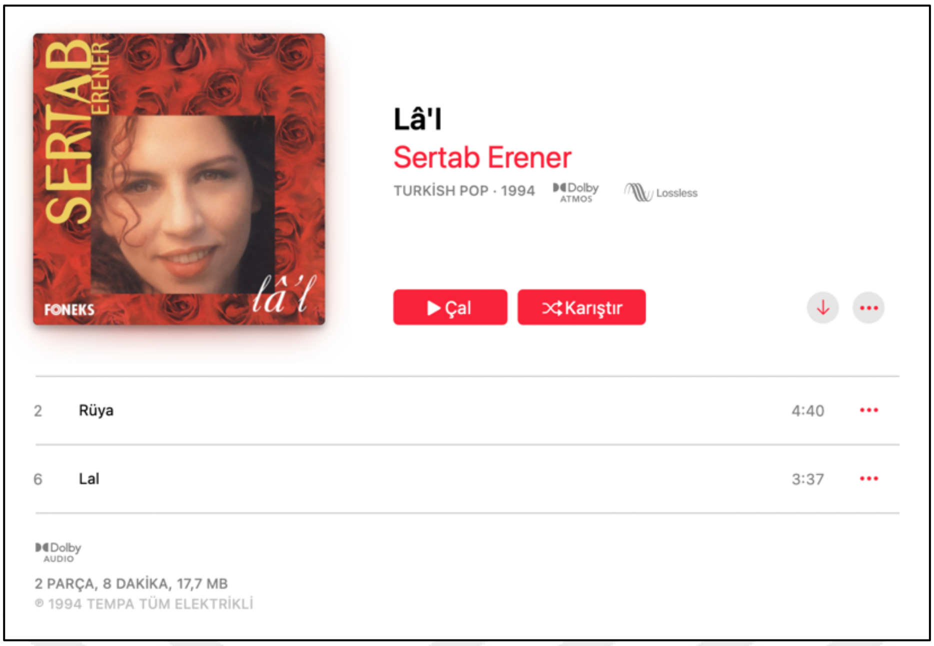


Figure 3.9 : Dolby Atmos / Lossless claim of Apple Music for Sertab Erener’s two songs from the album La’l.

As seen in Figure 3.10, the entire album is also available on Apple Music in low quality. The fact that the most important albums of these artists, who achieve very high monthly streaming numbers, are well below the promised quality on all platforms is not an acceptable situation for listeners who seek quality in music.

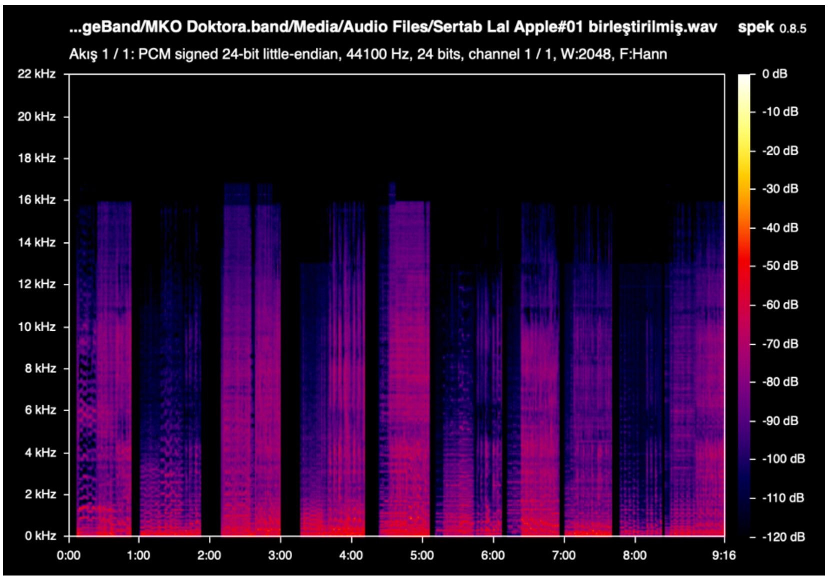


Figure 3.10 : Frequency analysis of Sertab Erener’s La’l Album

The frequent occurrence of low-quality examples, where streaming services fail to deliver the promised audio quality, has raised additional questions. A fifth step is taken for an inquiry concerns the platform Tidal, which claims to offer lossless music but is not active in Turkey. The research aimed to determine whether Tidal also contained such low-quality examples or if it provided only high-quality content to its users. Despite withdrawing from the Turkish market in 2021, Tidal was found to contain examples from popular artists that were below 128 Kbps, similar to the other active platforms in Turkey. An example is illustrated in Figure 3.11, showing 30-second samples of the tracks of an album.

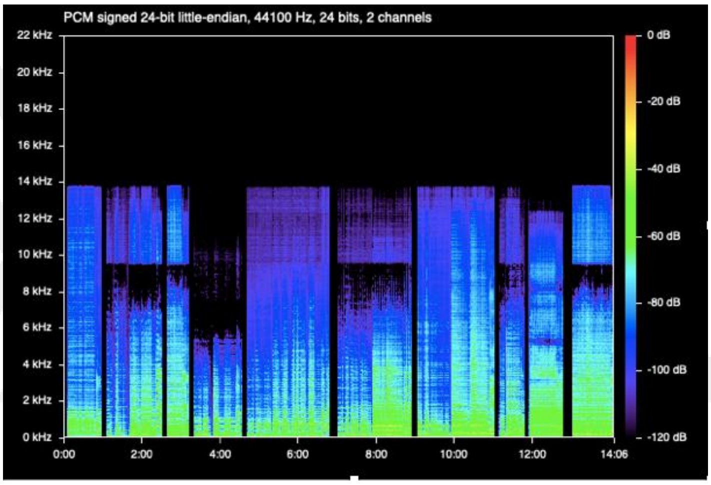


Figure 3.11 : Frequency analysis of the song, Neşet Ertaş's "Gönül Dağı", on Tidal

The findings reveal that, contrary to its claims of lossless audio (with a minimum quality of 16-bit uncompressed format), Tidal offered low-quality audio samples comparable to other platforms when subjected to spectrogram analysis.

Another critical question was whether such errors or uncorrected repertoires were present in global charts. To address this, sixth step was taken to extend the study's scope to international tracks. The methodology prioritized the examination of old or nostalgic song lists from various countries on Spotify. Spectrogram analyses were conducted on the top ten songs from these lists. If no low-quality examples were found, the investigation continued up to the top 40 songs. Upon encountering a sample below the promised quality, the relevant artist's album or top ten list was further examined.

The research encompassed 30 different countries and uncovered numerous examples of audio quality below the promised standard. Table 3.7 illustrates the countries examined and the proportion of low-quality examples found. From a random selection of 665 songs, 195 were identified as being below the promised quality. In Appendix B, a selection of spectrometer graphs of selected Spotify artists from 30 countries conversions is shown.

Table 3.7 : Analysis results of international music tracks.

#	Country	# of songs examined	# of songs below promised quality
1	Albania	17	15
2	Arabic	20	18
3	Armenia	20	7
4	Austria	10	0
5	Azerbaijan	17	16
6	Brazil	20	0
7	Bulgary	30	20
8	Chile	10	2
9	China	10	2
10	Denmark	17	3
11	Dutch	30	6
12	England	30	0
13	France	30	2
14	Germany	30	2
15	Greece	40	1
16	Hungary	30	4
17	India	20	11
18	Indonesia	10	10
19	Iran	30	8
20	Israel	30	6
21	Italy	40	11
22	Japan	20	0
23	Korea	28	4
24	Mexico	10	0
25	Nigeria	18	10
26	Pakistan	9	2
27	Poland	19	11
28	Portugal	10	2
29	Romania	20	15
30	Vietnam	10	7
	Total	**665**	**195**

Figure 3.12 illustrates a striking example that is noteworthy. Rahul Dev Burman, an iconic Indian music director and actor, is celebrated as one of the greatest and most successful figures in the Hindi film music industry. With over 9 million monthly listeners on Spotify, his music continues to resonate with audiences globally. A preliminary investigation into his top ten songs on Spotify reveals a noticeable variance in audio quality. This variation is evident when examining the bitrate and spectrogram of each track. Despite the high listener count and enduring popularity, several tracks are available in suboptimal quality, falling short of the promised streaming standards.

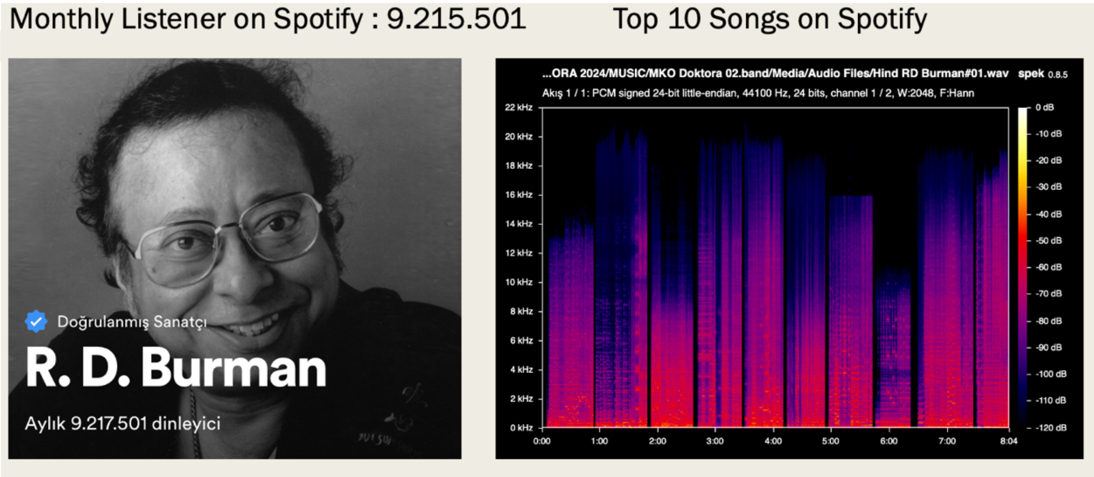


Figure 3.12 : Analysis results for Rahul Dev Burman (India).

Another striking example is Nouhad Wadie Haddad, widely known as Fairuz, a legendary Lebanese singer celebrated as one of the most iconic vocalists in the history of the Arab World with approximately 1 million monthly listeners on Spotify. An examination of her popular songs on Spotify reveals a troubling trend: the majority of her top tracks are available in low quality (Figure 3.13). This is evident when scrutinizing the bitrate and spectrogram analyses of these songs.

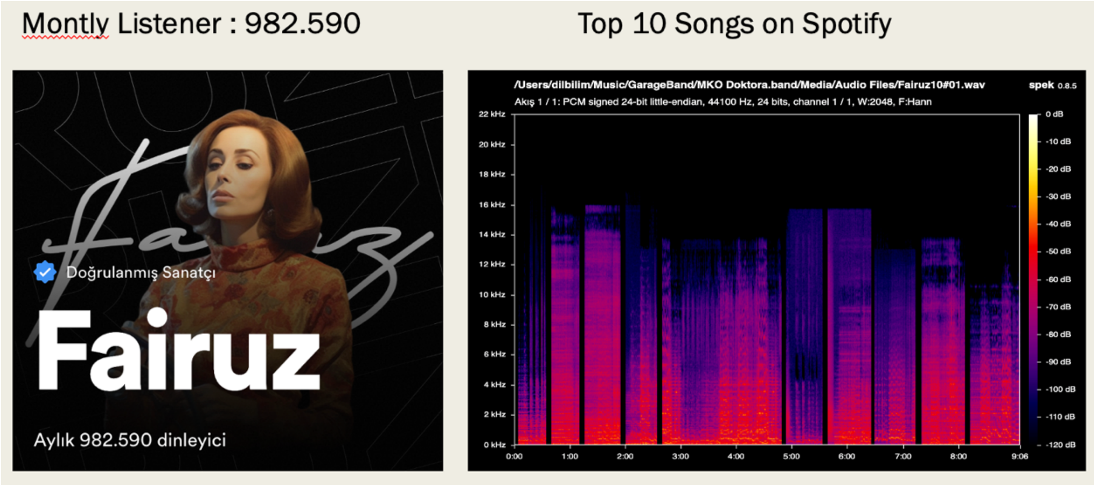


Figure 3.13 : Analysis results for Fairuz (Lebanon)

These figures underscore the substantial discrepancies in audio quality across various platforms, highlighting the inconsistency between promised and actual delivered quality by music streaming platforms. As a result, H1 hypothesis is rejected. In the next section, a supplementary study was conducted to further validate the findings related to H1 and also to test the viability of H2.

3.6. Testing the Uploadability of Audio Files with Lower-Than-Promised Sound Quality to Music Streaming Platforms

The objective of this study is to investigate whether music streaming platforms implement audio quality control procedures for uploaded audio files and whether low-quality music works can be uploaded to the platform. In this study, three musical compositions originally recorded in 24bit/44.1kHz resolution were converted to compressed formats with a 128Kbps bit rate, resulting in irreversible quality loss.

Subsequently, these formats were upscaled back to 24bit/44.1kHz resolution and increased to 160Kbps. Despite the resolution being upscaled, the perceived sound quality remained at 128Kbps due to the irreversible quality loss incurred in the initial conversion. The purpose of this experiment is to determine whether music platforms perform frequency analysis in addition to file resolution checks during uploads, which is to say, whether they assess the perceived sound quality alongside file quality specifications.

Some of the songs in the three separate music albums in Table 3.8 were converted from their original versions with 24bit 44.1khz to 128 Kbps and 160 Kbps sound quality, and were converted back to 24bit 44.1khz format and distributed to the world music network through three separate digital distributors that can be accessed from Turkey: The Orchard, Eğlence Fabrikası (Entertainment Factory), and Distrokid. The tracks were also transferred from the digital network to Apple Music and Spotify.

Table 3.8 : Music works uploaded to platforms.

Dublörün Hikayesi – Oyun Müzikleri (Eğlence Fabrikası)	Yan Rol- Oyun Müzikleri (The Orchard)	Levent Ergün – Renkler (Instrumental) Distrokid
1.Savaşçı Dublör: Uploaded format 24bit 44.1khz 2.Romantik Dublör: Uploaded format 24bit 44.1khz 3.Dublör ve Baba: Uploaded format 24bit 44.1khz 4.Postacı Dublör: Original format 160Kbps mp3 – Uploaded format 24bit 44.1khz 5.Angaralı Dublör: Original format 128Kbps mp3 – Uploaded format 24bit 44.1khz	1.Bir ben gibi topukla (intro): Uploaded format 24bit 44.1khz 2. Bir ben gibi coş: Original format 128Kbps mp3– Uploaded format 44.1khz 3. Bir baba gibi sev: Uploaded format 24bit 44.1khz 4. Bir ben gibi kal (outro): Original format 160Kbps mp3– Uploaded format 24bit 44.1khz	1. Renkler (Enstrümantal) Original format 24bit 44.1khz, Uploaded format 128Kbps mp3 2. Renkler Calm Mix (Enstrümental) Original format 160 Kbps, Uploaded format 24bit 44.1khz

As an example, the frequency analysis of Levent Ergün's song "Renkler", produced from the original 24bit 44.1khz mix, was used. The first 3-minute section of the screening shows the original high-resolution version of the song, and the second 3-minute section shows the resolution before uploading to the system in the version that was reduced to 128Kbps mp3 file and converted back to 24bit 44.1 khz (Figure 3.14).

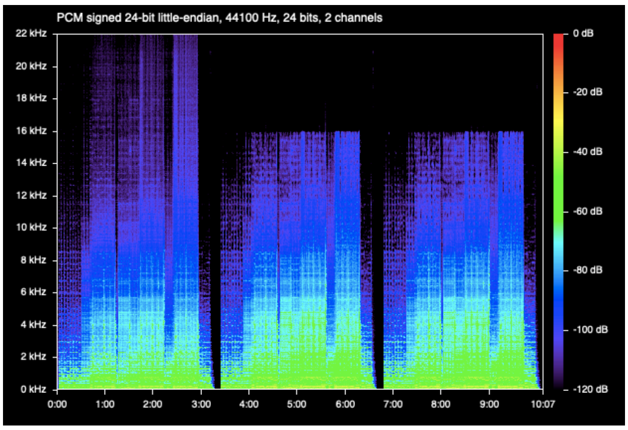


Figure 3.14 : Analysis of formats of Levent Ergün's song uploaded via Distrokid.

Although the file uploaded to the system is technically 24bit 44.1khz, we see a clear cut-off at 16khz in the graph, since its content is taken from the mp3 file. The last 3 minutes, that is, between the 6th and 9th minutes, shows the file uploaded to the system via the DistroKid distributor. The version recorded on the computer again via Spotify naturally meets the 128Kbps resolution uploaded to the system.

The clear cut-offs at 16Khz on the left Y axes show that the versions shown with the acoustic label in the graphics are uploaded to the system as 128Kbps (Figure 3.12). In addition, it was examined whether 3 different digital distributors allow low quality uploads. It has been observed that Distrokid allows mp3 uploading, while The Orchard and Entertainment Factory's audio upload platforms do not support compressed formats (Figure 3.15).

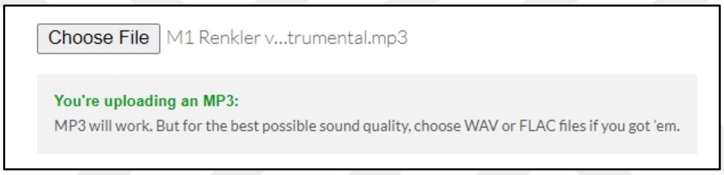


Figure 3.15 : The notification "you are uploading an mp3" on Distrokid's download platform.

Because it is revealed that music streaming platforms are not delivering the audio quality they promise, and they do not have necessary audio quality checks in place, the H1 and H2 hypotheses are rejected.

3.7.Testing The Human Perception of Audio Quality

A supplementary study was conducted to explore human perception of audio quality based on various characteristics discussed in the literature review chapter. Unlike many studies that utilize high-quality systems, this study opted to use listeners' own listening environments. This choice was made because consumers typically select and evaluate their music streaming platforms using their personal music equipment.

Additionally, since perception can be influenced by factors such as song familiarity (Wilson & Fazenda, 2016) and genre (Burunat, Tsatsishvili, Brattico, & Toiviainen, 2017), participants were presented with the same tracks at different audio qualities for comparative assessment. Furthermore, listeners were asked to provide a general assessment of which version they preferred, acknowledging that casual listeners might find it challenging to differentiate between various quality dimensions such as clarity, sharpness, brightness, and fullness (Gabrielsson & Sjögren, 1979).

Figure 3.16 shows the listening environments used by the participants and their distribution. Most of the attendants use headphone speakers as expected. Other listeners use smartphone / tablet speakers, professional monitoring systems, Bluetooth speakers, mini desktop/laptop speakers and car monitoring systems.

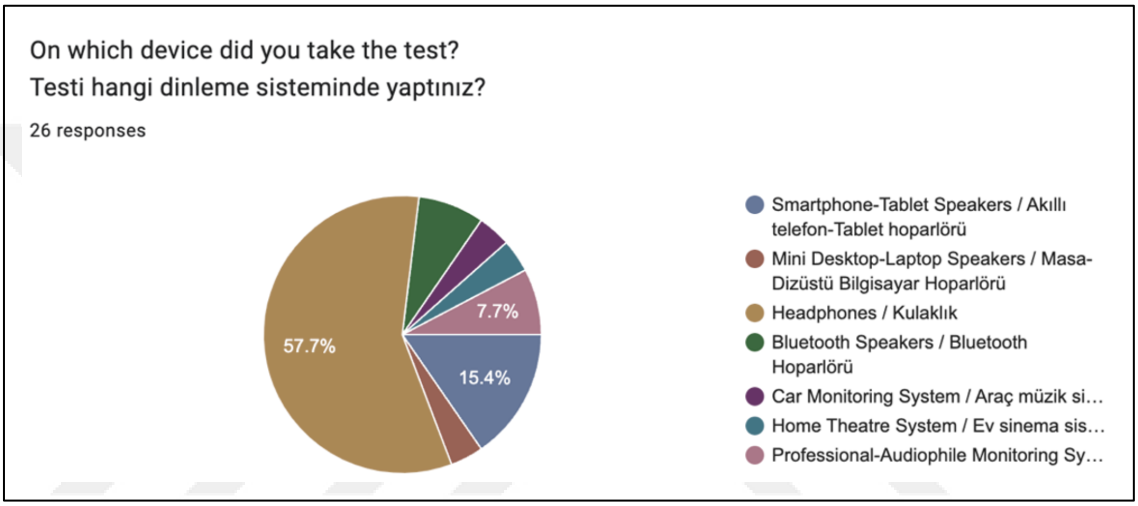


Figure 3.16 : A-B hearing test: Devices participants used for listening to the samples.

To facilitate the survey, an online test was designed, enabling listeners to discern quality differences between compressed files of same tracks in their own environments. Google Forms, linked to Dropbox, was selected to offer a mobile and online experience. The test followed an A/B format, where participants had to choose between two options, A and B (Figure 3.17). In the first selection, listeners were required to indicate whether they perceived any difference between the two.


1st Audio A - B Comparison - Karşılaştırma 1

Please listen to two samples played consecutively / Lütfen peşpeşe çalan iki örneği dinleyiniz

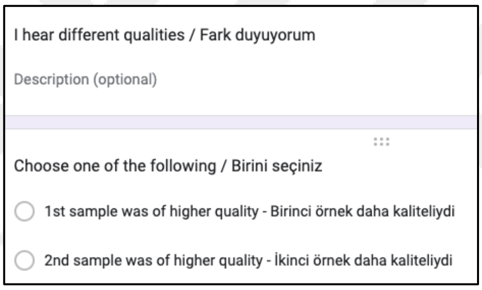
PLEASE LISTEN FIRST / LÜTFEN DİNLEYİNİZ

Do you hear any difference? / Fark duydunuz mu?

- Yes / Evet
- No / Hayır

Figure 3.17 : A-B hearing test: Post-listening survey question 1

If they selected "yes," the second question prompted the listener to identify which of the samples had higher quality (Figure 3.18).


I hear different qualities / Fark duyuyorum

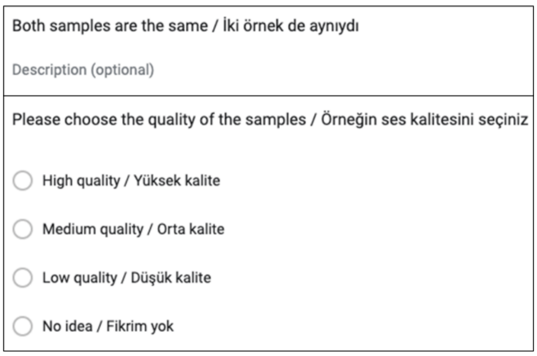
Description (optional)

Choose one of the following / Birini seçiniz

- 1st sample was of higher quality - Birinci örnek daha kaliteliydi
- 2nd sample was of higher quality - İkinci örnek daha kaliteliydi

Figure 3.18 : A-B hearing test: Post-listening survey question 2

If the listeners chose "No, I do not perceive any difference," they were then asked to evaluate the quality of the samples (Figure 3.19).


Both samples are the same / İki örnek de aynıydı

Description (optional)

Please choose the quality of the samples / Örneğin ses kalitesini seçiniz

- High quality / Yüksek kalite
- Medium quality / Orta kalite
- Low quality / Düşük kalite
- No idea / Fikrim yok

Figure 3.19 : A-B hearing test: Post-listening survey question 3

This process was carried out consecutively for 12 different music samples. The quality and order of the samples used are as shown in the table below (Table 3.9). To prevent the test participants from being psychologically inclined to prefer the samples they listened to first or last when evaluating high-quality and low-quality samples according to their order, the same samples in different orders were also included in the questions.

Table 3.9 : Order of the samples used at the A-B hearing test.

Sample #	Sample A bit rate (Kbps)	Sample B bit rate (Kbps)
1	256	128
2	96	256
3	256	256
4	160	256
5	256	96
6	128	128
7	256	160
8	128	256
9	128	256
10	128	96
11	96	96
12	96	128

Each question was scored with 1 point. The maximum score participants could achieve was 24. Table 3.10 shows some statistical figures of the scores. The participant with the lowest score received 3 points, while the participant with the highest score received 15 points.

Table 3.10 : Statistical values of the survey answers.

Average Score	Median Score	Min – Max Score	Max Possible Score
9.33	9	3-15	24

Figure 3.20 shows the distribution of points.

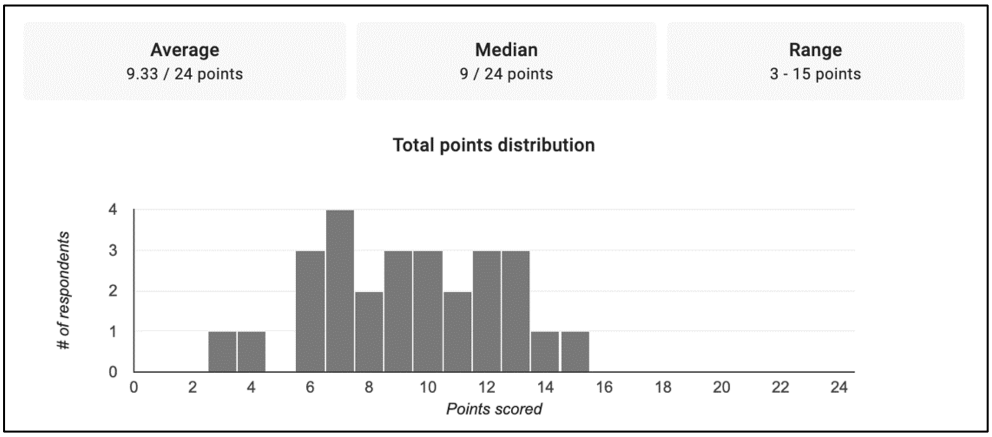


Figure 3.20 : A-B hearing test: Distribution of points

For the results to be meaningful, the scores of listeners who received less than 7 points and did not use a paid streaming service were excluded, and the results were evaluated based on 20 participants. Table 3.11 shows the accuracy percentages in the comparisons and the results regarding quality perception in identical comparisons.

Table 3.11 : Comparison results of samples with different sound qualities.

Bit rate comparison (Kbps)	% of participants who perceived a difference	% of participants who correctly identified the better quality
256 vs 96	72.5	52.5
256 vs 128	60	35
256 vs 160	40	15
256 vs 16bit	60	45
128 vs 96	42.8	32

Table 3.12 shows the percentages of correct answers for questions where participants listened to identical samples.

Table 3.12 : Comparison results of identical samples.

Bit rate comparison (Kbps)	% of participants who perceived no difference	% of participants who correctly identified the quality
256 vs 256	65	35
128 vs 128	70	40
96 vs 96	60	30

The initial findings show that the largest difference in accuracy rates occurred when comparing audio encoded at 256 Kbps to 96 Kbps. This comparison resulted in a 52.5% accuracy rate in distinguishing between the two formats. To determine if this result is statistically significant and to decide if further studies on other bitrates are needed, a statistical test is conducted to compare the observed accuracy to the accuracy expected by chance. A common test for this purpose is the binomial test, which evaluates if the observed proportion of successes in a sample is significantly different from a specified proportion.

Given:

- N: total number of trials (predictions)
- K: number of successes (correct predictions)
- p: probability of success under the null hypothesis (e.g., p=0.5)

The binomial test evaluates the probability of obtaining K or more (or K or fewer, in the case of a two-sided test) successes in N trials, under the null hypothesis that the probability of success on each trial is p.

The p-value for the two-sided binomial test is computed as:

$$\text{p-value} = 2 \cdot \min\left(P(X \leq K), P(X \geq K)\right) \tag{3.1}$$

Where P(X≤K) and P(X≥K) are the cumulative probabilities of obtaining K or fewer and K or more successes, respectively.

For the specific case:

- N = 100

- K = 52.5
- p = 0.5

The formula simplifies to:

$$\text{p-value} = 2 \cdot \min\left(\sum_{i=0}^{53} \binom{100}{i} p^i (1-p)^{100-i}, \sum_{i=53}^{100} \binom{100}{i} p^i (1-p)^{100-i}\right) \quad (3.2)$$

The observed accuracy for the second class is approximately 0.525. The p-value from the binomial test is approximately 0.878.

Since the p-value (0.878) is much higher than the typical significance level of 0.05, we fail to reject the null hypothesis. This means that the observed accuracy of 0.525 is not statistically and significantly different from the expected accuracy of 0.5 by chance. In other words, the accuracy of the listeners is not significantly higher than what would be expected by random guessing.

To conclude, this study examined the ability of human listeners to differentiate between mp3 audio files encoded at 256 Kbps and lower bitrates, such as 96 Kbps. Twenty participants were asked to identify the higher quality audio. Results indicated that only 52.5% of participants could correctly distinguish between the two bitrates, a performance marginally exceeding chance. A binomial test confirmed that this difference was not statistically significant (p = 0.878), suggesting that listeners may not reliably perceive quality differences between these compression levels.

These findings align with previous research, highlighting the challenges in perceptually distinguishing between different mp3 bitrates. The marginal improvement over chance performance suggests that the perceptual difference between 256 Kbps and 96 Kbps may be insufficiently remarkable for average listeners. While higher bitrates theoretically preserve more audio information, the perceptual benefits may not always be clear, especially for typical listeners using consumer-grade equipment. H3 is rejected based on these results.

4. CONCLUSION

This study revealed that high audio quality, a key promise made by music streaming platforms, is not being consistently delivered. Music platforms verify file formats but do not perform spectral analysis on the uploaded files, resulting in the leakage of low-quality audio being disguised within high-quality file formats like Trojan horses. Moreover, it was concluded that bulk migrations of large catalogs from physical to digital formats during the early stages of digitalization have led to the ongoing presence of extensive low-quality audio collections on these platforms. Moreover, most music consumers are often unaware of the issues with audio quality, as they rarely perceive the differences in sound quality. These findings provide a basis for important conclusions.

4.1.Theoretical Implications of This Study

The first contribution is to provide further insight into the widely held belief that people can distinguish between high- and low-quality audio. This fact has several implications.

The first implication lies in the field of signal processing and computing, where scientists and engineers are developing more efficient formats with improved quality. The study's findings could guide the development of new audio technologies and compression algorithms that better balance file size and sound quality, enhancing the overall listening experience. It is advisable for researchers in this area to prioritize reducing file sizes rather than enhancing sound quality, as the latter offers minimal benefit in terms of improving perceived sound quality.

Second, as digital technologies continue to advance, dedicating substantial time to recording technologies, digital signal processing and artificial intelligence becomes increasingly appealing to academics in the field of music theory, composition, and performance. By demonstrating that the marginal benefit of higher bitrates and advanced codecs is limited, composers are encouraged to prioritize their music theory work over how their music will sound in recorded media.

Another contribution is to bridge practical life with academic research by testing human perception of audio quality using participants' everyday equipment, rather than creating artificial test environments in studios with advanced tools. Additionally, it utilizes the actual music tracks hosted on streaming platforms, rather than creating custom samples for laboratory experiments.

In summary, this study challenges the belief that listeners can easily discern high- from low-quality audio, suggesting a focus on reducing file sizes. By using real-world conditions and streaming tracks, it bridges practical life with academic research.

4.2.Practical Application of This Study

From a practical standpoint, this study provides actionable insights for stakeholders in the music streaming industry, including streaming platforms, audio engineers, consumers, and policy makers.

For streaming platforms, the results emphasize the importance of maintaining high audio quality standards and implementing rigorous quality control mechanisms to ensure that the content delivered meets the promised standards. The cases of Rahul Dev Burman and Fairuz highlight a significant issue, where many of the most popular songs by the leading artists in their respective countries are uploaded in low quality on music streaming platforms. The large-scale migration of music catalogs, particularly those from the 2000s, should be reviewed and reprocessed where necessary. Ensuring that all tracks meet a consistent quality standard will not only enhance listener satisfaction but also safeguard the legacy of artists worldwide.

Another implication for streaming platforms is the need to reassess their marketing communication, especially when they promote their high-quality audio promises to consumers. It is strongly recommended that they include a disclaimer in their advertisements, noting that some tracks may not meet the audio quality standards they promote. They could take it a step further by including percentage figures of low-quality tracks available on their platforms. Additionally, they could display the actual audio quality of the track directly while the song is being played.

Music producers, sound engineers, musicians, and studio managers might use this study to reevaluate their investments in new equipment and software. As they invest more in high-end audio equipment, they might want to consider that listeners, including trained ears and even themselves, may not perceive the difference they intend to create. The marginal benefit they are striving to achieve demands large budgets but ultimately may provide no real value for themselves and the listeners.

Consumers, on the other hand, can benefit from a greater awareness of the factors affecting audio quality, empowering them to make more informed choices about their streaming service subscriptions and playback equipment. They should be aware that when they pay a premium for higher sound quality, music streaming services often lack the necessary mechanisms to uphold that value proposition.

Policymakers also bear responsibilities that emerge from the findings of this study. Policymakers should prevent unfair competition from platforms that seek to gain an advantage by claiming superior audio quality. They should ensure transparency about the quality of the catalogs hosted on platforms and require that relevant warnings are clearly visible.

In conclusion, this study underscores the need for a collaborative effort among streaming platforms, audio professionals, consumers, and policymakers to address the challenges related to audio quality in the music streaming industry. By prioritizing transparency, quality control, and informed decision-making, these stakeholders can help preserve the integrity of music and enhance the overall listening experience.

5. LIMITATIONS AND FUTURE DIRECTIONS

This study has several limitations that should be acknowledged.

In terms of human perception of audio quality, the relatively small test panel means the results should be considered indicative rather than definitive. Additional subjective testing would be needed to strengthen confidence in the findings. For instance, the sample size and demographic diversity of participants could be expanded in future research to ensure the findings are generalizable across different populations.

Second, although the tests were conducted in the listeners' own environments, there was no control over whether they selected their typical listening conditions, most of which are portable devices in less-than-ideal settings. Future research could address this by placing greater emphasis on ensuring that participants select their typical listening environments. Additionally, more research is needed to understand how listening environment and device limitations affect how people hear different audio formats. Future research may conduct experiments in more varied and realistic listening environments.

Additionally, further studies could explore the impact of other factors, such as network conditions and device types, on perceived audio quality. Investigating the long-term effects of continuous exposure to different audio quality levels on listener preferences and hearing health could also provide valuable insights.

Moreover, significant differences can exist between music signals; for instance, a fast-paced jazz piece featuring a high-hat cymbal will contrast greatly with a classical composition that has a slower tempo and is orchestrated for a full ensemble. The emotional intent of the artist, the timbre of the instrumentation, and the tempo are crucial considerations, all of which are influenced by the musical genre. Future research can focus on the impact of these qualities as well.

Another area of research on human perception of audio quality could explore the discrepancy between consumer surveys and market research, which indicate that audio quality is valued, and the reality that users often struggle to discern quality differences and rarely lodge complaints. This suggests that audio quality may be a more debatable factor in their decision-making process.

Moreover, while the findings of this study suggest that beyond a certain threshold, increasing bitrate may yield diminishing returns in perceived audio quality, further research is needed to explore the subtleties of these perceptual limits and to identify the conditions under which bitrate improvements offer the most significant perceptual benefits. Understanding the interplay between compression methods, listening environments, and human perception is crucial for optimizing audio delivery and ensuring a satisfying listening experience for consumers. Still, it should be noted that the study primarily focused on specific bit rates and codecs which may not encompass the full range of variables present in real-world streaming scenarios.

Regarding the audio quality of music streaming platforms, the analysis was conducted on 1,078 selected Turkish music pieces and 665 works from the world repertoire uploaded to digital platforms in the early 2000s. It is uncertain how well the identified inconsistencies reflect the entire catalogs of the platforms. Nonetheless, as previously emphasized, the lack of audio quality checks when uploading new tracks indicates that this issue should not be overlooked. It is critical for researchers in the area to focus on identifying stages in the distribution process where quality degradation occurs and develop standards to mitigate these issues. Optimizing the entire journey from studio to streaming platform will help preserve the investments in high-quality production, ensuring listeners experience the music as intended. This will strengthen the relationship between producers, artists, and consumers, emphasizing the value of high-fidelity music in the digital age.

During this study, YouTube, the leading streaming platform in Turkey, was not included in the research. The primary reason for this exclusion is that content on YouTube can be uploaded by end users without any control, and the platform is also freely accessible. Additionally, YouTube Music, which was a relatively new service in Turkey at the time the study began, did not rank highly in popularity among the country's streaming platforms. Consequently, it was not a significant focus in the surveys. Given these factors, YouTube and YouTube Music were deemed less relevant to the core objectives of this research, which aimed to analyze controlled and licensed content provided by more regulated platforms.

Lastly, advancing psychoacoustic models and developing more sophisticated algorithms that can dynamically adjust compression settings based on content type and listening conditions would be a fruitful area for future exploration, potentially leading to significant improvements in digital audio quality.

In summary, this study highlights key areas for further research in audio quality perception within music streaming. Future work should address limitations such as sample size, listening conditions, and the impact of musical genres, network conditions, and devices. Additionally, exploring perceptual limits and developing advanced algorithms and standards could significantly improve digital audio quality. These efforts will help preserve high-quality music production and enhance the listening experience, strengthening the connection between artists, producers, and audiences in the digital age.

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APPENDICES

APPENDIX A: Spectrogram analyses of 10 popular Turkish Artists' CDs that were accessible.

APPENDIX B: Spectrogram analyses of world wide songs and artists on Spotify.

APPENDIX C: Transcripts of interviews with music market proffesionals in orginal Turkish and English translations respectively.

APPENDIX A: Spectrogram analyses of 10 popular Turkish Artists' CDs that were accessible.

Table A.1 : Ahmet Kaya top 10 songs on Spotify.

#	Song	Album	Year	Plays (approx. millions)
1	Kendine iyi bak	Sevgi Duvarı	1990	43.9
2	Kum Gibi	Şarkılarım Dağlara	1994	51.1
3	Doruklara Sevdalandım	Sevgi Duvarı	1990	27.2
4	Nereden Bileceksiniz	Dosta Düşmana karşı	1998	44.3
5	Şiire Gazele	Sevgi Duvarı	1990	22.2
6	Hani Benim Gençliğim	Yorgun Demokrat	1987	33.8
7	Hep Sonradan	Sevgi Duvarı	1990	25.0
8	Herkes Kendi İşine	Başkaldırıyorum	1988	13.9
9	Söyle	Dosta Düşmana karşı	1988	37.0
10	İçimde Ölen Biri	Sana Neler Edeceğim	1992	20.2

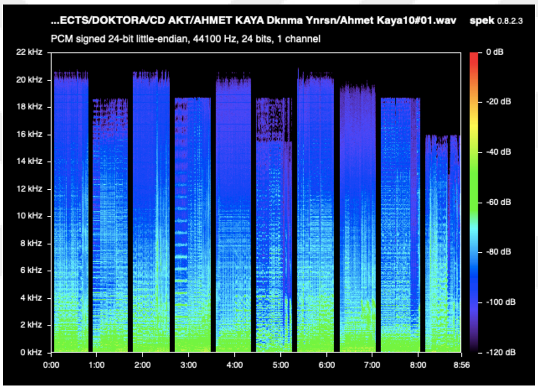
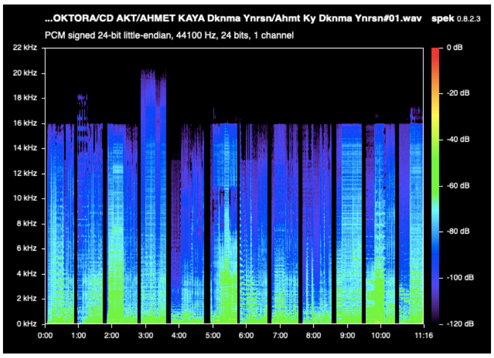
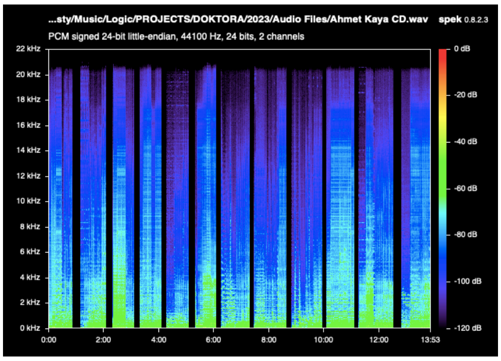


Figure A.1 : Frequency Analysis of Ahmet Kaya top 10 songs on Spotify.



(a)



(b)

Figure A.2 : Frequency Analysis of Ahmet Kaya's Dokunma Yanarsın album: (a) Spotify (b) CD.

Table A.2 : Ajda Pekkan top 10 songs on Spotify.

#	Song	Album	Year	Plays (approx. millions)
1	Yakar Geçerim	Farkın Bu	2011	19.0
2	Bi'Tık – Sunrise Version	AJDA	2021	19.2
3	Bambaşka Biri	The Best of Ajda	1998	18.7
4	Eğlen Güzelim	Ajda Pekkan	1996	14.1
5	Yaz yaz yaz	1990	1990	6.3
6	Düşünme Hiç	Seksenlerin En Güzel 4 Albümü	1983	14.3
7	Oyalama Beni	93'	1993	3.4
8	Kimler Geldi Kimler Geçti	Sana Neler Edeceğim	1975	7.3
9	Arada Sırada Dance Remix	Farkın Bu	2011	7.7
10	Sana Neler Edeceğim	Sana Neler Edeceğim	1975	9.5

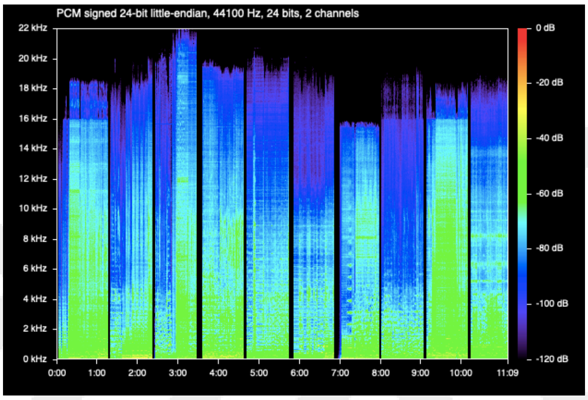
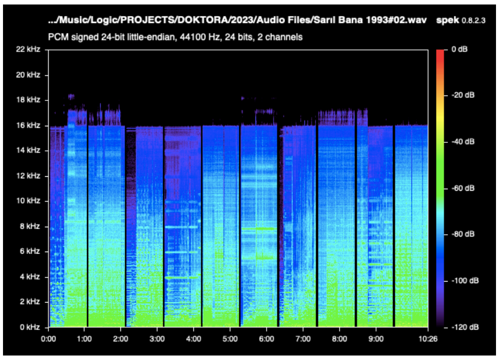


Figure A.3 : Frequency Analysis of Ajda Pekkan top 10 songs on Spotify.


(a)

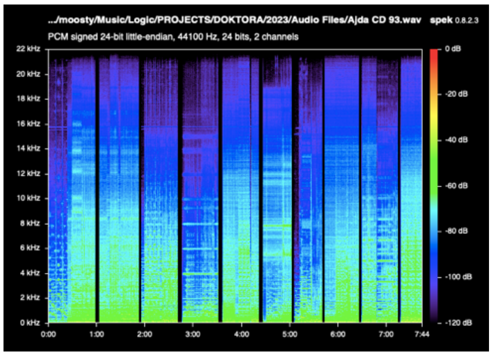

(b)

Figure A.4 : Frequency Analysis of Ajda Pekkan's '93 album: (a) Spotify (b) CD.

Table A.3 : Cem Karaca top 10 songs on Spotify.

#	Song	Album	Year	Plays (approx. millions)
1	Bu Son Olsun	Bu Son Olsun	2015	53.2
2	Resimdeki Göz Yaşları	Cemaz Ül Evvel	1994	12.8
3	Deniz Üstü Köpürür	Cem Karaca Koleksiyon	2015	29.1
4	Tamirci Çırağı	Ölümsüzler	2004	30.0
5	Ceviz Ağacı	Merhaba Gençler	1987	16.3
6	Çok Yorgunum	Merhaba Gençler	1987	17.5
7	Islak Islak	Nerede Kalmıştık	1992	15.6
8	Kerkük Zindanı	Bindik bir Alamete	1999	8.4
9	Çökertme	Cem Karaca Anısına Vol3	1998	2.3
10	Sen de Başını Alıp Gitme	Nerede Kalmıştık	1992	12.3

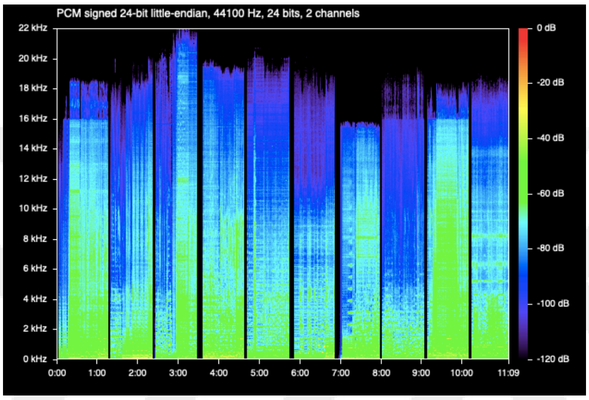
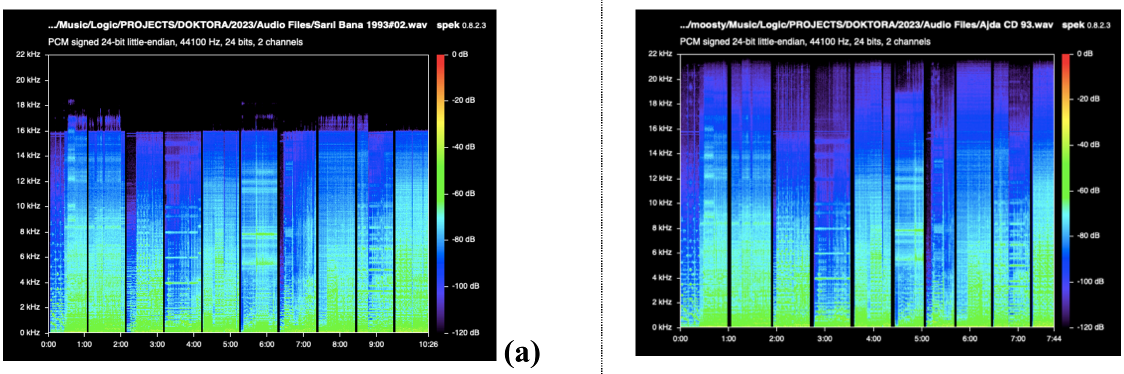


Figure A.5 : Frequency Analysis of Cem Karaca top 10 songs on Spotify.



(a) (b)

Figure A.6 : Frequency Analysis of Cem Karaca's Cemaz Ül Evvel album: (a) Spotify (b) CD.

Table A.4 : Levent Yüksel top 10 songs on Spotify.

#	Song	Album	Year	Plays (approx. millions)
1	Zalim	Levent Yüksel'in 2.Cd'si	1996	22.2
2	Med Cezir	Med Cezir	1993	29.0
3	Yeterki Onursuz Olmasın..	Med Cezir	1993	9.1
4	Ya Sonra	Kadın Şarkıları	1996	20.8
5	Dedikodu	Med Cezir	1993	11.6
6	Bak Bir Varmış Bir Yok..	Perili Sirk	2010	7.5
7	Tuana	Med Cezir	1993	12.4
8	Beni Bırakın	Med Cezir	1993	6.5
9	Sultanım	Aşkla	2000	6.0
10	Bu Gece Son	Med Cezir	1993	5.6

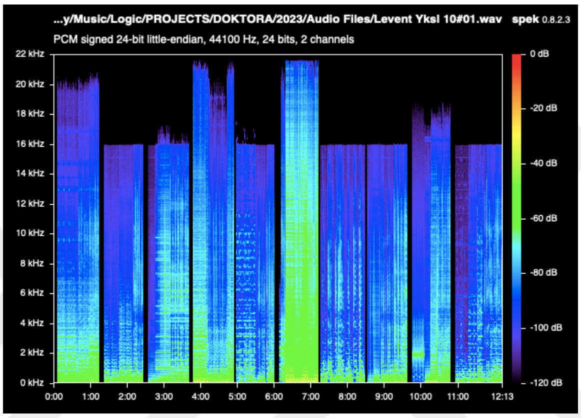


Figure A.7 : Frequency Analysis of Levent Yüksel top 10 songs on Spotify.

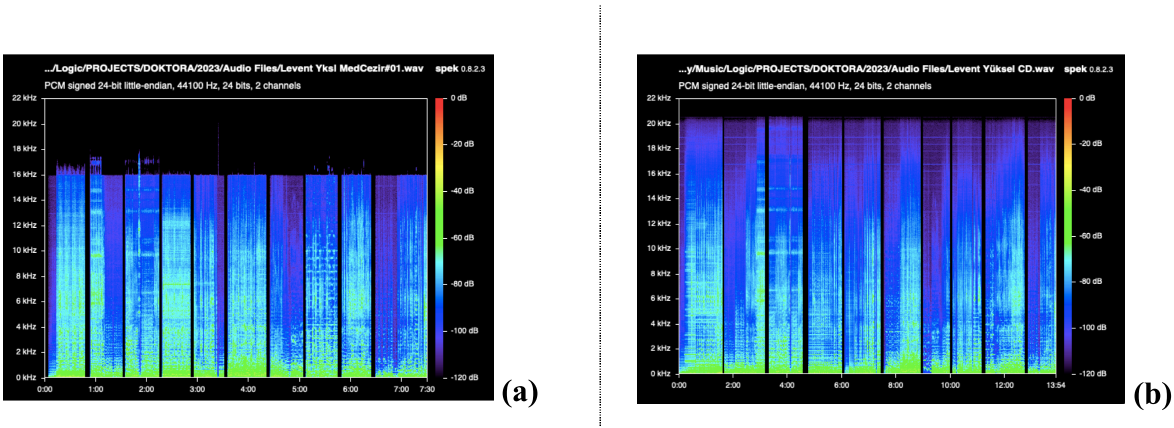


Figure A.8 : Frequency Analysis of Levent Yüksel's Med Cezir album: (a) Spotify (b) CD.

Table A.5 : Nazan Öncel top 10 songs on Spotify.

#	Song	Album	Year	Plays (approx. millions)
1	Geceler Kara Tren	Ben Böyle Aşk Görmedim	1994	12.2
2	Erkekler de Yanar	Sokak Kızı	1996	15.3
3	Gitme Kal Bu Şehirde	Bir Hadise Var	1992	19.9
4	Aşkım Baksana Bana	7'n Bitirdin	2006	9.4
5	Hay Hay	Yan Yana Fotoğraf Çektirelim	2004	8.2
6	Mühürledim Seni Kal..	Bir Hadise Var	1992	5.9
7	Kimler Gelmiş	Durum Şarkıları	2018	12.4
8	Nereye Böyle	Yan Yana Fotoğraf Çektirelim	2004	6.9
9	Gidelim Buralardan	Bir Şarkı Tut	2013	13.6
10	Aşık Değilim Olabilirim	Bir Hadise Var	1992	4.9

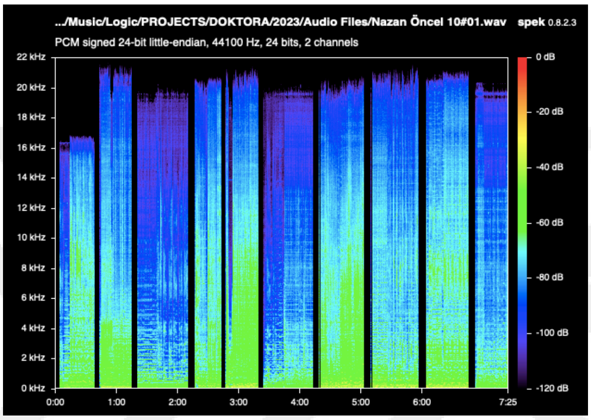


Figure A.9 : Frequency Analysis of Nazan Öncel top 10 songs on Spotify.

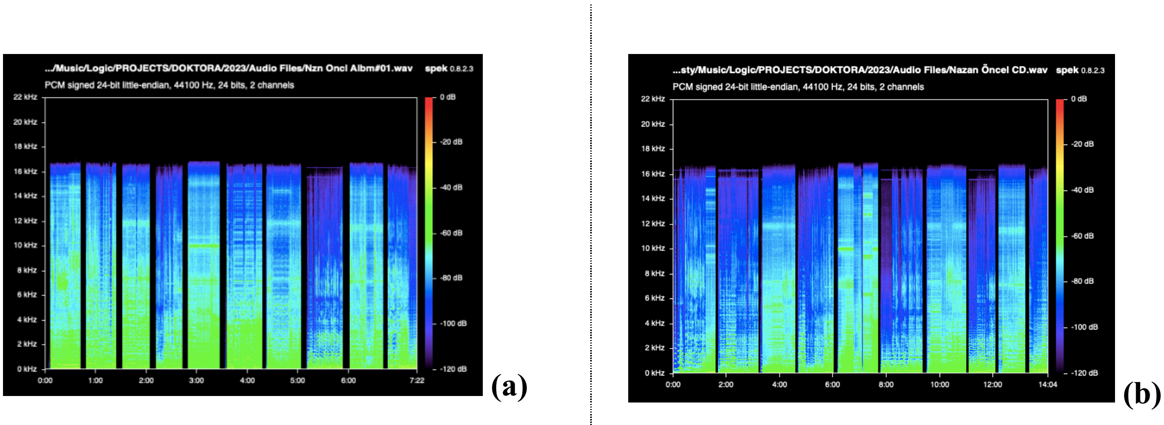


Figure A.10 : Frequency Analysis of Nazan Öncel's Ben Böyle Aşk Görmedim album:(a) Spotify (b) CD.

Table A.6 : Neşet Ertaş top 10 songs on Spotify.

#	Song	Album	Year	Plays (approx. millions)
1	Yolcu	Yolcu	2003	28.7
2	Yalan Dünya	Hata Benim	2000	27.7
3	Neredesin Sen	Acem Kızı	2007	25.5
4	Gönül Dağı	Gönül Dağı	1999	27.0
5	Sen Benimsin Ben Senin	Kendim Ettim Kendim Buldum	1988	10.2
6	Yar imiş Meğer	Yolcu	2003	5.6
7	Ahirim Sensin	Hata Benim	2000	10.1
8	Kaşların Karasına	Sözlü Oyun Havaları	2007	5.2
9	Yazımı Kışa Çevirdin	Hata Benim	2000	8.7
10	Kendim Ettim Kendim Buldum	Kendim Ettim Kendim Buldum	1988	6.4

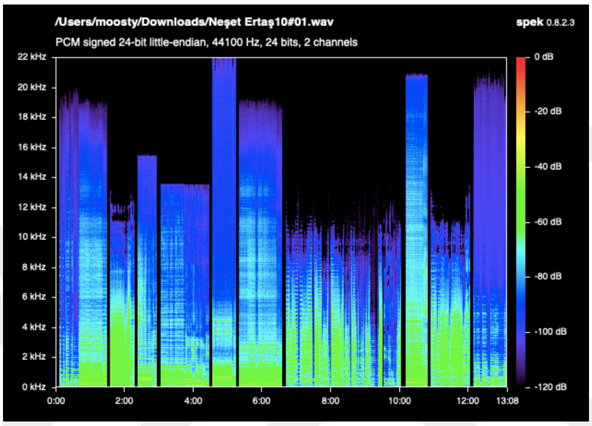


Figure A.11 : Frequency Analysis of Neşet Ertaş top 10 songs on Spotify.

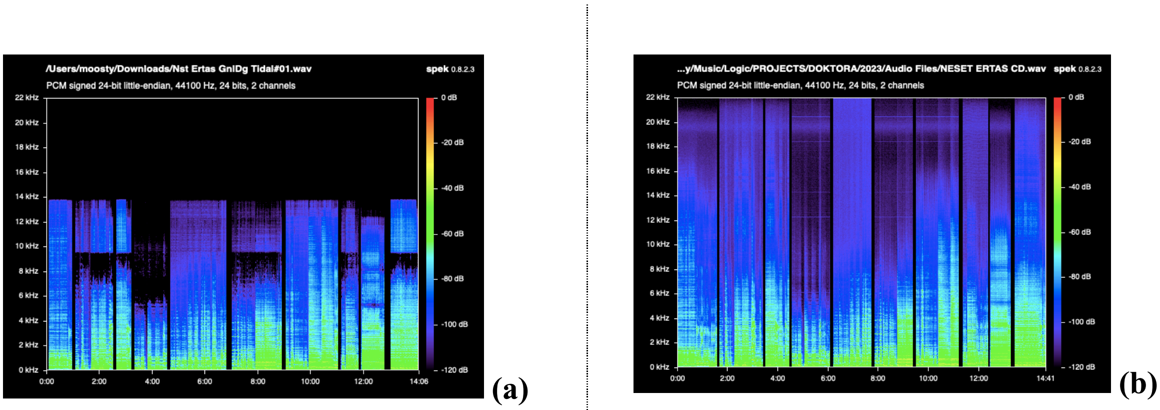


Figure A.12 : Frequency Analysis of Neşet Ertaş's Gönül Dağı album: (a) Spotify (b) CD.

Table A.7 : Sertab Erener top 10 songs on Spotify.

#	Song	Album	Year	Plays (approx. millions)
1	Olsun	Kırık Kalpler Albümü	2016	99.4
2	İyileşiyorum	Sade	2013	31.3
3	Mecbursun	La’l	1994	38.5
4	Aşk	Sertab Erener	1999	21.3
5	Bu Böyle	Rengarenk	2010	16.7
6	Yanarım	Sertab Erener	1999	22.6
7	Kime Diyorum	Kırık Kalpler Albümü	2016	11.4
8	Aldırma Deli Gönlüm	Sakin Ol	1992	17.0
9	Bir Çaresi Bulunur	Rengarenk	2010	15.6
10	Zor Kadın	Sertab Erener	1999	24.0

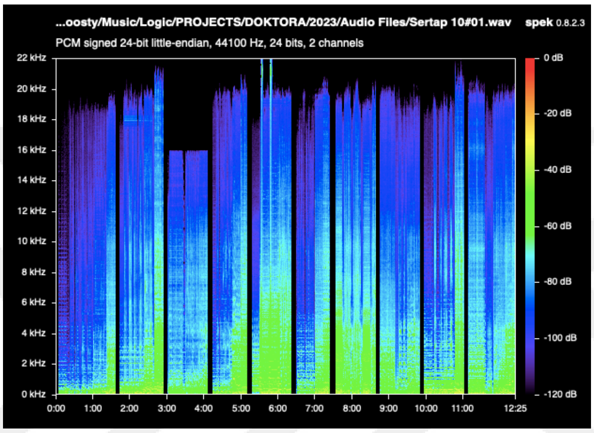
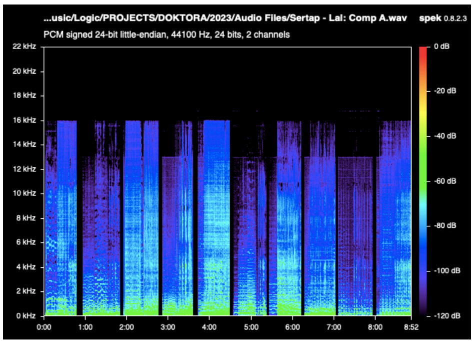
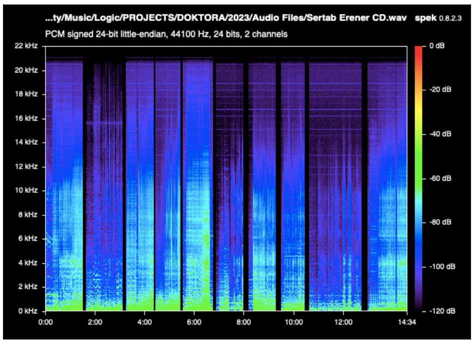


Figure A.13 : Frequency Analysis of Sertab Erener top 10 songs on Spotify.



(a)



(b)

Figure A.14 : Frequency Analysis of Sertab Erener’s La’l album: (a) Spotify (b) CD.

Table A.8 : Sezen Aksu top 10 songs on Spotify.

#	Song	Album	Year	Plays (approx. millions)
1	Firuze	Firuze	1982	19.8
2	Geri Dön	Sen Ağlama	1984	25.6
3	Biliyorsun	Ağlamak Güzeldir	1981	36.2
4	Tükeneceğiz	Sen Ağlama	1999	42.2
5	Unuttun mu Beni	Öptüm	2011	26.8
6	Kaybolan Yıllar	Serçe	1978	28.0
7	Yalnızca Sitem	Git	1986	14.2
8	Haydi Gel benimle Ol	Sen Ağlama	1984	30.0
9	Zalim	Düş Bahçeleri	1996	15.6
10	Kusura bakma	Allaha Ismarladık	1977	15.4

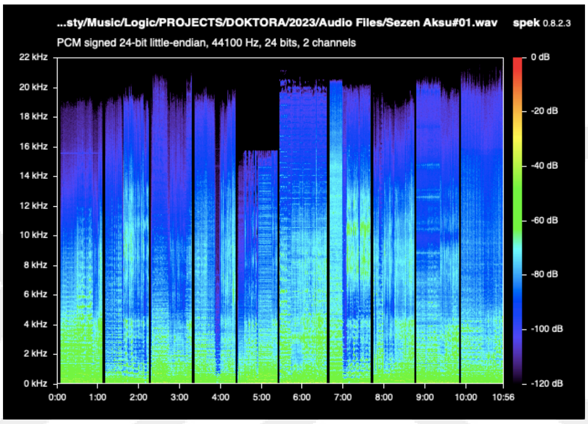
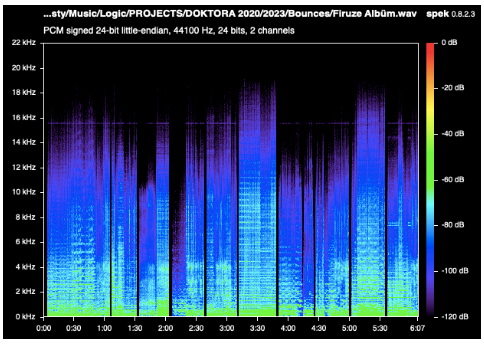
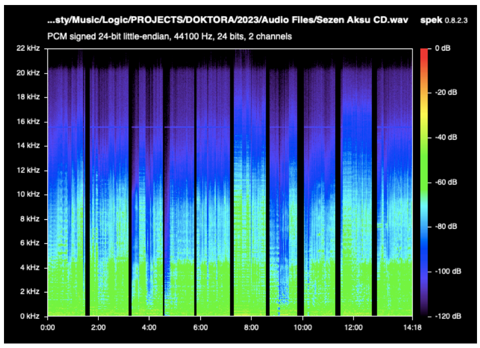


Figure A.15 : Frequency Analysis of Sezen Aksu top 10 songs on Spotify.



(a)



(b)

Figure A.16 : Frequency Analysis of Sezen Aksu's Firuze album: (a) Spotify (b) CD.

Table A.9 : Şebnem Ferah top 10 songs on Spotify.

#	Song	Album	Year	Plays (approx. millions)
1	Bu aşk fazla sana	Kadın	2013	19.8
2	Bırak Kadının Olayım	Kadın	2013	25.6
3	Yağmurlar	Kadın	2013	36.2
4	Gözlerimin Etrafındaki Çizgiler	Kelimler Yetse	2013	42.2
5	Sil Baştan	10 Mart 2007 İstanbul Konseri	2007	26.8
6	Mayın Tarlası	Kelimler Yetse	2013	28.0
7	Od	Od	2013	14.2
8	Hoşçakal	Can Kırıkları	2005	30.0
9	Yalnız	Benim Adım Orman	2009	15.6
10	Kusura bakma	Can Kırıkları	2005	15.4

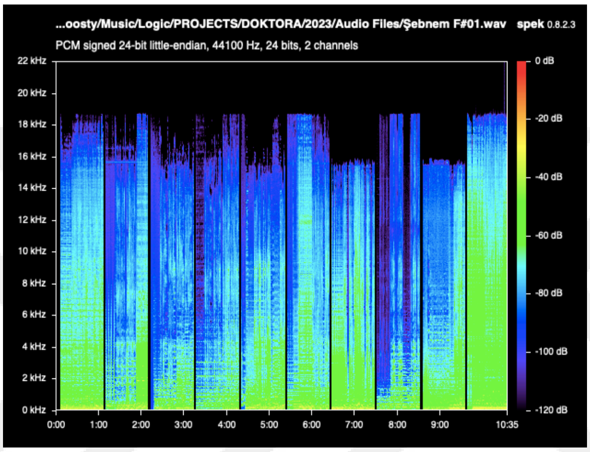
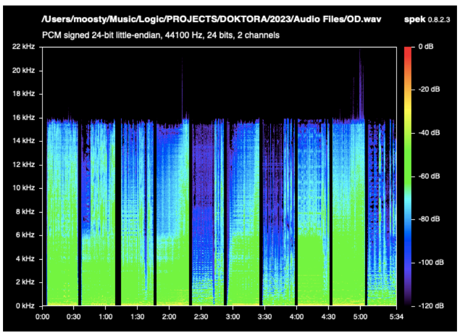
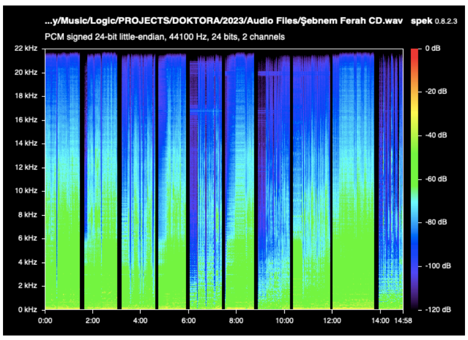


Figure A.17 : Frequency Analysis of Şebnem Ferah top 10 songs on Spotify.



(a)



(b)

Figure A.18 : Frequency Analysis of Şebnem Ferah's Od album: (a) Spotify (b) CD.

Table A.10 : Tarkan top 10 songs on Spotify.

#	Song	Album	Year	Plays (approx. millions)
1	Şımarık	Ölürüm Sana	1997	81.4
2	Yap Bi Güzellik	Single	2022	24.3
3	Öp	Adımı Kalbine Yaz	2010	26.6
4	Adımı Kalbine Yaz	Adımı Kalbine Yaz	2010	20.0
5	Dudu	Dudu	2003	34.3
6	Son Durak	Single	2022	5.6
7	Kuzu kuzu	Karma	2001	43.3
8	Ölürüm Sana	Ölürüm Sana	1997	32.0
9	Geççek	Single	2022	22.6
10	İşim Olmaz	Adımı Kalbine Yaz	2010	16.3

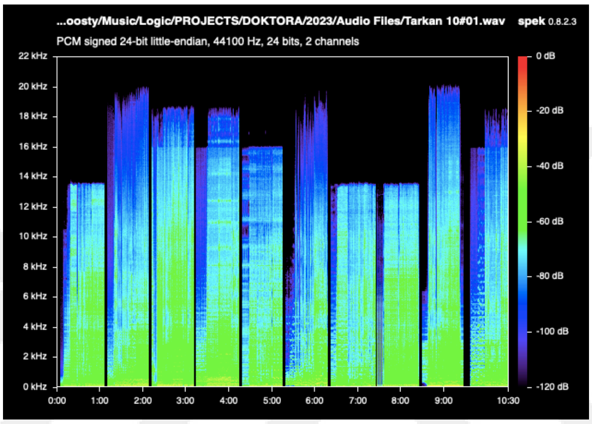
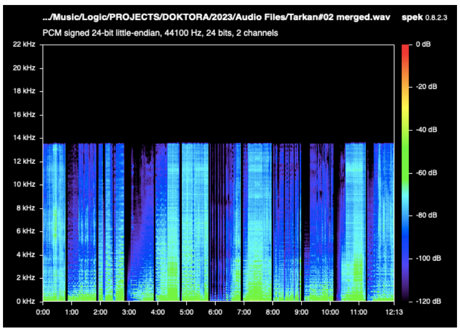
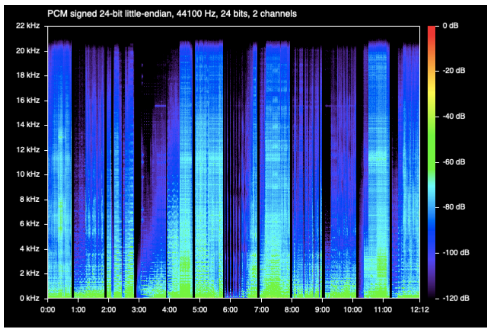


Figure A.19 : Frequency Analysis of Tarkan top 10 songs on Spotify.



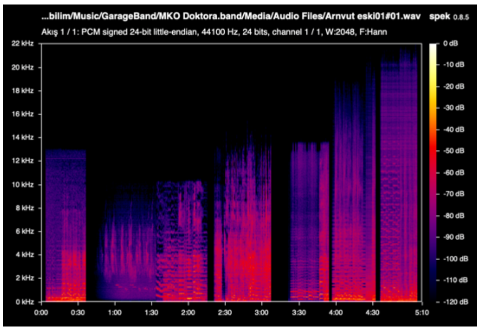
(a)



(b)

Figure A.20 : Frequency Analysis of Tarkan’s A’acayipsin album: (a) Spotify (b) CD.

APPENDIX B : Spectrogram analyses of world wide songs and artists on Spotify.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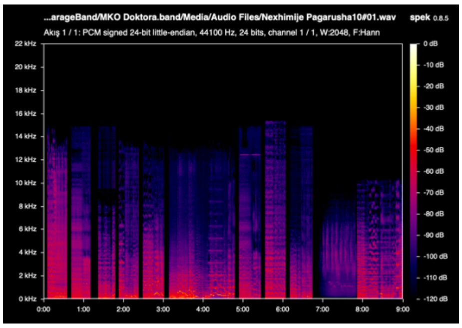
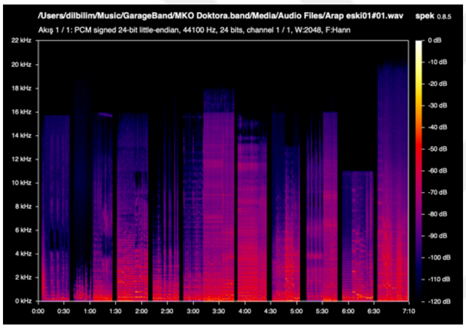

(b)

Figure B.1: Spectogram analysis: (a) Albanian old songs (b) Nexhmije Pagarusha top 10 songs from Albania.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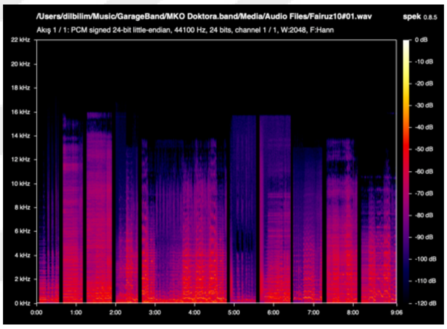
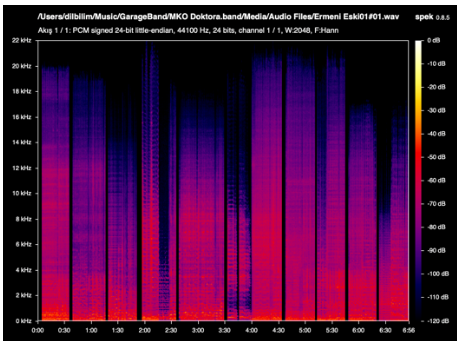

(b)

Figure B.2: Spectogram analysis: (a) Arabic old songs (b) Fairuz top 10 songs from Lebannon.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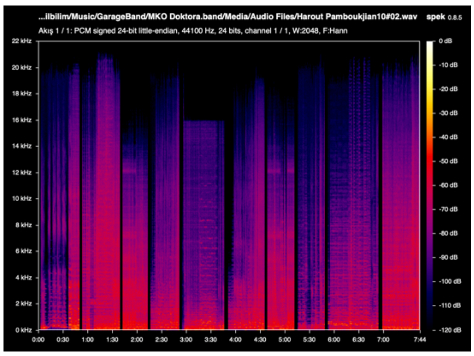

(b)

Figure B.3: Spectogram analysis: (a) Armenian old songs (b) Harout Pamboukjian top 10 songs from Armenia

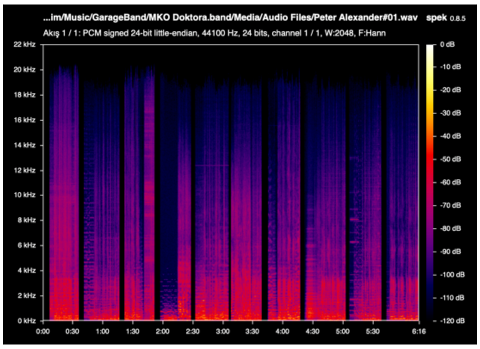
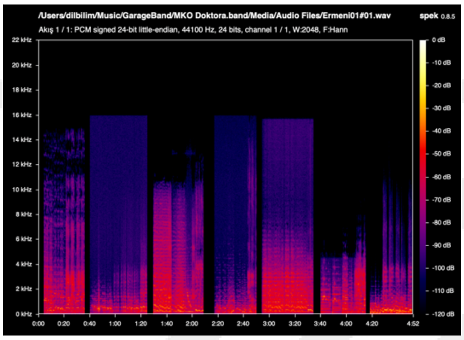
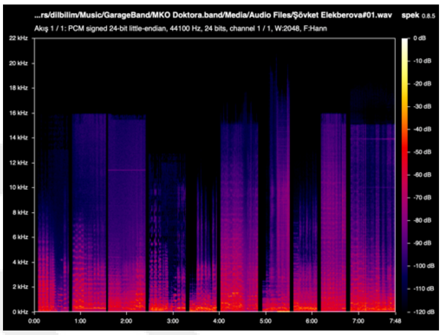


Figure B.4: Spectogram analysis: Austrian old songs

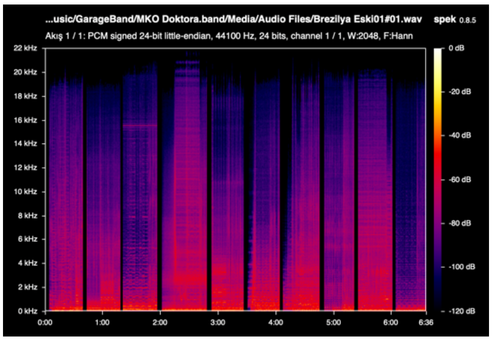


(a)

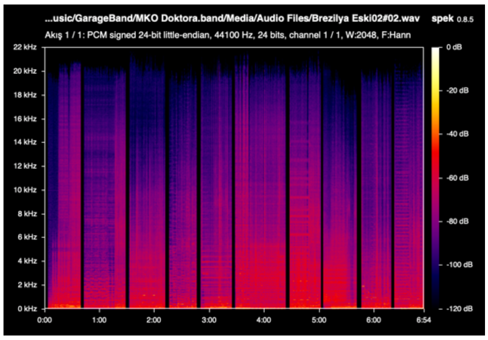


(b)

Figure B.5: (a) Azerbaijanian old songs (b) Şövket Elekberova top 10 songs from Azarbaijan

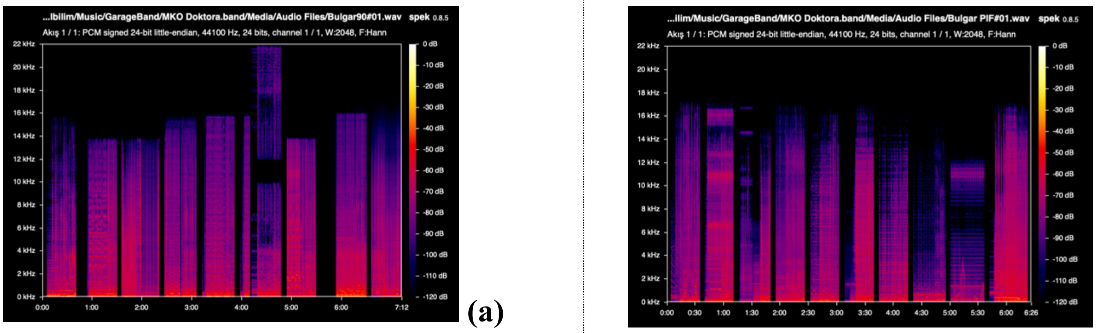


(a)



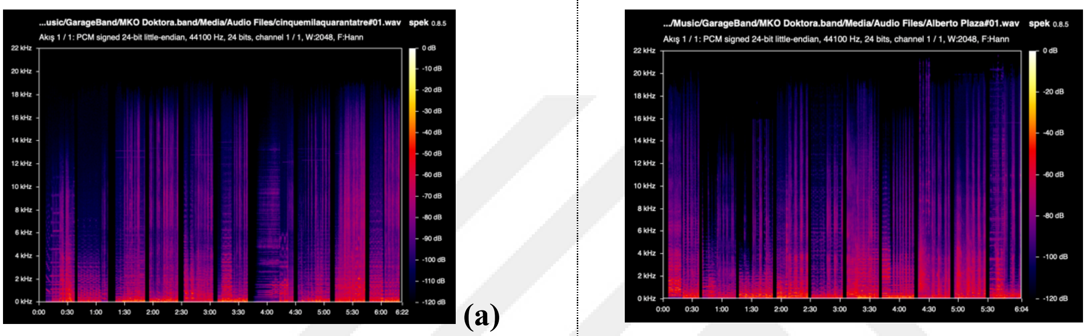
(b)

Figure B.6: (a) Brazilian old songs (b) Brazilian old songs continued



(a) (b)

Figure B.7: (a)Bulgarian old songs (b) P:I.F. top 10 songs from Bulgaria



(a) (b)

Figure B.8: (a) Chilean old songs (b) Alberto Plazza top 10 songs from Chillie

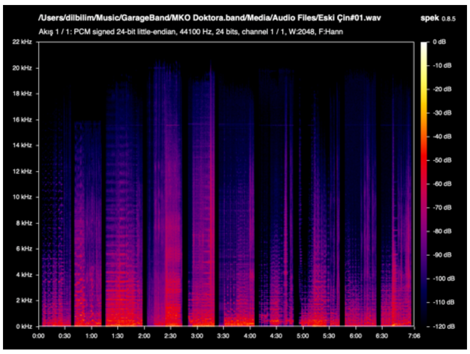
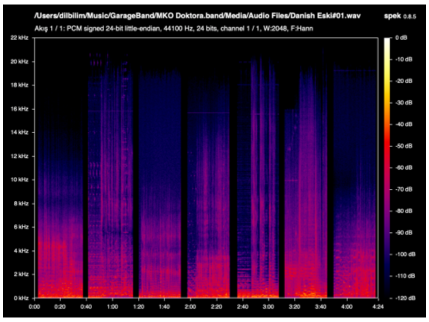


Figure B.9: Chinese old songs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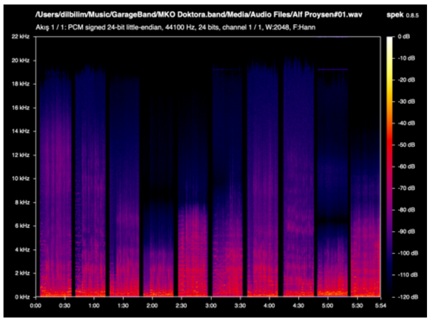
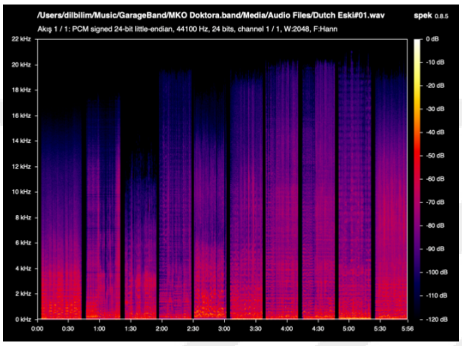

(b)

Figure B.10: (a) Danish old songs (b) Alf Proysen top 10 songs from Denmark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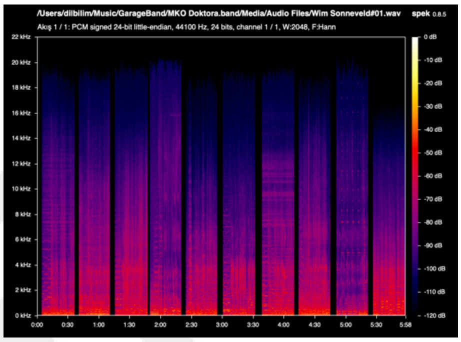
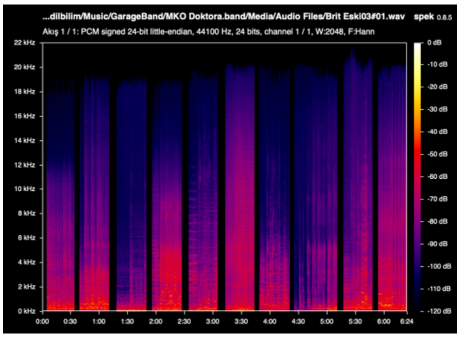

(b)

Figure B.11: (a) Dutch old songs (b) Wim Sonneveld top 10 songs from Holland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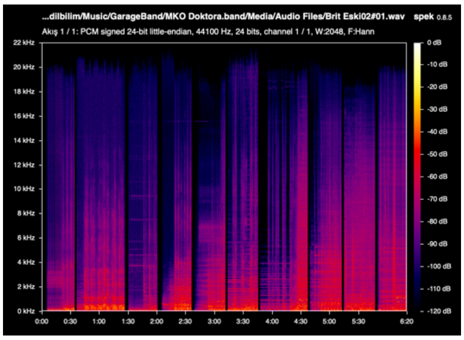
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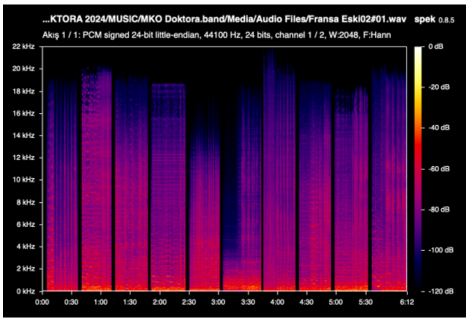
Figure B.12: (a) British old songs (b) British old songs continued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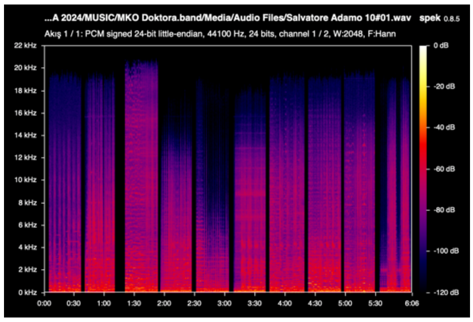
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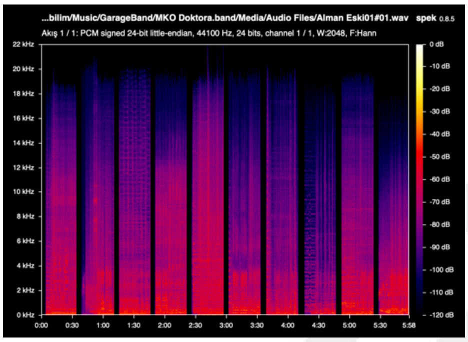
Figure B.13: (a) French old songs (b) Salvatore Adamo top 10 songs from France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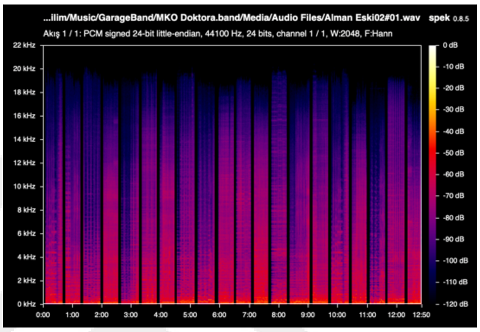
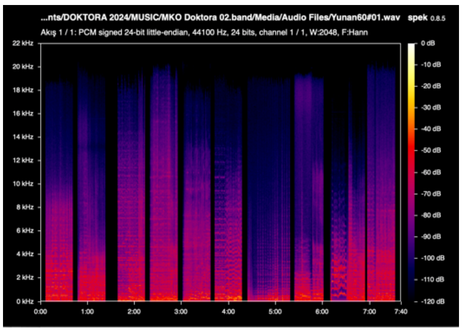

(b)

Figure B.14: (a) German old songs (b) German old songs continued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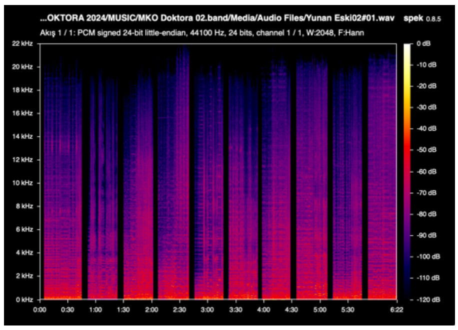
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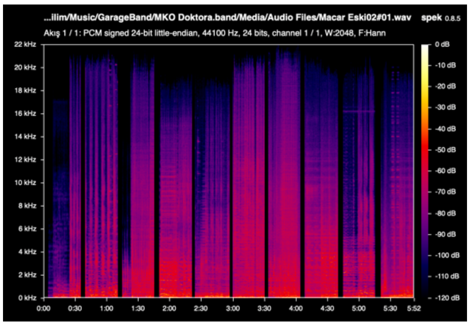
Figure B15: (a) Greek old songs (b) Greek old songs continued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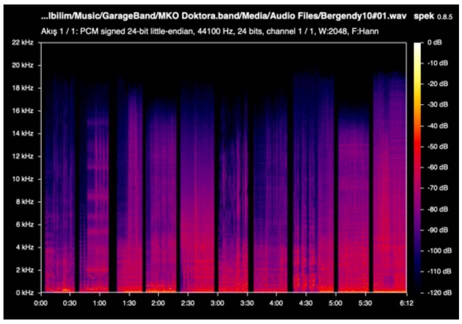
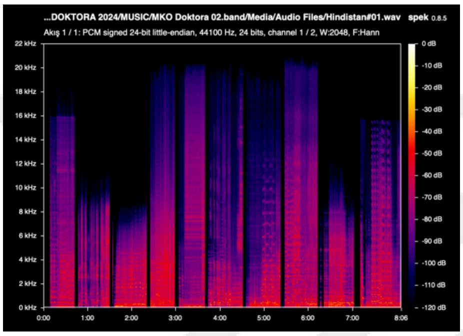

(b)

Figure B.16: (a) Hungarian old songs (b) Bergendy top 10 songs from Hungary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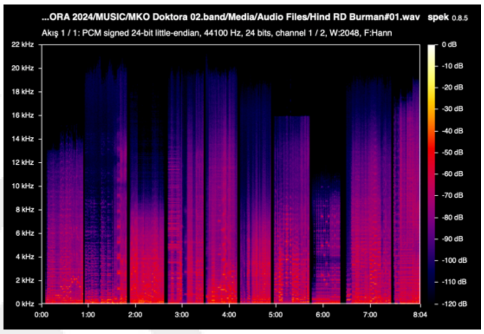

(b)

Figure B.17: (a) Indian old songs (b) German old songs continued

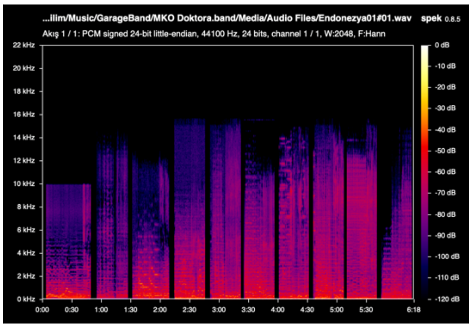
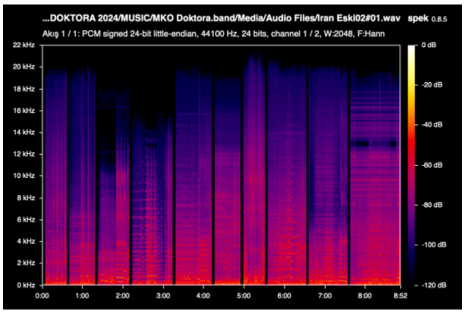
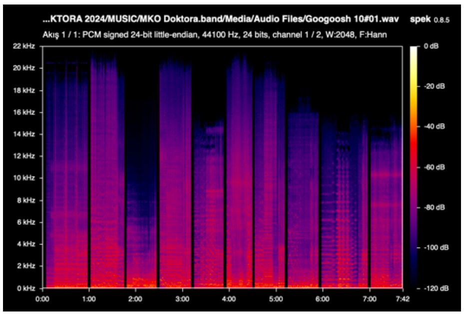


Figure B.18: Indonesian old songs

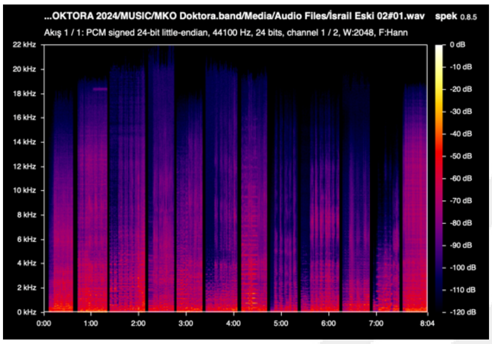


(a)

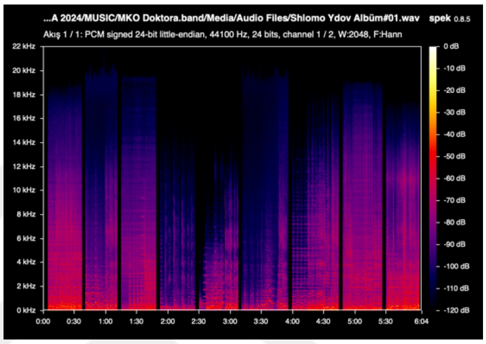


(b)

Figure B.19: (a) Persian old songs (b) Googoosh top 10 songs from Iran

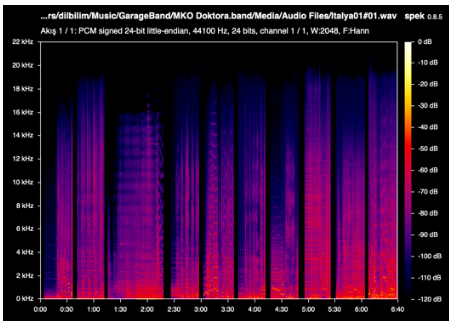


(a)



(b)

Figure B.20: (a) Jewish old songs (b) Shlomo Ydov top 10 songs from Israel



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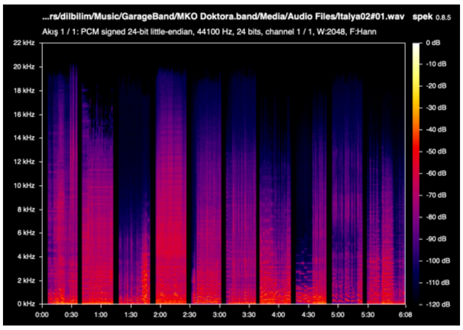
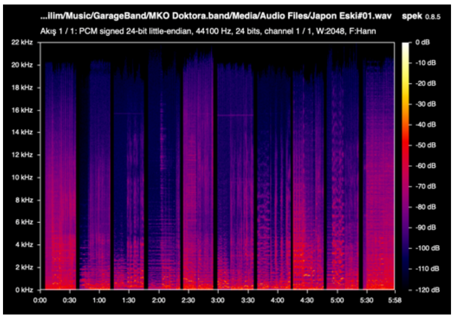


(b)

Figure B.21: (a) Italian old songs (b) Italian old songs continued



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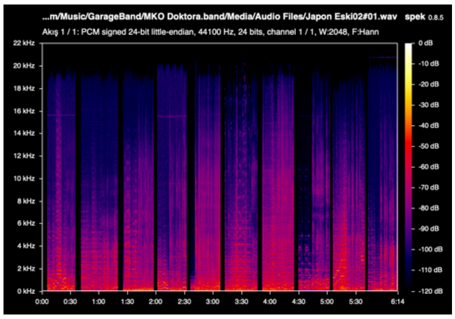
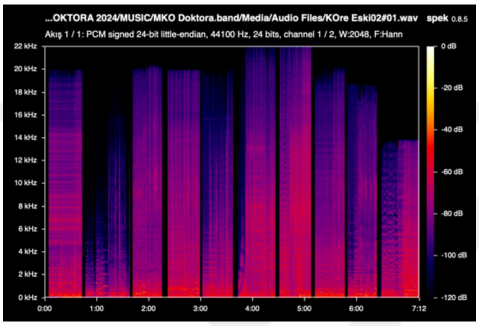


(b)

Figure B.22: (a) Japaneese old songs (b) Japaneese old songs continued



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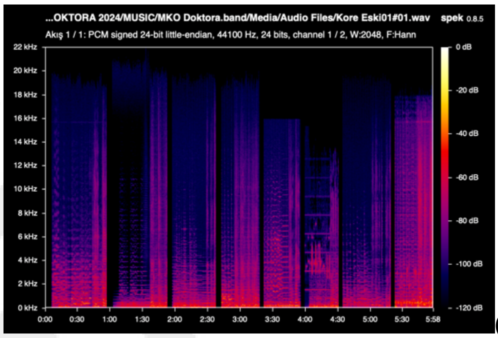


(b)

Figure B.23: (a) Korean old songs (b) Korean old songs continued

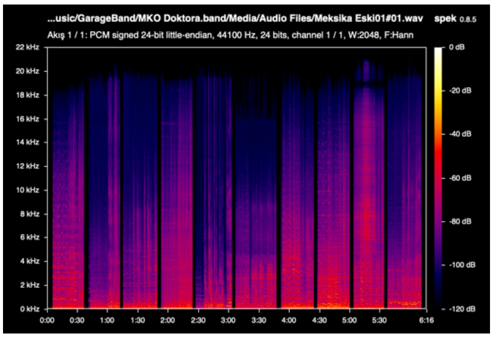
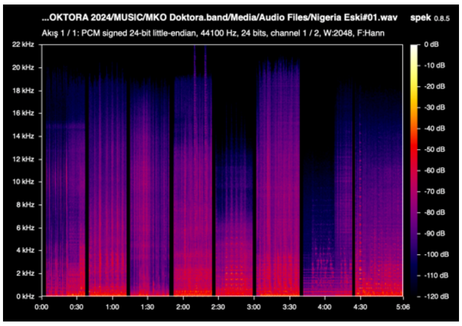
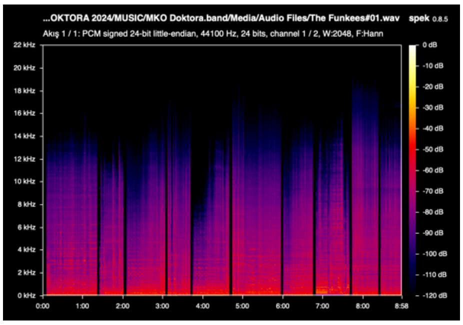


Figure B.24: Mexican old songs



(a)



(b)

Figure B.25: (a) Nigerian old songs (b) The Funkees top 10 songs from Nigeria

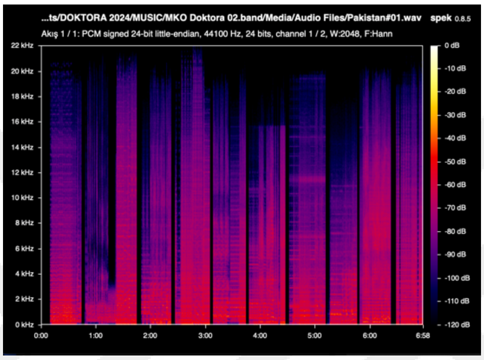
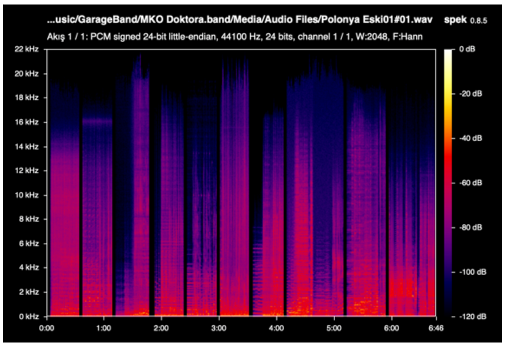
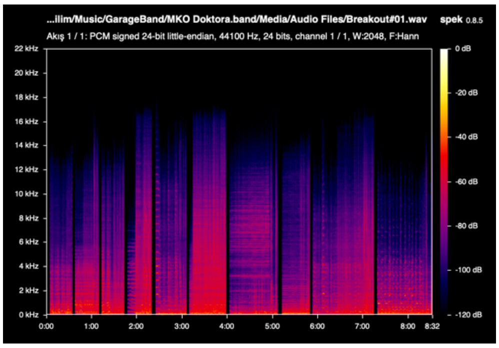


Figure B.26: Urdu old songs from Pakistan



(a)



(b)

Figure B.27: (a) Polish old songs (b) Breakout top 10 songs from Poland

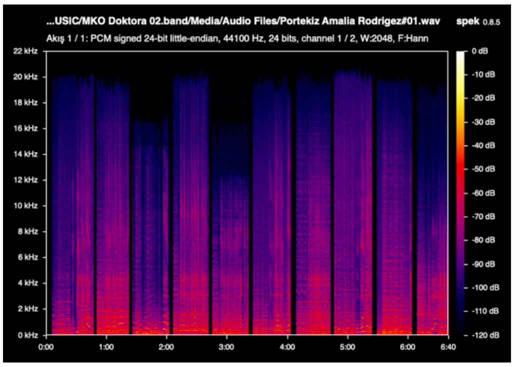


Figure B.28: Amalia Rodrigues from Portugal

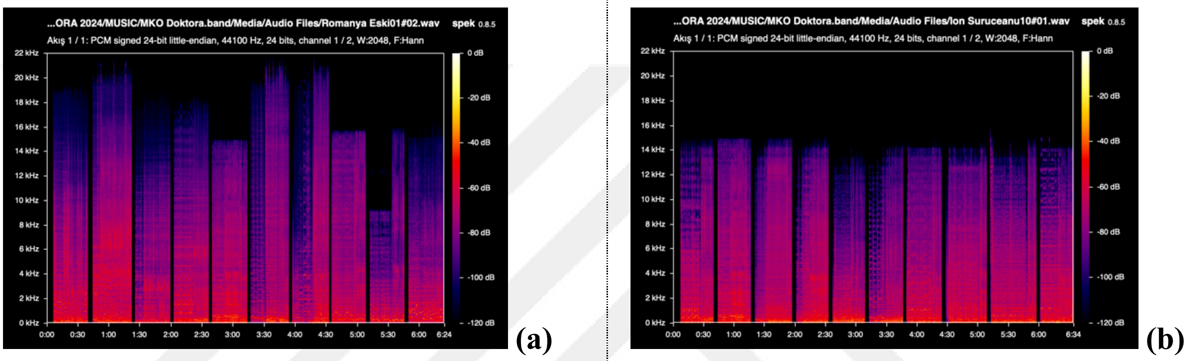


Figure B.29: (a) Romanian old songs (b) Ion Suruceanu top 10 songs from Romania

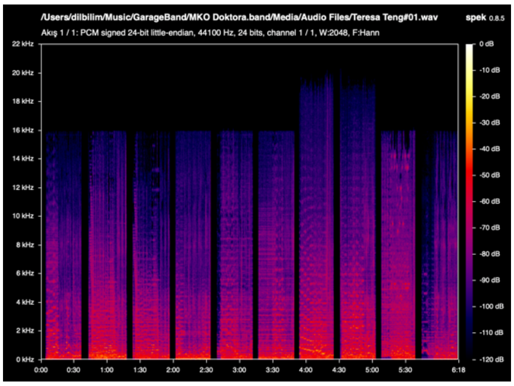


Figure B.30: Teresa Teng from Vietnam

APPENDIX C: Transcripts of interviews with music market proffesionals in orginal Turkish and English translations respectively.

Interview with Metin Uzelli:

Metin Uzelli is the founding member of MÜ-YAP and Vice President at The Orchard / Turkey (Digital distribution company World-wide)

Original (Turkish) Version

Mustafa K. Öztürk: Basitçe sorularla başlamak isterim belki siz beni yönlendirirsiniz. Aslında aradığım cevap bu sorularda yoktu. MÜ-YAP'a bu röportaj isteğimi yolladığımda öncelikle her şey olumlu ilerledi ama sonrasında soruları istedikleri andan sonra olumsuz bir şekilde devam etti. Ben bahsettiğim üzere fark ettim ki Türkiye müzik arşivinde düşük kaliteli şarkılar bulunmakta. Zaten araştırma yaparken çıkış noktam da buydu. Türkiye'deki özel Müzik servislerin yani özellikle Türkiye arşivine sahip olan Fizy, Muud, Spotify, Apple Music gibi servislerin paralı Premium versiyonlarında kalite yükseliyor şeklinde bir vaatleri bulunmaktaydı. Bense bu araştırmaya girerken şunu düşünmüştüm. Bu eski arşiv yani 2005 yılı öncesi yüklenen eski arşiv düşük kalitede yüklenmiş olmalı. Zaten o yıllarda çalışan ve sektörde bulunan arkadaşlarımdan da bu şekilde bilgiler almıştım. Sisteme 128kbps mp3 yüklendiğini biliyorduk fakat ücret ödediğinizde bu sistemlerin iddia ettiği kendi standartlarında çok daha yüksek bir ses kalitesiydi. Türkiye arşivinde ise zaten önceden düşük kalitede yüklenmiş MP3lerin ancak yükseltilerek fakat kaliteleri değişmeyerek bu sisteme ayak uydurabileceklerini öngördüm. Bunu araştırmaya başladığımda da örnekler bulmaya başladım. İlk sorum bununla ilgili olarak ilk ne zaman yüklendi bu Mp3'ler sisteme? Ne şekilde yüklendi ve kim tarafından yüklendi? Sonrasında düzeltme yapıldı mı ya da yapılabiliyor mu? Bu bilgileri edinmek istiyorum.

Metin Uzelli: Şimdi şöyle yapalım istersen, ben senin hazırladığın sorulara göz attım. Bunların içinde cevaplayabileceklerim var, cevaplayamayacaklarım var. Burada ses kaydıyla devam edeceğimizi düşünerek ve bunun avantajından yararlanarak istersen ben kronolojik olarak sana Türkiye müzik endüstrisinin bu alandaki tarihinden bahsedeyim öncelikli olarak. Sen de benim anlattıklarım içerisinden sorunlarınla ilgili cevaplarını alabilirsin bu şekilde.

İlk olarak verdiğim bilgilerin nereye dayandığını paylaşmak isterim. Ben 50 yaşındayım, babam eski plak şirketlerinden birinin sahibi ama bu işe girişiminin sebebi ticaret ve sanayi ile olan yatkınlığından kaynaklanıyor. Babam bir müzik insanı değil. Babamın bu işe girmesini ardından 1977 yılında bir hamle yapıyor ve bir fizibilite raporu hazırlatıyor. Akabinde bu faaliyet başlıyor 1979 gibi Kaset fabrikasını kuruyor. Bu fabrikada 1997 yılına kadar üretim yapıyordu. 1997'de kapandı. Üretimle ilgili bir faaliyetimiz olduğundan kayıtların kaynakları konusunda bilgi sahibi oldum. Bunlardan bir tanesi şu; normalde burada bu kayıtların sahibi plak şirketleridir, bu plak şirketinin sahibi sanatçı da olabilir. Plak şirketlerinin kaynaklarına baktığımız zaman üç ana unsur görürüz. Bunlar plak şirketlerinin sermayesini oluşturur. Birincisi haklarının kendilerine ait olduğunu gösteren dokümanlardır. İkincisi haklarına sahip oldukları ses kayıtlarının *Master* (Ana çoğaltma işlemi için kullanılacak olan yüksek kaliteli ses dosyası) dosyalarıdır ve son olarak bu sanatçılara ilişkin görsel materyallerdir. Dolayısıyla eğer bir plak şirketi sahibi iseniz sımsıkı muhafaza etmekte zorunda olduğunuz ve güncel tutmakla zorunda olduğunuz materyal ve varlıklar bunlardır. Yurtdışında herhangi bir plak şirketine gittiğinizde orada hiç kimse bu materyale sahip olmak ve muhafaza etmekten bir övünç kaynağı olarak bahsetmez çünkü bu onların varlık sebebidir. Fakat Türkiye geldiğimizde buradaki şirketlerin hiçbiri ne dokümanlarını ne *Master* dosyalarını ne fotoğraflarını ne de benzeri arşivlerini muhafaza edememişler. Bizim şirketimiz Almanya'da kurulduğu için (Uzelli müzik) oradaki bu anlayışı içselleştirmiş. Üretici olarak daha farklı bir süreç disiplini oluşmuş. Dolayısıyla bizim şirkette *Master* dosyalar fotoğraflar görsel malzemeler itinayla muhafaza edilmiştir. Bizim burada fabrika binamızda eskiden özel bir yerde muhafaza ediliyordu şimdi bu ofiste özel bir alan yarattık sonra görebilirsin. Arşiv odalarını gösterdiğim zaman sektördeki insanlar çok şaşırıyorlar ve övgü dolu sözler söylüyorlar. Halbuki bunlar asgari şekilde yapılıyor olması gereken standart olmalı. Bu kayıtların alındığı dönem stüdyo kaydı elimizde olabilecek en ana kaynak ve çok değerli. Multi kanal band dediğimiz kanal kaydı ise daha da makbul. Tüm bunların muhafaza edilmiş olması gerekiyor. Değişen teknoloji ve ihtiyaca ayak uyduracak şekilde dönem dönem bunların o anki teknolojinin imkân verdiği en yüksek çözünürlüğe de yedekleniyor olması lazım. Bant dediğimiz materyaller fiziki ürünler olduğum için kondisyonları da çok önemli olduğundan dolayı zaman onların aleyhine işliyor. Dijital formata aktarıyor olsak bunları belli dönemlerde olabildiğince muhafaza etmiş oluyorsunuz. Buradaki en önemli konu çözünürlük. Bu bantlara baktığınızda çözünürlük çok yüksek gerçekten. Fakat bunların muhafazasında yapışmak gibi manyetik alan gibi ya da doğru oynatıcının bulunmaması gibi sebeplerden dolayı okunması ve kaydedilmesi mümkün olamayabiliyor. Bugün sektörde birçok firma birtakım yollarla *Master* dosyalarına ulaşıyorlar ve bu ulaştıkları dosyaları ana bant zannediyorlar. Bunları teybe takıp dinliyorlar fakat yeterli teknik bilgiye de sahip olmadıkları için her dinlediklerinde o bantlara zarar vermiş oluyorlar ve üstündeki veriyi kazıyorlar. Bant okundukça zedeleniyor. Bütün her şeyi tertemiz yapıyor olsanız bile hatta bandınızın kondisyonu harika olsa bile burada tanıdığım hiç kimse o eski analog teyplerdeki kalibrasyon tekniklerine sahip değil. Dediğim gibi fiziki bir durum var kafa ayarı, frekansların doğru akıp akmadığı gibi testleri doğru yapmıyorlar çünkü bunu yapıyor olmanın birinci koşulu kalibrasyon bandına ihtiyacı olunması. Referans bandını teybe takıp 1 kHz vereceksin "pink code" vereceksin "grey code" vereceksin onun çıkışına (output) bakacaksın bilgisayarında doğru veri geldiğini göreceksin ki o bandı taktığında yürüsün. Doğru bir iş yaptığına inansan bile o bandı doğru işlediğinin garantisi değildir bu çünkü o cihazın daha önce kaydedildiği kalibrasyonundan emin olamıyorsun. Bu da o müziğe ilişkin bir sürü veriyi değiştirebilir. Bütün hikâye oradan başlıyor. Türkiye'deki müzik sektörüne baktığımızda kasetin arkasından gelen format CD olduğundan dolayı ve Türkiye'deki kaset üreticilerin Uzelli değil Raks gibi Nora gibi Kamel gibi şirketler kaset üretiminin hemen arkasından yeni format olan CD üretim bantlarını da kurdular dolayısıyla kasetin arkasından gelen format CD olduğundan dolayı ve henüz manyetik bantlar genç ve güncel olarak kullanıyorken o bantlar CD formatında üretildilerse CD'ye dijital olarak aktarmış oldular. CD'nin ilk çıktığı zamanda bu iş ciddiyet ve disipline yapılıyordu. Ve dijitale geçildiği zaman dijitalin artık bu sektöre geldiğinde, MP3ler veya bir takım dijital formatlar kullanacağı zaman kaynak her zaman CD oldu. Yani eğer ki bir kaydın CD formatında baskısı mevcutsa o CD kopyaları aynı zamanda eldeki en iyi *Master* görevini gördü. Bununda konforu ve rahatlığından dolayı insanlar o eski analog bantları terk ettiler ancak şöyle bir şey var her şeyin CD'si basılmamıştı. CD fabrikalarının kapanmasıyla beraber CD'lerde yeterince basılmadıysa yok olabiliyorlar o CD baskıları da o yüzden çok önemli hale geliyor. O zaman yapılan aktarımın ne kadar sağlıklı olup olmadığı da ayrı bir muamma. Dolayısıyla eğer CD formatında senin elinde varsa ilk başta bunlar dijitale yüklenirken MP3 formatında yüklendi. Bu ne zaman ve ne şekilde oldu ondan biraz bahsedeyim size. CD'den sonra dijital formata geçiş MÜ-YAP eliyle oldu. O dönemde bu logo melodi işleri vardı. Cep telefonu operatörleri ve bunlara hizmet veren birtakım şirketler ciddi suistimallere yol açtıklarından dolayı dijital yani gerçek müziğin gerçek tonun dijital evriminde MÜ-YAP üyesi şirketler farklı bir yol izlemeyi tercih ettiler. İzledikleri yolda şuydu, dediler ki; normalde MÜ-YAP meslek birliğinin esas kuruluş amacı umumi müzik mahallerindeki müziğin kullanımından elde edilen gelirleri toplamaktır. Asıl amacı budur ama madem ki biz böyle bir meslek birliğini kurduk biz bir aradayız, biz bu konuda da güç birliği yapalım. Şirketler olarak dijital alandaki haklarımızı lisanları tek tek vermeyelim hep birlikte MÜ-YAP üzerinden verelim. Bu tabii o dönem doğru bir karardı şu açıdan. İlk dijital müzik platformunun da müşterinde potansiyel müşteri Turkcell'di ve cep telefonu operatörleriydi. Tabii ki pazar çok küçük bir pazardı bahsettiğim yıl 2003 2004 50.000 dolarlık 100.000 dolarlık bir pazar vardı toplamda Türkiye'de amma velakin o kataloğa sahip olmak o operatörler için çok önemliydi. Dolayısıyla pazarın ederinden çok daha büyük bir parayı, bütçeyi vermeye razıydı bu operatörler. Çünkü buna aynı zamanda bu bir marketing bütçesi olarak bakıyorlardı. "Value Added Service" dediğimiz katma değerli servisler alanında önemli bir araçtı onlar açısından. Dolayısıyla 100.000 dolarlık toplam pazar olan bir iş için 1 milyon dolarlık bütçe vermeyi göze alıyordu operatörler. Ve bütün Türkiye müzik endüstrisindeki şarkıları tek lisanslama ile alabilecekse MÜ-YAP oradaki tekel olma gücünü de kullanarak 100.000 $ elde edecekken 1 milyon $ gibi bir parayı bu operatörlerden rahatlıkla tahsil etti ve o parayı da kendi içinde pazar paylarına göre paylaştırdı. Sektör bu anlamda dijitale ticari anlamda çok iyi bir giriş yaptı. MÜ-YAP'ın eliyle de lisanslama yapılınca biz burada bir veri tabanı oluşturalım, buraya bütün kataloğu ve meta datayı, ses ve görüntü dosyalarını da yükleyelim hem bu üstün bir veri tabanı olmuş olur hem de buradan bunları lisanslarız dendi. Tabii o zaman bunlar ilk başladığında dünyada henüz "*streaming*" (akışta müzik dinleme) yoktu sadece "*download*" (internet üzerinden dosya indirme) vardı. Dosya boyutları önemliydi. İkincisi o zaman dünyada herkes birbirini hırsızlıkla suçluyordu. Bir paranoya vardı çünkü internet korsancılığı çok yüksekti. "Bu nedenle, kullanım ve indirme işlemlerini tamamen müzik servislerine bırakmak yerine merkezi bir veri tabanı tercih edildi ve buradan ses dosyalarını DRM (Dijital Hak Yönetimi) sistemleriyle uyumlu formatlara dönüştürmek için özel yazılımlar kullanıldı." Bu anlamda MP3 süper bir kaliteydi, boyut olarak da yüksek bir dosyaydı o zamanın teknolojisi için. Kısaca bütün hepsi MP3 olarak yüklendi oraya fakat tabii teknolojinin gelişimi işte 2004'te başladı bu ve bütün şirketler ellerindeki her bir materyalden kasetten bile MP3 elde ettiler. Meslek birliğinde böyle ortak bir veri tabanı yapılıyor ve herkes oraya gönderiyordu. Buradaki insanların teknik bilgileri sınırlı olduğu için yine bu şirketler kendilerinde bir kopya muhafaza etmek yerine oradaki datanın en iyisi olduğunu düşünerek MÜ-YAP'ın veri tabanına güvendiler. MP3 ün yeterince iyi bir kalite olduğu düşündükleri için de ellerindeki bazı *Master* kopyalardan kurtuldular. Ve devamında bu teknolojinin gereksinimleri değiştikçe bu şirketten şirkete değişmek üzere kimi yeniden CD'den bir kopya aldı, analog bandı olanlar belki bazen yeniden analog banttan kopyalar aldılar ya da MP3lerden "*convert*" (analogdan dijitale çevirme ya da dijital formatlar arası çevirme işlemi) ederek farklı formatlara dönüştürdüler. Dolayısıyla bugün örneğin Tidal gibi bir müzik servisine müziğinizin stüdyo kalitesine gidiyor olması için orada bir teknik *spek* (spesifikasyon) var, orada diyor ki 24 bit vs. belirli özellikler o formata MP3 ten "*convert*" edilmiş o dosya. Sen oradaki teknik gereksinimleri karşılıyorsun amma velakin senin kaynak dosyanda o çözünürlük yok.

Mustafa K. Öztürk: Burada bir araya girmek istiyorum. Zaten benim de tam araştırdığım nokta bunun üstüneydi. Misal ayrıca bir örnek olarak vermek isterim, bir Barış Manço şarkısında sanki bir analog sistemden kayıt yapılıyor ve şarkının ortasında biri yavaş yavaş sesi açıyor. Sinyal seviyesi az oldu açmam lazım gibi bir durum oluşmuş. Bunun sebebi ilk *Master* kayıtta mı vardı, miksaj sırasında mı yoksa aktarılırken mi olmuş nasıl bu durum oluşmuş çok merak etmiştim.

Metin Uzelli: Her şey olabilir. "*Volume"* (Ses şiddeti) değişir, voltaj değişir, devir değişir. Kafanın önüne pislik gelir iki saniyeliğine, o sıra pisliği atar oradan o esnada o kaydı yapan kişinin dikkat edemediyse kaçtı o.

Mustafa K. Öztürk: Kısaca her plak şirketi ayrı ayrı yaptı bu aktarımları.

Metin Uzelli: Tabii ki bunları ayrı ayrı yapıyor plak şirketleri. Dolayısıyla o elindeki kaynak dosyayla alakalı.

Mustafa K. Öztürk: Plak şirketinin sekreteri de yapmış olabilir yani kızım sen yap demişlerse.

Metin Uzelli: Tabii ki yani ne örnekleri var onu anlatamam. Orada hikâye bitmiyor. O hataları biz yapmadık mı? Biz de yaptık Uzelli olarak. Ama Uzelli'de bizim şöyle büyük bir şansımız vardı. Bizim hem Türkiye'de hem Almanya'da üretimimiz olduğu için ve aynı zamanda üretici olduğumuz için, bize stüdyodan gelen her *Master* hemen *duplike* (tekrar kopyalanmış) edilmiş bir kopyası mevcuttu.

Almanya'ya gitmiş bir kopyası Türkiye'de fabrikada kalmış. Bir de bizim fabrikada üretim kopyası dediğimiz, yani stüdyodan gelen ana *Master*'ın bir kopyası alınırdı. Bu bantların teknik özellikleri çok üstün kalitedeydi. Çok mukavim ve dayanıklı bantlardı. Çünkü bunlar yüksek devirde dönerler ve üretim hattında kullanıldıkları için üstün kalitesi olan bantlardır. Biz onları da muhafaza ettiğimiz için stüdyodan gelen *Master* zamana yenildiyse bile üretim kopyalarının bantları biz de hala duruyor. Dolayısıyla Uzelli'nin kendi kataloğunun dışında Uzelli fabrikasında üretilmek üzere gelmiş kopyası gelmiş bantların da birçoğunun kopyaları duruyor bizde hala ve işte bu içinde bulunduğumuz süreç içinde lazım olduğunda veriyoruz insanlara. Şimdi burada konu şu dediğim gibi bu aktarmayı kim ne zaman yaptıysa o işi, o şirketin elimdeki dosya da en çok o çözünürlükte bulunur.

Biz mesela Almanya'daki arşivimizi yani depoyu 1994'te imha ettik. Ama imha etmeden önce ben oraya gittim. Teybimizi kurduk. DAT (Digital Audio Tape) o zaman çok güncel ve iyi bir formattı. Bütün bu albümlerin hepsini *Master*'ların hepsini Türkiye'de de yedekleri olmasına rağmen (ekstra bir back-up olarak) onların hepsini DAT'a kaydettik ve öyle imha ettik. Şimdi baktığımız zaman bizde her albümün aşağı yukarı bir stüdyo *Master*'ı bir DAT kopyası, Almanya'daki bandın DAT kopyası, bir de üretim kopyası var. Dolayısıyla elindekilerden bir tanesinin kondisyonu yeterli değilse öbürüne başvurmak ya da bazen hani total kalitede fark olmuyor ama aktarmada işte birtakım çapaklar edit gerektirecek böyle coplar vesaire oluyor. O zaman hani başka bir yerden alıp oraya koyabileceğimiz parçalar olabiliyor, o tip yamamalar yapmaya imkân veriyor bu. Dolayısıyla bu hani bu aslında olması gereken de bir şeydi.

Ama Türkiye'de dediğim gibi o *Master* disiplini maalesef yeterince oluşmadı.

Senin çalışmanın *streaming* ile alakalı olduğunu biliyorum ama bugün bunun tabii başka bir yere daha sirayet ediyor. Biliyorsun plak yeniden güncel bir format olarak hayatımıza girmiş durumda ve bugün işte birçok özellikle eski kayıtların plakları yeniden basılıyor. Mesela oradaki kaynak dosyaların durumu içler acısı.

Mustafa K. Öztürk: Mp3'lerden yaratıyorlar belki de.

Metin Uzelli: İnanın çok sayıda kayıt o şekilde.

Mustafa K. Öztürk: Peki bu durumda şimdi o CD'ler ve kasetler, bazı kasetlerin de CD'si yoktu zaten yani CD ye çevrilmedi. Tabii o kasetlerin ana formatından değil de kasetten de sonuçta Mp3 yapmış olabilirler.

Metin Uzelli: Tabii

Mustafa K. Öztürk: Mü-Yap bunları bir şekilde Turkcell'e, Vodafone'a, o zaman Vodafone yoktu galiba da.

Metin Uzelli: TT net müzik ve Turkcell'e verdi onları.

Mustafa K. Öztürk: O sırada muhtemelen 128kbps verdi *download* olacağı için.

Metin Uzelli: Tabii

Mustafa K. Öztürk: *Streaming* başlayınca herhangi bir örnek vereyim diye söylüyorum. Avrupa müziğin işte arşivindeki x bir şarkı a zaman 128kbps olarak sisteme girmişti. TT net müzik ve Turkcell almıştı bunları. Şu iddiayla hani daha yüksek para ödeyin ve daha yüksek kaliteye geçin dediklerinde bu Mp3'ü biz aslında 128 kbps almıştık şimdi bunu 256 kbps ye çevirecek durumu uyguluyorlar mı? Bunu çeviren kim? Ya da mesela ben Orchard'la ilgili durumu az çok biliyorum. Sonuçta buradan Orchard'a gidiyor ve oradan dağılıyor. Evet, en azından bir kontrol var. Küçük de olsa yani? Küçük derken oradaki kontrol mekanizmasını bilmiyorum da ben buraya sisteme kendimce düzgün bir 24 bit bir ses dosyası yolluyorum. Onu sistem kontrol ediyor diye düşünüyorum. Belki ben Mp3'ten çevirdim ama en nihayetinde teknik olarak karşılıyorum ve sisteme veriyor. Türkiye için Fizy, Muud dünya için Tidal, Spotify vs. ye yolluyor. Onlar da diyor ki, ben bunu işte ana formatını yüksek 256 kbps (kilo bit per second) yaparım ya da işte "*wave file*" (Kayıpsız bir ses dosyası formatı) olarak devam ettiririm. Ücret ödemeyen kullanıcılar için de düşük kaliteye çeviririm. Tüm bunları her sistem kendisi yapıyor diye düşünüyorum.

Metin Uzelli: Doğru

Mustafa K. Öztürk: Yani Spotify ayrı yapıyor, Fizy ayrı yapıyor. Oraya gelen ana kaynağı bölüyorlar kendi tekniklerine göre diyor ki ben belki en düşük kalite 64 yapacağım diyor. Diğer biri 128 yapıyor ama gelen ilk kaydın kalitesi düşükse ama görünürde 24 bit olması dışında hiçbir şey değişmiyor olması lazım. Bu noktada bir kontrol yok. Spotify şunu demiyor, yani bana gelen dosya aslında zaten mp3'müş.

Bunu ben geri göndereyim demiyor. Bana gelen buydu oradan *conversion* yaptım diyor diye anlıyorum.

Metin Uzelli: Doğru şimdi aynen öyle işte. Orada süreç şöyle işliyor, yurt dışında her şey beyana esastır. Senin beyanın değerlidir. Sen bu 24 bit diyorsan o 24 bit'e göre devam eder.

Zaten Mp3'ten çevrilmiş bir 24 bit ses dosyasını birisi veriyorsa zaten muteber değildir. Günün sonunda teknik yürüyüş bu şekildedir. Orchard gibi dağıtımcılar ne yaparlar? Yüzlerce mağazaya hizmet verdiği için, senin gönderebileceğin en yüksek "*spek*" i ister. Sonra her şirketle olan anlaşmasında o şirketin talep ettiği bir format vardır. Fizy 96 ister de işte diğeri 128 ister Tidal da 256 ister. Orchard kendi sisteminde bunları çevirip kim ne istiyorsa onu gönderir. Bazı durumlarda örneğin Tidal'da olduğu gibi çünkü şunu unutmamak lazım ki hepsinde üç format da var. Yani düşük orta ve yüksek kalite. Kendi çevirip eder koyar oraya, senden yüksek kaliteyi alır, orta ve düşük kalitesine kendisi çevirip koyar. Sonrasında müşterinin seçimine bırakır. Sen hangisini dinlemek istiyorsan onu seçersin ama dediğim gibi orada yüksek kalite dinlediğin sesin yüksek kalite olduğuna dair bir garanti yok.

Mustafa K. Öztürk: Tekrar sisteme yüklemeye dönersek tamam biz beyanımızı yanlış verdik, doğru verdik. Hakikaten orada sistemin bir hatası yok. Varsa o bizim hatamız. 24bit bir dosya vereceğime 16bit bir dosya yüklemişim ve bu benim hatamdı. Ama misal eski işte bir plaktan banttan ya da kalan kasetten eski CD'den girip tekrardan çevirdik. Doğal olarak CD'den çevirilince 16 bit, kasetten çevrildiyse ne şekilde yapıldıysa o çözünürlükte konuldu. Bu noktada bir şey gözüme çarptı. Fizy Muud Apple Music ve Spotify'ın listeleri birbirini tutmuyor. Yani Türk arşivine dair söylüyorum. Misal Barış Mançoʼnun çok eski bir şarkısı bu 4 mecranın birinde var diğerinde yok. Burada bir çeşitlilik oluşmuş.

Metin Uzelli: Bunun sebebinin buradaki teknik *spek* ile ilgisi hiç yok. Birinde olup olmamasının konusu sadece bazı özelikle barış Manço gibi ürünlerde, Türk hukukuna göre hakları netleştirilmeyip edilmeyip yurt dışındaki dağıtımcılar üzerinden piyasaya sunulan birtakım içerikler var. O ürünler o tip dağıtımcıların da Muud ve Fizy ile anlaşması olmadığından dolayı oraya gitmiyor. Ama Spotify gidebiliyor.

Mustafa K. Öztürk: Anladım bu şekilde bir karışıklık olmuş.

Metin Uzelli: Genelde de işte bunlar aslında "*gray label*" (başka bir kurum adına üçüncü taraf bir şirket tarafından sağlanan bir ürün veya hizmet) lardır. Yurt dışındaki sistem beyana dayalıdır. Bu albümün hakları benimdir dersin ve itiraz eden olursa kanıtlamak durumundasındır. Türkiye'de senin onu çıkartabiliyor olman için ise öncelikle senin olduğunu kanıtlamak zorundasındır. Şimdi aradaki fark budur ama yurt dışındaki bu yöntemi suiistimal ederler. Yalan söylerler, senin de gidip o şirketin hesap vermesi için yurt dışında bir avukat tutman gerekir. Türklerde o konuda çok beceriksizdirler, bunu da keşfetmişlerdir. Dolayısıyla orada bir suiistimal söz konusudur.

Mustafa K. Öztürk: Tersi mümkün oluyor mu? Mesela Fizy ve Muud 'da var şarkı ama Spotify ve Apple Music'e hiç gitmemiş.

Metin Uzelli: Orada da sonuçta şirketin uhdesinde olan bir şey. Bugün işte ne bileyim. Orchard ile çalışan herhangi bir şirket, bu albümü sadece Muud'a gönder veya sadece Almanya ülkesine gönder gibi her türlü kısıtlama ve seçimi yapabileceği için eğer şirket öyle bir tercihte bulunduysa olabilir. Ama sonuçta bugün şunu bilmek gerekiyor ki, birisi Muud'a veya Fizy'ye bir şey iletiyorsa, oraya giden ürün kanalı Spotify ile aynı. Hani MÜ-YAP'tan direkt giden bir şey yok. O 2012'de bitti. Ondan sonra zamanında 128 olabilir ama dediğim gibi burada bir Orchard gibi bir dağıtımcıya yapacağın yükleme de istenen *spek* de yıllar içinde değişti. Yani ben 2005 yılından beri Orchard'da çalışıyorum. 2005 yılında yüklemeyle ilgili arzu edilen *spek* ile şimdikinin alakası yok.

Mustafa K. Öztürk: Peki yine o zaman 2012 öncesine ya da 2005 yıl öncesine arşive bakarsak mesela orada işte yine diyelim ki Moğolların bir şarkısı olsun. Çok eski bir ilk kayıtları. O kayıtlar Mü-Yap tarafından mı dağıtılmıştı?

Metin Uzelli: Yok öyle demeyelim, şöyle diyelim, ben Uzelli olarak Orchard'la çalışıyorum. 2010 yılındaki *spek*'lere göre de en üst kalitede yükledim albümü. Makaradan kaydettim 16 bit yaptım ve koydum diyelim sisteme ve her yere de gitti. Bu sıkıntı yok ama Tidal stüdyo kalitesi dediğimiz 24bit istiyor benden ama ben onu bir daha 24 yapıp yüklemediysem Tidal'a gitmez o ürün. Çünkü Orchard sistemine yüklediğim benim en yüksek 16 bittir. Orchard Tidal'a yalan söylemez ya da Orchard 16 biti, 24'e "convert" edip göndermez. Ancak plak şirketi 16'yı 24 bite "convert" edip bak ben bunu 24 yaptım yüklüyorum derse o ürün Tidal'a gider ve bazen de Uzelli onu 16'dan türetmeyip makaradan gerçekten bir de 24 bit dosyaya alır mesela.

Biz makaradan dijitale atarken her zaman en yüksek çözünürlükte atarız yani 24 bit. Bugün belki Orchard'ın istediği *spek* belki 16'dır ama bu benim dijital bir kopyam ana kaynağım olduğundan olabilecek en yüksekte 24 bitte alayım koyayım ama oraya gerekirse 16 bit göndereyim mantığındayız. Sonrasında yeniden bir 24 talebi geldiğinde elimdeki zaten o ana dosyadan 24 çıktılarını alır, onları koyarım öbür tarafa tekrar.

Mustafa K. Öztürk: Orchard öncesi olan bir arşivde bu durum nasıl yaşanıyor? Öncesinde Spotify'a nasıl yüklenmiş dosyalar?

Metin Uzelli: Öncesindeki sistem MÜ-YAP'ın kurduğu sistem.

Mustafa K. Öztürk: Orada bulunan bir şarkı sisteme bir şekilde girmişti. Yani Turkcell ve en azından TT netin arşivine girmişti. Spotify'ya da bunun bir noktada gönderilmesi gerekecek.

Metin Uzelli: Orada şimdi şöyle. Şunu söyleyeyim. MÜ-YAP'ın vakti zamanında Fizy'ye gönderdiği dosyaların hepsi "replace" edildi. Çünkü sistem hiçbir zaman öyle çalışmaz. Yani ne demek o? Ben Uzelli olarak MÜ-YAP'la anlaşmalıydım. 2004'te dosyalarımı yükledim Mp3 olarak ve bunlar Fizy'ye gitti. 3 yıl orada bunlar kullanıldı. 3 yılın sonunda ben Mü-Yap'tan ayrıldım. Aynı albümleri Orchard'a yükleyip Orchard'dan gönderdim. Fizy hukuken öncekileri silmek ve buradan Orchard'ın gönderdiklerini kullanmak zorunda. Ben yine aynı Mp3'leri yüklemediğim durumda onlar değişmiştir atık. Yani Turkcell bu ürün bana daha önce gelmişti Mustafa'dan aynı ürün bu, Metin'in gönderdiğiyle aynıdır ben gene o Mustafa'dan geleni kullanayım diyemez hiçbir şekilde hukuken.

Mustafa K. Öztürk: MÜ-YAP'tan ayrıldınız. Ayrılmamış birilerinin şarkıları vardı orada. Spotify ve Apple Music dedi ki "Bizim bu listeye / arşive ihtiyacımız var".

Metin Uzelli: Dağıtıcıdan alır ve dağıtıcının *spek*'lerinde alır. Başka türlü alamaz. MÜ-YAP'taki içerik dağıtıcıya geçmez. Plak şirketi dağıtıcıya yüklemek zorundadır. Zaten yüklemediyse o ürünün Spotify'la anlaşma yapması mümkün değil. Yani Sezen Aksu'nun şirketi bir dağıtıcıyla anlaşıp bunu Spotify'a gönderebilirsin demediği takdirde Spotify o şarkıları koyamaz sistemine.

Mustafa K. Öztürk: O yüzden o zaman belki de bu yükleme yapılmayan albümler hala kalmış. Yani Spotify'ın listesinde olmayan ama Fizy ve Muud'da olan arşivin bir sebebi bu.

Metin Uzelli: Aynen bu.

Mustafa K. Öztürk: Yani bazıları tekrar sisteme yeniden yükleme yapmadığı için bazı şarkılarda çok düşük bir kalite ortaya çıkıyor. *Spek* testi yapıyorum sırayla şarkıları ve bulmaya çalışıyorum bu tip arşivi, o eski kayıtların bir kısmında gerçekten çok düşük bir ses kalitesi çıkıyor. Daha garip olan bir durum da Fizy'nin bir oynatıcısında yüksek kaliteyi seçtiğiniz zaman kaliteyi düşüyor. Yani hatalı yapmışlar yüksek kalite seçeneğine tıklıyorsunuz ve mp3'ün kalitesi düşüyor. Duyumda çok bir şey fark etmiyor, yakın kalite kullanmışlar ama işte 128 civarında bir yerden aşağı düşüyor. Bu tip durumları bulmaya çalışıyorum. Ne ara karışmış ve sisteme güvenirlik ne kadar? Bu çıkan sonuçlara göre de testleri yapmaya devam edeceğim. Bir de insanların hani kullanım alışkanlıklarını çözmeye çalışacağım.

Metin Uzelli: Oradaki en büyük sıkıntı dediğim gibi, oradaki kalitenin farkına varabilecek dinleyicinin olmaması zaten aslında.

Mustafa K. Öztürk: Yani belki dünyada da çok yok. "*Audiophile*" ler (kaliteli müzik ses sistemleri ile dinlemeyi seven müzik tutkunları) var ama sanki kimse bu durumu yeterince sorgulamamış gibi.

Metin Uzelli: Evet, sorgulamadığı gibi orada bana sorarsan, müziğin başına gelen başka şeyler de var. Hani teknik *spek*'lerin dışında buradaki o *Master*'lara müdahalelerin de olduğunu görüyoruz. Yanlış tonlamalar, EQ veriyor adam ondan sonra ya da işte başka şeyler yapıyorlar.

Mustafa K. Öztürk: Peki CD haline geçirilmemiş kaset plak arşivi nasıl ve ne zaman dijitale döndürürdü?

Metin Uzelli: Allah bilir.

Mustafa K. Öztürk: O şirket ne zaman karar verip böyle bir çevirme işlemine gittiğinde diyorsunuz bu durumda. Ve o sırada bunu kimin nasıl yaptığını bilmiyoruz. Yani belki kasetten yani hiçbir *Master* dosyasına ulaşmadan sadece o eldeki kasetten ya da plaktan yaptığı bir "*conversion*" (analogdan dijitale aktarılma / çevrilme işlemi) dı.

Metin Uzelli: Şöyle söyleyeyim işte bu dijital YouTube'a insanların müzik yükleyebilmesinin önü açıldıktan sonra birçok plak şirketi kaynak olarak YouTube'u kullandı. Yani elindeki kayıtlardan en temizi YouTube'da bir adamın bulup yüklediği kayıt elindeki en temiz kayıttı aslında ve onu alıp ondan "*convert*" (analogdan dijitale aktarılma / çevrilme) edilip yapılmış çok ürün var. Hani seviyeyi oradan düşünün.

Mustafa K. Öztürk: YouTube'u bu sebepten dolayı listeden çıkarttık. Çünkü direkt ana kullanıcı yükleyince her türlü hata mümkün. Örnek olarak YouTube a klip yüklüyoruz, videoyu "*convert*" eden sesi bozmuş. Şimdi YouTube'dan bir örnek alınamaz aslında, çünkü birçok videoda ses kalitesi çok düşük.

Metin Uzelli: Teknik olarak tek güzel durum YouTube'daki bir videodaki sesi değiştirebiliyorsunuz.

Mustafa K. Öztürk: Son olarak Türkiye'de genel bir kontrol hiçbir zaman bir mekanizma olmadı diye anlıyorum. Ancak bunu yükleyen firmanın kendi özenine kalmış. Siz anlatırken bütün sorularımın cevabını almış gözüküyorum. Teşekkürler röportaj isteğimi kırmadığınız ve vaktinizi ayırdığınız için.

Translated (English) Version

Mustafa K. Öztürk: I'd like to start with simple questions, perhaps you could guide me. Actually, the answer I was looking for wasn't in these questions. When I sent my interview request to MÜ-YAP, everything initially progressed positively, but later the questions continued negatively after they wanted them. As I mentioned, I noticed that there are low-quality songs in Turkey's music archive. This was my starting point during the research. Private music services in Turkey, especially services like Fizy, Muud, Spotify, Apple Music, which have the Turkish archive, had promises in their paid Premium versions that the quality increases. When I entered into this research, I thought this: This old archive, uploaded before 2005, must have been uploaded in low quality. We already knew that 128kbps mp3s were uploaded to the system, but when you paid, these systems claimed to have much higher sound quality according to their own standards. In the Turkish archive, I predicted that only MP3s previously uploaded in low quality could adapt to this system by being upgraded but without changing their quality. When I started researching this, I began to find examples. My first question regarding this is: When were these MP3s first uploaded to the system? How were they uploaded and by whom? Was there any correction made afterwards or can it be made? I want to obtain this information.

Metin Uzelli: Let's do it this way, if you want. I've glanced over the questions you've prepared. There are some I can answer, and some I can't. Assuming we continue with the audio recording, and leveraging its advantages, how about I start by giving you a chronological overview of the history of the music industry in Turkey in this area? You can then extract answers to your questions from what I narrate.

Firstly, I'd like to share the basis of the information I've provided. I'm 50 years old, my father was the owner of one of the old record companies, but his venture into this field stemmed from his inclination towards trade and industry. My father isn't a music person. Following my father's entry into this business, he made a move in 1977 and prepared a feasibility report. Subsequently, around 1979, he established a cassette factory. This factory was operational until 1997 when it closed down. Given our involvement in production activities, I became knowledgeable about the sources of records. One of these sources is: typically, the owners of these records are the record companies, which could also be owned by artists. When we look at the resources of record companies, we see three main elements. These constitute the capital of record companies. Firstly, there are documents proving their ownership rights. Secondly, there are Master files of the sound recordings they own rights to, and finally, there are visual materials related to these artists. Therefore, if you own a record company, the materials and assets you must tightly preserve and keep up-to-date are these. When you visit any record company abroad, no one there boasts about owning and preserving this material because it's their raison d'être. However, in Turkey, none of the companies have been able to preserve their documents, Master files, photographs, or similar archives. Our company, Uzelli Music, was established in Germany, so we internalized this understanding there. A different process discipline developed as a producer. Therefore, Master files and visual materials were carefully preserved in our company. They used to be kept in a special place in our factory building, but now we've created a special area in this office; you can see it later. When I show the archive rooms, people in the industry are very surprised and say words of praise. However, these should be the minimum standards to be followed. The period when these records were acquired is crucial, as studio recordings are the main source and very valuable. What we call the multichannel tapes, the channel recording, is even more desirable.

All of these need to be preserved. Periodically, as technology evolves and to meet the demand, they should also be backed up to the highest resolution possible according to the current technology. Since the tapes are physical products, their condition is crucial, and time works against them. Even if we transfer them to digital format, we are preserving them as much as possible at certain intervals. The most important aspect here is resolution. When you look at these tapes, the resolution is indeed very high. However, due to reasons such as sticking to the tape due to magnetic fields or the absence of the correct player, it may not be possible to read or record them. Today, many companies in the industry access Master files through various means and think that the files they access are the main tapes. They listen to them by putting them on tape, but since they don't have enough technical knowledge, every time they listen, they damage those tapes and scratch the data on them. As the tape is read, it deteriorates. Even if you do everything perfectly, even if the condition of your tape is perfect, no one I know here has the calibration techniques of those old analog tapes. As I said, there is a physical condition; head adjustment, whether frequencies flow correctly or not, tests are not done correctly because the first condition of doing this is the need for a calibration tape. You will put the reference tape into the tape and give 1 kHz, give the "pink code," give the "grey code," look at its output on your computer, and see that the correct data is coming so that it works when you put that tape on. Even if you believe you've done the right job, that doesn't guarantee that the tape has been processed correctly because you can’t be sure about the calibration of the device that was previously recorded. This can change a lot of data related to that music. The whole story starts from there. When we look at the music industry in Turkey, since the cassette was followed by the CD format and the cassette manufacturers in Turkey, not Uzelli but companies like Raks, Nora, Kamel, set up new format production lines for CDs right after cassette production. Therefore, since the cassette was followed by the CD format, and while magnetic tapes were still being used young and up-to-date, if those tapes were produced in CD format, they were digitally transferred to CD. When CDs first came out, this process was done with seriousness and discipline. And when digital came into this industry, MP3s or some digital formats were to be used; the source was always the CD. That is, if a recording had a CD print, those CD copies also served as the best available master. Due to the convenience and ease of CDs, people abandoned those old analog tapes. But here's the thing: not everything was on CD. If CD factories closed down and CDs were not printed enough, they could disappear, so those CD prints became very important. The question of how healthy the transfer done at that time is also a separate mystery. Therefore, if you have it in CD format, when they were first uploaded digitally, they were uploaded in MP3 format. Let me tell you a bit about when and how this happened. The transition to digital format after CDs was through MÜ-YAP. At that time, there were these logo melody businesses. Due to the serious abuses caused by mobile phone operators and some companies providing services to them, during the digital evolution of real music tones, the member companies of MÜ-YAP chose a different path. The path they chose was this: they said, "The main purpose of the MÜ-YAP professional association is to collect revenues from the use of music in public places. This is the main purpose, but since we have established such a professional association, let's unite and make a collective effort in this regard." This was certainly the right decision at that time for the following reason: the first digital music platform's potential customer was Turkcell and mobile phone operators. Of course, the market was a very small market at that time; in the years I mentioned, 2003, 2004, there was a market of \$50,000 to \$100,000 total in Turkey, but having that catalog was very important for those operators. Therefore, the operators were willing to pay a much larger amount than the market value because they also saw it as a marketing budget. Value-added services were an important tool for them in the area of Value-Added Service. Therefore, for a business with a total market of \$100,000, operators were willing to allocate a budget of \$1 million. And if MÜ-YAP could monopolize the rights to all the songs in the entire Turkish music industry and earn \$100,000, they easily collected \$1 million from these operators and distributed it internally according to their market shares. In this sense, the sector made a very good commercial entry into digital. With the licensing through MÜ-YAP, it was said, "Let's create a database here, upload all the catalogs and metadata, audio and visual files here, and license them from here." Of course, at that time, when these started, there was no music streaming globally; there was only downloading. File sizes were important. Secondly, at that time, everyone accused each other of theft. There was a paranoia because internet piracy was very high. Therefore, instead of leaving the usage and downloading entirely to music services, a centralized database was preferred, and specialized software was used to convert audio files from there into formats compatible with DRM (Digital Rights Management) systems. In this sense, MP3 was of super quality and was a large file size for the technology of the time. In short, everything was uploaded as MP3 there, but of course, the development of technology started in

2004, and all companies obtained MP3s from every material they had, even from cassettes. A joint database was created in the professional association, and everyone was sending their materials there. Since the technical knowledge of the people here was limited, these companies trusted the MÜ-YAP database, thinking that it contained the best data rather than keeping a copy for themselves. And as the requirements of this technology changed, from company to company, some took a new copy from CD, those with analog tapes might sometimes take new copies from analog tapes, or they converted them to different formats by "converting" from MP3s. Therefore, for example, if your music goes to a music service like Tidal in studio quality today, there is a technical spec there, it says 24 bits, etc. The file that was "converted" from MP3 to that format. You meet the technical requirements there, but the source file doesn't have that resolution.

Mustafa K. Öztürk: I want to come together here. This is actually the exact point I've been researching. For example, I'd like to give an example: it seems like a recording is being made from an analog system in a Barış Manço song, and someone gradually increases the volume in the middle of the song. It seems like there was a situation where the signal level was low and needed to be increased. I was very curious about how this situation occurred, whether it was present in the original master recording, during mixing, or during transfer.

Metin Uzelli: It could be anything. Volume changes, voltage changes, speed changes. Dirt can come in front of your head for two seconds, you throw away the dirt, and if the person recording didn't pay attention, they missed it.

Mustafa K. Öztürk: In short, each record company handled these transfers separately.

Metin Uzelli: Of course, record companies do these separately. So, it's related to the source file they have.

Mustafa K. Öztürk: The secretary of the record company could have done it, like if they said "Hey, you do it."

Metin Uzelli: Of course, I can't tell you specific examples. The story doesn't end there. Didn't we make those mistakes? We did, as Uzelli. But fortunately, we had a great advantage at Uzelli. Since we had production both in Turkey and Germany, and since we were also manufacturers, as soon as we received a master from the studio, a duplicate copy was made.

A copy went to Germany, and a copy remained at the factory in Turkey. We also took what we called a pressing copy at our factory, meaning a copy of the main master from the studio. The technical specifications of these tapes were of very high quality. They were very strong and durable tapes. Because they spin at high speeds and are used in the duplication line, they are high-quality tapes. Because we kept them, even if the master from the studio deteriorated over time, we still have the tapes of the duplication copies. So, besides Uzelli's own catalog, many copies of tapes that came to Uzelli's factory for production are still with us, and when needed, we provide them to people in the current process we are in. So, as I said, whoever did this transfer, the file I have from that company will have the highest resolution.

For example, we destroyed our archive, our warehouse in Germany, in 1994. But before we destroyed it, I went there. We set up our tape recorder. DAT (Digital Audio Tape) was a very current and good format at that time. Although all these albums had backups in Turkey (as an extra backup), we recorded all of them on DAT and destroyed them. Now, when we look at it, we have approximately a studio master, a DAT copy of the tape in Germany, and a production copy for each album. So, if the condition of one of them is not sufficient, we can resort to the other. Sometimes there is no difference in total quality, but in transfer, there are some defects that require editing, such as scratches, etc. At that time, we can have pieces that we can take from somewhere else and put there, allowing us to make such patches. So, this is actually something that should have been done.

But unfortunately, in Turkey, as I said, that master discipline did not develop enough.

I know your work is related to streaming, but today it naturally extends to another place. You know, vinyl has re-entered our lives as a current format, and today, especially the records of old recordings are being reissued. For example, the condition of the source files there is pathetic.

Mustafa K. Öztürk: They might be creating them from MP3s.

Metin Uzelli: Believe me, many recordings are like that.

Mustafa K. Öztürk: So, now in this case, those CDs and tapes, some tapes didn't even have CDs, they were not converted to CDs anyway. Of course, those tapes could have been converted from the tape format, not the original format, to MP3s.

Metin Uzelli: Of course.

Mustafa K. Öztürk: Mü-Yap somehow gave them to Turkcell, Vodafone, back then Vodafone might not have been there.

Metin Uzelli: They gave them to TTNet Music and Turkcell.

Mustafa K. Öztürk: At that time, they probably provided 128kbps for download.

Metin Uzelli: Of course.

Mustafa K. Öztürk: When streaming started, let me give you an example. A certain song from the archives of Avrupa Müzik entered the system as 128kbps at one time. TTNet Music and Turkcell took these. So, when they say pay more and switch to higher quality, are they applying the situation of converting this MP3 we actually received at 128kbps to 256kbps now? Who is doing this conversion? Or for example, I know a little about Orchard's situation. After all, it goes from here to Orchard and then distributed. Yes, there is at least some control. Small, I mean? When I say small, I don't know the control mechanism there, but I think I'm sending a proper 24-bit audio file to the system here. I think the system checks it. Maybe I converted it from MP3, but ultimately, I am technically complying and providing it to the system. For Turkey, Fizy, Muud, for the world, Tidal, Spotify, etc. They say, I can make this into high-quality 256kbps or continue as a wave file. I convert it to low quality for users who don't pay. I think each system does all of these on its own.

Metin Uzelli: Right.

Mustafa K. Öztürk: So, Spotify does it separately, Fizy does it separately. They split the original source according to their own techniques, saying, "I might go for the lowest quality, 64," for example. Another might go for 128, but if the quality of the original recording is low, nothing should change except that it appears to be 24-bit. There's no control at this point. Spotify isn't saying, "The file I received was actually an mp3. Let me send it back." They're saying, "This is what I received, and I converted it."

Metin Uzelli: Exactly, that's how it is. The process works like this: abroad, everything is based on declaration. Your declaration is valuable. If you say it's 24-bit, they proceed accordingly.

If someone gives you a 24-bit audio file that has been converted from mp3, it's not valid. In the end, the technical process goes like this. What do distributors like Orchard do? Since they serve hundreds of stores, they want the highest "spec" you can provide. Then, in their agreements with each company, there's a requested format. Fizy may want 96, another might want 128, and Tidal might want 256. Orchard converts them in their system and sends what each company requests. In some cases, like with Tidal, because, let's not forget, they all have three formats: low, medium, and high quality. Orchard converts and puts them in their system, sends you the high quality, and converts the medium and low quality themselves. Then it's up to the customer to choose. You can choose which one to listen to, but as I said, there's no guarantee that what you're listening to in high quality is actually high quality.

Mustafa K. Öztürk: If we go back to reloading into the system, let's say we gave our declaration incorrectly, correctly. There's no fault in the system at that point. If there's a fault, it's ours. If I said I would provide a 24-bit file but uploaded a 16-bit file, that's my fault. But for example, let's say we reloaded from an old record, tape, or remaining cassette, or an old CD. Naturally, if it's from a CD, it's 16-bit, or if it's from a cassette, it's whatever resolution it was converted to. I noticed something here. The playlists of Fizy, Muud, Apple Music, and Spotify don't match. I'm talking about the Turkish archive. For example, an old song by Barış Manço is on one of these four platforms but not on the others. There's a diversity here.

Metin Uzelli: The reason for this has nothing to do with the technical spec here. In some cases, especially with certain products like Barış Manço, whose rights haven't been clarified or released according to Turkish law but are released through distributors abroad, there are some contents not available through Muud and Fizy because those distributors don't have agreements with them, but Spotify can.

Mustafa K. Öztürk: I see, so there's been some confusion like this.

Metin Uzelli: Generally, these are "gray label" products. The system abroad is based on declaration. You say you own the rights to this album, and if there's any objection, you have to prove it. In Turkey, to release it, you first have to prove it's yours. Now, there's a difference, but abroad, this method can be abused. They lie, and if someone objects, you have to hire a lawyer abroad to hold that company accountable. Turks are very incompetent in that regard, and they've discovered that. So, there's abuse there.

Mustafa K. Öztürk: Is the opposite possible? For example, a song is on Fizy and Muud but has never been on Spotify and Apple Music.

Metin Uzelli: Ultimately, it's something under the company's jurisdiction. Today, for instance, let's say a company working with Orchard, which sends the album to hundreds of stores, can make any kind of restriction or selection, like "only send this album to Muud" or "only send it to Germany." If the company made such a choice, it could happen. But ultimately, what needs to be understood is that if someone sends something to Muud or Fizy, the channel to there is the same as Spotify's. There's no direct delivery from MÜ-YAP. That ended in 2012. It might have been 128 at the time, but as I said, the "spec" requested for upload has changed over the years with a distributor like Orchard. The "spec" desired in 2005 when I started working at Orchard is not the same as todays.

Mustafa K. Öztürk: So, if we look back at the archive before Orchard, how did they upload files to Spotify?

Metin Uzelli: The previous system was established by MÜ-YAP.

Mustafa K. Öztürk: A song was somehow entered into the system. It was in Turkcell's and at least TT Net's archives. It would have to be sent to Spotify at some point.

Metin Uzelli: It's like this there. Let me explain. MÜ-YAP's files sent to Fizy were all replaced. Because the system never works like that. What does that mean? I was working with MÜ-YAP as Uzelli. I uploaded my files in 2004 as mp3, and they went to Fizy. They were used there for three years. After three years, I left MÜ-YAP. I uploaded the same albums to Orchard and sent them. Legally, Fizy had to delete the previous ones and use what Orchard sent. If I didn't upload the same mp3s again, they've changed now. So, Turkcell couldn't say, "This product came to me before from Mustafa. It's the same as what Metin sent, so I'll use what Mustafa sent." They can't do that legally in any way.

Mustafa K. Öztürk: You left MÜ-YAP. There were songs from companies that hadn't left there. Spotify and Apple Music said, "We need this list/archive."

Metin Uzelli: They get it from the distributor and from their specs. They can't get it any other way. The content in MÜ-YAP doesn't transfer to the distributor. The record company has to upload it to the distributor. If they didn't upload it, Spotify can't put those songs in their system unless Sezen Aksu's company says, "You can send this to Spotify" or something similar.

Mustafa K. Öztürk: So maybe some albums weren't uploaded again because the company didn't decide to do it. That's why they're still missing from Spotify's list but exist on Fizy and Muud.

Metin Uzelli: Exactly.

Mustafa K. Öztürk: So, because some didn't reload into the system, some songs have a very low quality. I'm testing the specs of the songs one by one and trying to find these kinds of archives. Some old recordings have really low sound quality. What's even weirder is that when you select high quality on one of Fizy's players, the quality drops. They've made a mistake; when you click on the high-quality option, the quality of the mp3 drops. It doesn't make much difference in perception; they've used a close quality, but it drops below around 128. I'm trying to find these types of situations. When did things get mixed up, and how much can we trust the system? I'll continue testing based on the results. I'll also try to understand people's usage habits.

Metin Uzelli: The biggest problem there is, as I said, that there's no listener who can notice the difference in quality anyway.

Mustafa K. Öztürk: Maybe there aren't many in the world. There are audiophiles, but it's as if no one has questioned this situation enough.

Metin Uzelli: Yes, they haven't questioned it. And if you ask me, there are other things happening to music here. Besides the technical specs, we see interventions in these masters. Incorrect tonalities, EQ adjustments, and other things are done.

Mustafa K. Öztürk: So, how and when would an archive of cassette tapes or vinyl records that haven't been converted to CD be digitized?

Metin Uzelli: God knows.

Mustafa K. Öztürk: When the company decides to do such a conversion, you say. And at that time, we don't know who did it or how. Maybe it was just a conversion from the cassette or vinyl without ever reaching a master file.

Metin Uzelli: Let me put it this way; after digital platforms like YouTube allowed people to upload music, many record companies used YouTube as a source. The cleanest recording from their collection that someone uploaded to YouTube was actually the cleanest recording they had. And many products have been made by taking and converting them from there. Consider the level from there.

Mustafa K. Öztürk: That's why we removed YouTube from the list. Because when the end-user uploads directly, all sorts of errors are possible. For example, we upload a video to YouTube, and the video conversion messes up the audio. Now, you can't take an example from YouTube because the sound quality in many videos is very low.

Metin Uzelli: Technically, you can change the audio in a video on YouTube.

Mustafa K. Öztürk: Finally, I understand that there has never been a general control mechanism in Turkey. Instead, it's left to the diligence of the company that uploads. You've answered all my questions while telling this. Thank you for not refusing my interview request and for taking your time.

Interview with Selim Serezli

Selim Serezli is a music business professional for over 27 years and General Manager of Universal Music Publishing Türkiye.

Original (Turkish) Version

Mustafa K. Öztürk: Sizi tanıyarak başlayabilir miyiz?

Selim Serezli: Müzik profesyonel yaşamıma aslında en başta yapım şirketinde çalışarak başladım sonrasında sanatçı menajerliği, konser organizasyonu ve yine yapım fonksiyonları olan bir şirkette devam ettim. Ardından 2013-2016 yılları arasında dijital dağıtım alanında yani özel şirketler tarafından dijital dağıtımın üstlenildiği en kritik ve başlarındaki kısmında çok aktif olarak yer aldım ve bu dönemde bizzat kendi ellerimle dağıtımla uğraştım sonrasında da müzik yayımcılığı dediğimiz edisyon ya da *publishing* (müzik eserlerinin telif haklarının ve lisanslama işlemlerinin yönetimi) denilen alanda çalıştım.

Mustafa K. Öztürk: Şirket isimlerini alma şansımız olur mu?

Selim Serezli: Tabii ki Sony Music ile başladım arkasından PMD Yapım isimli bir şirkette TMC'nin ortaklığında çalıştım, GRGDN (GERGEDAN) Müzik yapım firmasında menajerlik ve yapım, Eğlence Fabrikası dijital dağıtım firması, şimdi de Universal Music Publishing'de kariyerime devam etmekteyim.

Mustafa K. Öztürk: Neredeyse sektördeki tüm mecralarda çalışmışsınız.

Selim Serezli: Evet biraz 360° gibi oldu sonu, yani dahil olmadığım alan neredeyse kalmadı. Zaten bunun Toplamı 27 seneye yaklaşıyor öncesinde radyo programcılığı gibi yine müzik piyasasıyla bir bağ var yani yıl olarak 1993'ün sonlarından başlayan bir radyo süreci var ama sektör profesyoneli diyebileceğimiz kısım 1997'den itibaren başlıyor.

Mustafa K. Öztürk: Ben de zaten bu tecrübelerinizden yararlanmak için bu röportajı sizden talep etmiştim. Doktora tezimle alakalı Türkiye'nin dijitale geçiş sürecinde yaşanan sıkıntıları sormak için buradayım. Siz de herhalde o zamanlarda Sony Music'te çalışıyordunuz?

Selim Serezli: Evet bu konular ilk gündeme gelmeye başladığında Sony Music'teydim.

Mustafa K. Öztürk: Bu noktada orada yaşadığınız ilk problemleri ya da tecrübeleri aktarabilirseniz sevinirim. Müzik sektörünün dijitale geçişindeki CD satışlarının düşüşü, Türkiye'deki plak firmalarının yaşadığı sıkıntılara dair aklınıza gelen sektör problemleri varsa aktarırsanız sevinirim.

Selim Serezli: Şunu hatırlıyorum yıl 2005 olması lazım iTunes'u kuruyor Apple, Steve Jobs'un önderliğinde yanlış hatırlamıyorsam oradaki hikayelerde önce Universal Music'i ikna ediyorlar öyle başlıyor sonra tabii ki büyük firmalar dediğimiz Universal, Sony Music, Warner vs. arka arkaya devreye giriyorlar. Türkiye'de ise o dönemde tabii ki dijitalle alakamız yok. Apple Music de iTunes'u Türkiye'ye getirmeye hiç niyetli değil fakat MÜ-YAP mevcut müzik yapımcıları meslek birliği MÜ-YAP da çok doğru bir vizyonla zannediyorum o zaman The Orchard'la, Metin Uzelli bu hikâyeyi çok daha iyi anlatır, iş birliğine giriyor. The Orchard MÜ-YAP'la Türkiye'deki kataloğun dünyada daha o zaman henüz streaming dönemi de başlamadığı için, indirme yani download dönemi diyelim, 2005 ile başlayan bu sürece, o sırada MÜ-YAP dijital olarak MDADS (MÜ-YAP Dijital Audio Dağıtım Sistemi) dedikleri formatı başlatıyor. Hatırladığım kadarıyla şunu yapıyoruz: Herhangi bir albümü hazır ettiğimizde ya master'ı ya da hepsinin bir wave dosyası gibi bir dijital halini, bir CD çalara takıp dinleyeceğimiz halini değil, data halini eser işletme belgesi ile birlikte şu an için meta data diyeceğimiz birtakım verilerle birlikte MÜ-YAP'ın dijital sorumlusu Emre Kılıç'a gönderiyoruz. MÜ-YAP bütün müzik yapımcılarından münhasır bir yetki alıyor. Dijital olarak bana vereceksin ben senin adına gerekli teknik ihtiyaçlara da cevap verecek şekilde hazırlığını yapıp bütün dünyaya bunu dağıtacağım diyor. Bütün dünyada o sırada ne varsa, biz tabii ki o sırada sadece iTunes'u biliyoruz ama dünyanın birçok yerinde farklı farklı dijital dağıtımcılar mevcut. Bizde de çok sevgili arkadaşım Gence Gören var. O da Sony Music'in dijital departmanının başında. Bu sırada Nokia gibi bir web sitesi aracılığıyla çeşitli iş birlikleri ile hani toplumun müzik sevgisi üzerinden pazarlama iletişimini gençlerle yapabilmek adına cin fikirli insanlar devreye giriyorlar. Çeşitli ajanslar falan hiç kimseye sormadan yani telif hakkı, yapım hakkı, ne MÜ-YAP bağlantısı vesaire kafalarına göre, daha YouTube'da var yok arası. Ne bize ne eser sahiplerine sormadan bir marka ile bir araya getirip bir de üstüne para mı vereceğiz gibi bir tavır takınan girişimciler mevcuttu. Müzik eserleri herkesin malıymış gibi yaşanan bir durum var. Sevgili arkadaşımız Gence telefon açıp iyi günler bize sormadan kafanıza göre insanlara belki ücretli belki ücretsiz bir şekilde marka ile bir araya getirerek sunmak üzere eserimizi kullanmışsınız diyerek hakkını istediğinde bir de azar işitiyordu. MDADS bu anlamda çok önemliydi çünkü Türkiye'nin müzik arşivi dünyaya ithalat ihracat CD gönderdim plak gönderdim vs. anlaşması olmaksızın dünyadan da dinlenebilir hale geliyordu ve bunu bir tek MÜ-YAP aracılığıyla yapabiliyordun. O yüzden de MÜ-YAP'a bütün şirketler münhasıran bu yetkiyi veriyorlardı. O zamanlar burada temas edebileceğin ne iTunes ne Spotify gibi bir mecra vardı. Kısaca böyle bir hizmet Türkiye'de yoktu. Turkcell henüz Turkcell Müzik'i kurmamıştı. Avea Müzik, daha sonra Vodafone Freezone. Onlar daha kurulmadığı için tek çıkış noktası zaten MÜ-YAP'tı. Türkiye'de zaten böyle bir pazar da yoktu, böyle bir gelir kaynağı da haliyle yoktu. Emre Bey kulakları çınlasın eser işletme belgesi ile beraber CD'den elde ettiğimiz ses dosyasını yollayarak MDADS sistemine girilmesini sağlıyor, oradan da The Orchard aracılığıyla dünya sistemine entegre ediliyordu. Bu arada bu sisteme kendi şifrenle giriyorsun, bir arayüz var nerede ne kadar gelir elde ettiğine dair ayrıntılı bilgilere ulaşabiliyorsun. Kısaca eserini rahatlıkla takip edebiliyorsun. Hangi ülkede ne kadar dinleyiciye ulaşmış ne kadar download edilmiş tüm bunlara erişim elde edebiliyorduk. Çok net hatırlıyorum iTunes mağazasını yani Türkiye mağazasını Aralık 2012'de açtılar. Yani aslında işte Amerika'da falan başladıktan en az 7 sene belki 7 buçuk sene sonradır. O arada senelerce hani ne zaman açılacak açılmayacak mı artık vs falan deniyordu. iTunes'un planının şu olduğunu anlattıklarını hatırlıyorum birilerinin. Önce The Orchard aracılığıyla içeriye içerik girsin, ondan sonra bir de Türkiye pazarının iş yapılabilecek olgunluğa erişmesini de bekleyelim, hadi artık iTunes'u açabiliriz Türkiye'de. O gün ben yaşadığım coşkuyu hatırlıyorum sonunda iTunes 2012'de geldi diye.

Mustafa K. Öztürk: Siz Sony Music'tesiniz o zaman?

Selim Serezli: Hayır değilim Gergedan'dayım. 2012 Aralığına kadar iTunes mağazası açılmadı. 2012 Aralık'ta yerli albümleri kontrol ettiğimizde, isimleri yanlış, şarkılar yanlış, kapaklarda sıkıntı var, içindeki bilgiler çıkış tarihleri doğru yazmıyor. Albümler birbirine karışmış. Mesela hiç yüklenmemiş albümler var, ters çalan şarkılar vs. bir dolu problem mevcut.

Mustafa K. Öztürk: Bu olmayan albümleri kimin yüklemesi lazım peki?

Selim Serezli: Sony Music'in fakat demek ki ihtiyaç da duyulmamış. Diskografi olarak bakmak istediğiniz zaman o albümü bulamıyorsunuz. Ayrıca Türkçe dil bilgisi hatası çok fazla, şarkıların ismi küçük harfle başlıyor falan gibi bir takım kritik hatalar görüyorduk. iTunes Türkiye mağazası açıldı ben meraklıyım diye biraz da görev icabı girip çıkıp bizim sanatçılara albümlere falan bakıyorum. Hatayı tespit ettiğimiz zaman Sony Music'e haber veriyoruz arkadaşlar burada böyle bir sıkıntı var, muhatabınız iTunes işte konuşun düzeltin şeklinde. Bunun bir, iki sene sürdüğünü hatırlıyorum. Ses kalitesinden bahsetmiyorum. Albümün varlığı yani görseli kapağı vesairesi birçok önemli bilgisi hatalıdır. Belki dikkatinizi çekmiştir albümlerin birçoğunun çıkış tarihi 1.01.2013 yazar. Çünkü dijital sisteme yüklerken bir tarih girilmesi gerekiyor aksi takdirde, sistem *download*'a açılmıyor. Çıkış tarihini de bilen yok. Bu albüm ne bileyim işte çiçekler açmıştı o zamanlar çıkmıştı falan diye hatırlanıyor.

Mustafa K. Öztürk: Peki bu hala düzeltilmemiş midir?

Selim Serezli: Sanmıyorum daha bugün gördüm birlikte çalıştığımız bir albümün çıkış zamanının hatalı olduğunu. Bu bilgiyi pek de önemseyen kimse olmadığı için de düzeltilmiyor.

Mustafa K. Öztürk: Bir sonraki soruma geçiyorum zaten neredeyse o ilk dönemi tamamen özetlediniz. Şu an yakın dönem yaşadığınız problemleri sormak isterim. Özellikle sanatçı seviyesinde dijitalleşme ve bunun bilinci hakkında bir eksiklik var mı?

Selim Serezli: Müzik üretimi ve oradaki teknik kısım ile ilgili müzik yayımcısına yani editöre teknik soru pek sorulmaz. Zaten biz biraz daha kâğıt işi dediğimiz, işte haklar, söz beste paylaşımları, yüzdeleri varsa düzenleme payı, beste ile ilgili başka yerden alınması gereken bir izin var mı, düzenleme payı var mı yoksa halka mal olmuş anonim bir eser midir gibi soruların cevaplarıyla uğraşmaktayız.

Benim tespitim şu çok yakın geçmişe kadar neredeyse hiçbir şarkının söz yazarı, bestecisi, düzenlemecisi gibi aslında eskiden kredilerde yazan yani albümün kartonetini açtığımızda içinde okuduğumuz bütün o hak sahibi ve katkıda bulunanlar ve bu projede çalışan insanların isimlerini yazmayı hiç kimse umursamıyor. En başta müzik yapımcıları umursamıyordu. Dikkat edin mesela Spotify'dan aslında her şarkı için şarkıya katkıda bulunanlara basarsanız prodüksiyonda şarkıya katkıda bulunan tüm isimlere kadar detaylı görmeniz mümkündür. Daha yeni yeni belki bir iki senedir bunlar düzgün doldurmaya başlandı. Meta data dediğimiz bu kısımda hala ciddi problemler mevcut. Eminim ki bunu yine Universal, Sony Music, Warner gibi küresel şirketlerin Türkiye ofisleri ellerinden geldiğince eksiksiz bir şekilde doldurmak suretiyle şarkıları yayına açmadan evvel yerine getiriyorlardır. Fakat yerel şirketlerin çoğunda kimsenin hassasiyet gösterdiğini zannetmiyorum. Biz bazen editör kimliği ile bu bilgilerin düzgün eksiksiz girilmesi gerektiğini tavsiye etsek, anlatsak bile sonuca ulaşamadığımız sıklıkla oluyor. Adımların yavaş yavaş yavaş atıldığını, ancak son zamanlarda biraz daha düzelmeye başladığını söyleyebilirim.

Mustafa K. Öztürk: Eğlence Fabrikası'ndaki tecrübelerinizden de biraz bahsedebilir misiniz? Teknik ve bilgilerin girişinde yaşanan sıkıntılar anlamında.

Selim Serezli: Kredilerde çok fazla sıkıntı yaşandı. Biz istemediğimiz sürece çoğu bilgi ulaşmıyordu. İlk olarak muvafakatnameleri istiyorduk. Söz yazarı, besteci isimleri. Fonogram bilgileri, *copyright* bilgileri dediğimiz yapımcı bilgileri, şirketin resmi unvanı gibi birçok bilgiye ulaşmak için ciddi bir çaba göstermemiz gerekiyordu. Özellikle Unkapanı yapımcıları ya da sektöre yeni giriş yapmış yapımcılarda, ki bunlar arasında kendi albümleri için yapımcı rolünü de üstlenmeleri sebebiyle aslında bağımsız sanatçılar da vardı, bilgi toplamak konusunda zorlanmaktaydık.

Mustafa K. Öztürk: Ses kalitesi konusunda da hatırladıklarınızı paylaşır mısınız?

Selim Serezli: İlk başladığımda henüz Eğlence Fabrikası'nın dijital ara yüzü tamamlanmamıştı. Apple için onun arayüzü üzerinden yüklüyorduk. Sistem belirli spec'ler dışında zaten ses dosyası kabul etmiyordu. Ya kabul ediyordu ya ret ediyordu. Kabul ettiğinde zaten yüklemeyi gerçekleştirebiliyordun. Yapımcı ve tarih bilgileri özellikle girmediğinde yayına açmıyordu dosyayı. Çünkü belki ilk ekranda söz ve besteciyi göstermiyor, fakat yapımcı bilgisi ve tarih göstermek durumunda olduğundan bu bilgileri almadan ilerletmiyordu.

Bir dönem teknik anlamda da Spotify ile ilgili şu sıkıntıyı yaşadık. Apple music Mastered For ITunes (MFiT) çıkartmış durumda ve dosya 24 bit spec'lerine sahip. Fakat Spotify o sırada 24 bit dosyayı kabul etmiyordu. Bunu da Apple gibi yükleme sırasında anlayamıyorsun çünkü geri bildirim otomatik değil. Yayına açılmadığında ancak fark edebiliyorsun. Dönüp Spotify a şunu dedik 24bit MFiT yolladık, bunu kabul edin hem 16 bit ten de daha kaliteli. Bir dönem bu sebeple yapımcı ve sanatçılardan 24bit MFiT haricinde 16 bit master'lar da istedik ki Spotify'a da yüklemeyi sorunsuz yapabilelim.

Mustafa K. Öztürk: Edisyon firması olarak televizyon, dizi, film vs gibi diğer görsel mecralarda kullanılacak format nerden ve ne şekilde kullanıma gönderiyorsunuz? Bu noktalarda kaliteye dair bir kontrol mekanizması mevcut mu?

Selim Serezli: Genelde edisyon şirketine söz ve beste hakları için başvuruyorlar. Orijinal kayıt kullanacağı zaman, yapımcı ve yorumcu hakları için, zaten izin alması gereken bir yapım şirketi var. Master kayıt hakları genelde yapım şirketinde oluyor. Yorumcu eğer yapım şirketi ile tamamen bağlarını koparmış durumda yani yapımcının elinde yorumcuya dair haklar mevcut değilse yorumcu kendi başına da izin verebiliyor. Ama Master'ın, fonogramın sahibi yapımcı olduğu için yapımcıdan izin almak zorunda. Eserle ilgili de eser sahipleri yorumcudan tamamen farklı isimler de olabilir. Dolayısıyla eser sahipleri için editörü varsa editöründen izin alması lazım. O yüzden biz aslında birinci kayıt sağlayıcı değiliz. Ama bize de sordukları oluyor. Bizim aracılığımızla yapılan işler olabiliyor yani biz dizinin danışmanı olabiliriz. Danışman olduğumuz için zaten yapımcı ile ilişkiyi de biz yürütüyor olabiliriz. Yapımcısıyla değil de bizimle daha yakın ilişkileri var diye bizim üzerimizden her türlü kullanımı da çözmek istiyor olabilirler. Ben çok tanık oluyorum örnek vermek gerekirse, bu şarkının kaydını çok acil alabilir miyiz montajdayız işte kurgu devam ediyor şeklinde wave dosyası peşinden koşuyorlar. Ama eski bir kayıt ve hiçbir şekilde ulaşamıyorlarsa, bizim arkadaşların iTunes'dan download edip gönderdiğine de tanık oldum. iTunes'u kullanın tavsiyesi üzerine kendilerinin de yapabildiğini zannediyorum. Onun dışında da bilmediğimiz görmediğimiz ve bize sorulmayan zamanlarda da ispatlayamam fakat mutlaka ya YouTube'dan indiriyorlardır ya temiz bir mp3 bulmaya çalışıyorlardır ya da yine Spotify'dan, Fizy'den Muud'dan vs. bir yerlerden indirmek kaydıyla kullanıyorlardır. Temelde bildiğim kadarıyla önce orijinali yapım şirketinden istiyorlar sonra diğer yollara başvuruyorlar.

Mustafa K. Öztürk: Çok teşekkürler genel izlenim anlamında Eğlence Fabrikası'nda çalıştığınız dönemdeki dijitale dönüşümü de özetlerseniz sevinirim.

Selim Serezli: Dijital dönüşümün özellikle Unkapanı'nda neredeyse âtıl durumda olan albümler için çok büyük bir fırsat yarattığını söyleyebiliriz. Türkiye dünyada Hindistan, Endonezya, Filipinler gibi çok az sayıda kalan kaset pazarlarından biriydi o dönemde. Kaset CD geçişinde kasete çok bağlı kalan bir ülkeydik. Müzik mağazalarında başka ülkelerde hiç bulamayacağınız birçok kaset mevcuttu. Çok az talep olduğu için tekrar basılmamış CD'ler, hiçbir zaman dijital mecraya aktarılmamış plak ve kasetler gibi birçok albüm yeniden hayat bulmuş oldu. Unkapanı'nda bütün yapımcılar çok yüklü bir kataloğun üzerinde oturuyorlar ama o katalogdan para kazanamıyor durumdaydı. Dijital dönüşüm başlayınca bütün o katalog anlam ifade etmeye başladı. Kataloğun hepsini zaman içerisinde yüklemek çok uzun zaman almıştır ama artık herhalde yüklenmemiş albüm neredeyse kalmamıştır diye tahmin ediyorum. Dediğim gibi kendi ellerimle dijitale birçok kataloğun yüklenmesine Eğlence Fabrikası ve ben aracılık etmişizdir. Çünkü çoğu Unkapanı yapımcısı diyordu ki ben anlamam ben yükleyemem ben dijitale çeviremem MP3 yapamam. Biz de işletme belgelerini verin, CD leri verin diyerek ofiste tüm arşivlerini dijitale çevirtiyorduk. Hata yapmaktan korkandan bilgisayar kullanmakta zorlanana kadar birçok farklı sebep sunan yapımcı mevcuttu. Bizim avantajımız şirket içi güzel bir kontrol aşamamız mevcuttu fakat en nihayetinde bir şarkının ismi bile yanlış girilse yapımcı yorumcu eser sahibi biri fark edinceye kadar sistemde uzun süreler bu şekilde yer alıyordu. Yeni ara yüzlerle bu hata payları azalmış olsa da yeni dönemde bu sistemlerin son kullanıcıya da açıldığı düşünülürse hala birçok hatalı bilgi girişi mümkün görünmekte. Dinleyiciden de bir talep gelmediği düşünülürse kalite kontrol mekanizmalarının çok gelişeceği konusunda olumsuz bir öngörüm mevcut.

Mustafa K. Öztürk: Çok teşekkürler verdiğiniz değerli bilgiler ve zamanınız için.

Selim Serezli: Rica ederim, yardımcı olabilmişimdir umarım.

Translated (English) Version

Mustafa K. Öztürk: Can we start by getting to know you?

Selim Serezli: I actually started my professional music career by working at a record label, then continued with artist management, concert organization, and again at a company with production functions. Then, between 2013 and 2016, I was very actively involved in the field of digital distribution, where private companies took over the critical and initial parts of digital distribution. During this period, I dealt directly with distribution myself, and then worked in the field of music publishing.

Mustafa K. Öztürk: Would we have the chance to know the names of the companies?

Selim Serezli: Of course, I started with Sony Music, then worked at a company called PMD Productions, a joint venture with TMC, then at GRGDN (GERGEDAN) music production company as a label executive and an artist manager, at Entertainment

Factory as Digital Distribution Director, and now I continue my career at Universal Music Publishing Türkiye.

Mustafa K. Öztürk: You've worked in almost all sectors of the industry.

Selim Serezli: Yes, it became somewhat like 360° in the end, meaning there was hardly any area I hadn't been involved in. In fact, the total comes to about 27 years, excluding my previous radio programming experience which started around the end of 1993, my first connection with the music market. But the part we can call the professional sector of the industry started around 1997.

Mustafa K. Öztürk: I actually requested this interview from you to benefit from your experiences. I'm here to ask about the difficulties encountered during Turkey's transition to digital in relation to my doctoral thesis. I suppose you were working at Sony Music during those times?

Selim Serezli: Yes, I was at Sony Music when these topics first started to come up.

Mustafa K. Öztürk: Could you share the initial problems or experiences you had there at that time? Regarding the decline in CD sales during the music industry's transition to digital, and the difficulties experienced by record companies in Turkey?

Selim Serezli: I remember it must have been around 2005 when iTunes was launched. Apple, under the leadership of Steve Jobs, if I remember correctly from the stories there, first convinced Universal Music, and then, of course, other major companies like Sony Music, Warner, etc., followed suit one after the other. In Turkey, of course, we had no connection to digital at that time. Apple Music had no intention of bringing iTunes to Turkey, but MÜ-YAP, the professional association of existing record labels, had a very correct vision, I think. At that time, they entered into a collaboration with The Orchard and Metin Uzelli. MÜ-YAP initiated a format called MDADS (MÜ-YAP Digital Audio Distribution System) digitally. As far as I remember, what we did was, when we prepared any album, we sent the digital version, not the version to be listened to on a CD player, but the data version along with some label copy information, which we now call metadata, to MÜ-YAP's digital officer, Mr. Emre Kılıç, along with the registration certificate. MÜ-YAP obtained exclusive authorization from all music producers. "You will give it to me digitally, and I will prepare it to meet the necessary technical requirements on your behalf and distribute it to the whole world," they said. In many parts of the world, there were different digital distributors at that time. We also had our dear friend Gence Gören. He was in charge of the digital department at Sony Music. At the same time, people with witty ideas were getting involved through websites sponsored or even owned by big brands such as Nokia to do marketing communication with young people based on the society's love of music. Various agencies and so on, without asking anyone, were bringing together a brand with people, either paid or unpaid, without asking for copyright, production rights, or any MÜ-YAP connection, etc., even before the time YouTube started taking off. There were entrepreneurs who took a stance like, "Shall we also give money on top of bringing a brand together with your music product?" Music was being treated as if it belonged to everyone. When our dear colleague Gence called and claimed our company's rights by saying, "Good day, you've used our work in bringing people together with your brand without even asking us for permission," he would sometimes receive a scolding as well. In this sense, MDADS was very important because Turkey's music archive was becoming available for listening from around the world properly and without the need for import-export agreements for CDs and records, and this could only be done through MÜ-YAP. That's why all companies were exclusively giving MÜ-YAP this authority. At that time, there was no platform like iTunes or Spotify to touch upon here. In short, such a service didn't exist in Turkey. Turkcell had not yet established Turkcell Music. Neither Avea Music, nor Vodafone Freezone were launched yet. MÜ-YAP was the only exit point anyway in Turkey, and there was no such market or income source in Turkey. Mr. Emre Kılıç, may his ears ring, made it possible to enter the MDADS system by sending the sound file obtained from the CD along with the registration certificate, and from there, it was integrated into the global system through The Orchard. By the way, you log into this system with your own password, there is an interface where you can access detailed information about how much income you have earned from where. In short, you can easily track your work. We could access detailed information about how many listeners it reached in which country, how many times it was downloaded, and so on. I remember very clearly that they opened the iTunes store, that is, the Turkey store, in December 2012. So, actually, it started in America and other places at least 7 or maybe 7 and a half years earlier. For years, people were speculating whether it would open or not, when it would open, etc. I remember the enthusiasm I felt that day when iTunes finally arrived by the end of2012.

Mustafa K. Öztürk: So, you were at Sony Music at that time?

Selim Serezli: No, I was at Gergedan music. Until December 2012, the iTunes store wasn't opened. When we checked the local albums in December 2012, there were wrong names, wrong songs, problems with the covers, and incorrect release dates. Albums were mixed up. For example, there were albums that were never uploaded, songs playing in reverse, etc. There were many problems.

Mustafa K. Öztürk: Whose responsibility is it to upload these missing albums then?

Selim Serezli: It's Sony Music's responsibility, but apparently, there was no need for it. When you look at it from a discography perspective, you can't find that album. Also, there were many grammatical errors in Turkish, such as song titles starting with lowercase letters, and other critical mistakes. iTunes Turkey store was opened, and because I was curious enough, I regularly checked our artists' albums. When we noticed a mistake, we informed Sony Music, saying, "There's a problem here, you need to talk to iTunes to fix it." I remember this lasted for one or two years. I'm not even talking about the sound quality. The existence of the album, the cover image, and many other important information were incorrect. You might have noticed that the release date of many albums is written as 01.01.2013. Because when uploading to the digital system, a date must be entered, otherwise, the system won't allow downloads. But nobody told us to enter the correct date. I remember when I first checked, I saw only one correct release date in our entire album archive. Otherwise, they were all 01.01.2013.

Mustafa K. Öztürk: Hasn't this been corrected yet?

Selim Serezli: I don't think so. I saw today that the release date of an album we worked on is still incorrect. Since no one really cares about this information, it doesn't get corrected.

Mustafa K. Öztürk: I'm moving on to my next question; you've pretty much summarized the earlier period. Now, I'd like to ask about the problems you're currently experiencing, particularly at the artist level. Is there a lack of awareness regarding digitalization?

Selim Serezli: Questions about the technical side of music production are rarely directed at the music publisher or editor. We're more focused on what we call the paperwork—things like rights, lyric and composition splits, percentages, any arrangement shares, or permissions that might be needed for the composition if it's not a public domain or anonymous work.

My observation is this: until very recently, almost no one cared about listing credits like the lyricist, composer, or arranger—names we used to read on album credits when we opened the booklet. The music producers were the ones who neglected this the most. Notice, for example, that on Spotify, you can see all the details down to the names of those involved in the production if you click on "credits" for a song. Only in the last couple of years have people started to fill in this information properly. But there are still serious problems with metadata. I'm sure that the Turkish offices of global companies like Universal, Sony Music and Warner do their best to ensure all the information is complete before releasing tracks. However, I doubt that most local companies show the same level of care. Even when we, as editors, advise that this information should be entered accurately and completely, we often struggle to get results. Progress is slow, but things have started improving somewhat recently.

Mustafa K. Öztürk: Could you also talk a bit about your experience at Eğlence Fabrikası? Specifically, regarding the issues with technical information entry?

Selim Serezli: There were many problems with credits. Most information was only accessible if we requested it. First, we would ask for consents—lyricist and composer names, phonogram details, copyright information, such as the producer's name and the company's official title. We had to make a significant effort to gather this information. We especially struggled with Unkapanı producers or new producers entering the industry. This group also included independent artists who acted as their own producers for their albums.

Mustafa K. Öztürk: Could you share your recollections regarding sound quality?

Selim Serezli: When I first started, Eğlence Fabrikası's digital interface wasn't fully developed yet. We were uploading files through Apple's interface. The system wouldn't accept audio files that didn't meet certain specs. It would either accept or reject the file. If accepted, you could proceed with the upload. If information like the producer and release date was missing, the file wouldn't be published, as it's mandatory to display that information, even if lyricist and composer details aren't shown initially.

At one point, we also had an issue with Spotify. Apple Music had introduced Mastered for iTunes (MFiT), which supported 24-bit files. However, Spotify wasn't accepting 24-bit files at the time. Unlike Apple, where you'd be notified during upload, you'd only realize this with Spotify when the file didn't go live. We had to go back and tell Spotify that we'd sent a 24-bit MFiT file and requested that they accept it because it's of higher quality than 16-bit. For a period, we asked producers and artists to provide both 24-bit MFiT and 16-bit masters so that we could upload to Spotify without any issues.

Mustafa K. Öztürk: As a publishing company, how do you provide the formats used in other visual media like television, series, films, etc.? Is there any quality control mechanism in these areas?

Selim Serezli: Generally, they approach the publishing company for the rights to the lyrics and composition. If they want to use the original recording, there is already a production company that needs to give permission for the master rights and performer rights. The master recording rights typically belong to the record label. If the performer has completely severed ties with the record label and no longer holds any rights related to the performer, then they can grant permission on their own. However, since the label owns the master or phonogram, they need to obtain permission from the label. The rights holders for the musical work can be different individuals from the performer. Therefore, if there is a publisher for the rights holders, permission must be obtained from the publisher. So, we're not the primary provider of recordings, but we do get asked about this. Sometimes, works are facilitated through us, such as when we serve as a consultant for a TV series. Since we're the consultants, we might also handle the relationship with the master rights owner. They may prefer to handle all rights through us because of their closer relationship with us rather than the record label. I've often witnessed cases where they urgently ask, "Can we get the recording of this song immediately? We're in editing, and the cut is ongoing," and they chase after a WAV file. But if it's an old recording and they can't access it in any way, I've even seen colleagues download it from iTunes and send it. I assume they're also able to manage it themselves upon advice to use iTunes. Besides that, there are times when they download it from YouTube, search for a clean MP3, or download it from platforms like Spotify, Fizy, or Muud, even though I can't confirm this. My understanding is that they first request the original from the master rights owner, and if that fails, they turn to other methods.

Mustafa K. Öztürk: Thank you very much. I'd also appreciate it if you could summarize the digital transformation during your time at Eğlence Fabrikası.

Selim Serezli: We can say that the digital transformation created a huge opportunity for albums that were almost idle in Unkapanı. At that time, Turkey was one of the few remaining cassette markets in the world, along with countries like India, Indonesia, and the Philippines. We were a country that stuck to cassettes even during the transition to CDs. There were many cassettes available in music stores that couldn't be found anywhere else. Albums that had not been reprinted on CD due to low demand, or never digitized records and cassettes, were brought back to life. Unkapanı producers were sitting on large catalogs but couldn't monetize them. Once the digital transformation began, the entire catalog started to gain value. It took a long time to upload all the catalogs, but I believe there are hardly any albums left that haven't been uploaded by now. As I mentioned, at Eğlence Fabrikası, I personally facilitated the digital upload of many catalogs with my own hands. Most Unkapanı producers would say, "I don't understand this, I can't upload it, I can't convert it to digital or make it MP3." We would tell them to give us the registration certificates and CDs, and we would digitize their entire archive in the office. There were producers who presented various reasons, from fear of making mistakes to struggling with computer use. Our advantage was that we had a good internal control process in the company, but even then, if a song title was entered incorrectly, it would remain in the system for a long time until someone—be it the producer, performer, or rights holder—noticed. Although the error rate has decreased with new interfaces, if we consider that these systems are now open to end-users in the new era, many incorrect data entries are still possible. Given that there isn't much demand from listeners, I have a pessimistic view of how much quality control mechanisms will develop.

Mustafa K. Öztürk: Thank you very much for your valuable insights and time.

Selim Serezli: You're welcome; I hope I was able to help.

Interview with Bora Turan:

Bora Turan founded Eğlence Fabrikası (Entertainment Factory) in 2011 after gaining extensive experience in the technology field, both in Turkey and Silicon Valley. He previously held executive positions at Apple, Microsoft, and Ernst &Young.

Original (Turkish) Version

Mustafa K. Öztürk: Eğlence fabrikası ilk MP3 'nü kaç yılında ve nasıl, hangi sistemlere yükledi?

Bora Turan: Eğlence fabrikası hiçbir zaman MP3 yüklemedi. Başından beri Eğlence fabrikası hep "*lossless*" (kayıpsız ses dosya formatları) formatları zorunda tuttu çalıştığı firmalara. Dolayısıyla her yere *wave file* (Kayıpsız bir ses dosyası formatı) gönderdik. Bir tek senin de tespit ettiğin gibi Muud (TTnet tarafından satın alınan bir platform) wave kabul edemiyordu Mp3 istiyordu. Bir tek onlara müşteriden aldıktan sonra kendimiz degrade ederek Mp3'eçevirdik ve istedikleri formatta verdik. Biz hiçbir zaman başka format kullanmadık başından beri.

Mustafa K. Öztürk: Tamam, şunu sormak isterim, mesela TT net o zaman sizden kaç *kbps* (kilo bit per second / saniyede kaç kilo bit data yolladığı) istiyordu mp3'leri? Farklı yani iki tipte istiyor muydu? Kaliteli ve kalitesiz şeklinde ayrı formatlarda istiyor muydu?

Bora Turan: Hayır istemiyordu. Sadece tek tipte mp3 istiyordu. Zaten kaliteli kalitesiz diye ayrım yapan başından beni Apple Music olmuştur. Apple Music'in dışında bütün platformlar başlangıçta kaç bitti hatırlamıyorum. Başlangıçta 16 bit'di galiba sonra 24 bit'e geçtiler. Standart onu istediler. Mesela bilmiyorum takip ediyor musun? Şimdi Apple Music Dolby Atmos (Apple music – Dolby işbirliğiyle sağlanan uzaysal / 3 boyutlu ses formatı) istiyor.

Mustafa K. Öztürk: Onu bilmiyordum.

Bora Turan: Zaten bütün bu kalite standartlarını Apple zorlamıştır şimdiye kadar. Dolby Atmos verirsen sana daha iyi teklifler sunarım şeklinde seni yüksek kaliteye itmeye çabalıyorlar.

Mustafa K. Öztürk: Tamam, evet teşekkür ederim. Peki şeyi hatırlar mısınız? Bu TT nette ilk yolladığınız mp3'ler mesela 128 kbps miydi yoksa 256 kbps miydi?

Bora Turan: O zamanın standardı neyse o ama tam hatırlamıyorum.

Mustafa K. Öztürk: Tamam şimdi mesela Fizy ve Muud sizden kayıpsız formatta istiyor değil mi şu an itibariyle.

Bora Turan: Muud kayıpsız istemiyor galiba hala? Onu kontrol ederim ama Fizy'ye kayıpsız gönderiyoruz. Muud maalesef platform kategorisinde değil henüz o kaliteye ulaşamadılar.

Mustafa K. Öztürk: Tamam, teşekkürler. Yaptığım araştırmada sonuçta Türkiye'de kullanılan ana 5 tane platform mevcut. Bunlar Spotify, Fizy, Muud, Apple müzik ve Youtube.

Youtube video olarak da olsa çok fazla kullanılıyor müzik dinlemede fakat kullanıcılar içerikleri kendileri yükledikleri için araştırmadan çıkarttık. 4 platforma indirdik.

Size bu son kullanıcıdan gelen kayıt normalde 24 bit 44.1 khz ya da 48khz kilo geldiğini varsayıyoruz ama bazen düşürülmüş bir dosya gelebiliyor. Yani Mp3'ü de wave gibi gösterebiliyorsunuz. Bunun bir kontrolü yapılabiliyor mu? Yoksa beyan esastır, kullanıcıdan geleni yüklemekle yükümlüyüz durumu mu söz konusu oluyor. Ya da bunun kontrolünün yapıldığı bir nokta var mı?

Bora Turan: Bizim işlemler otomatik. Yüklerken dosyayı kullandığımız software bir kütüphane var. O kütüphane Sampling Rate'e bakıyor Bit Rate'e bakıyor eğer bizim sistemimizin istediği standarttan düşükse zaten hata veriyor ve yüklenmesine izin vermiyor. Albüm yüklenemiyor kısaca bir bunlara kendimiz bakmıyoruz makine bakıyor.

Mustafa K. Öztürk: Tamam. Yani aslında birisi sistemi atlatmak adına ses dosyasını önce Mp3'ten çevirip sonra oradan wave dosyasına çevirse aslında makine fark edemeyecek.

Bora Turan: Peki neden bu şekilde bir işleyişe bakıyorsun. Şu anda kötü kaydetmek mümkün değil zaten daha zor.

Mustafa K. Öztürk: Şu sebeple bakıyorum. Belki bilerek yapan çıkmıyordur fakat yanlışlıkla düşük kalitede yükleyen çıkabiliyordur. Eski arşivlere dair bu tür durumlar oluştuğunu duymuştum.

Bora Turan: Biz 2013'te başladık. En başından beri 16 bit ve 24 bit kullandık. Hiçbir zaman bizde böyle yüklemeler olmadı. Tamam hatırladım. Bir ara bize kasetler gönderdiler Unkapanı'ndan çeşitli kişiler, biz de olmaz dedik.

Mustafa K. Öztürk: Tamam, ben aynen bunu merak ediyordum zaten.

Bora Turan: Sadece biz kontrol etmiyoruz, platform da kontrol ediyor. Gerçi yetersiz platformlar kontrol etmez de mesela Apple Music'e a eski kalitesiz bir şey yollayamazsın.

Mustafa K. Öztürk: Size de eski arşiv gelmiş olabilir mi diye merak etmiştim çünkü kaset ya da plaktan çevrilen eski arşivler 24 bit kalitesine ulaşılamamış durumda olabilir.

Bora Turan: Bak, şöyle şeyler olmuş, en başta bütün Türk müziğini dijital platformlara yükleme işini Orchard'a vermişler. Bir nevi tekel oluşturmuşlar. Orchard da ne yapmış? Ne varsa yollayın demişler Ne meta datası var, doğru düzgün ne düzgün bilgisi var içeriğin. Bu fark ettiğin kötü arşivi bu sebeple bulabiliyorsun. İlk etaptaki endişe kalite değilmiş, endişe içerik olmamasıymış. Bu sebeple yeterli özen gösterilmeden ulaşılabilen tüm arşiv yüklenmiş.

Mustafa K. Öztürk: Bu noktada zaten ben buradan örnekler keşfettim. Eski arşiv kayıtlarında mp3 kalitesi düşük çıkıyor. Ama aslında bütün bu platformlar Premium kullanıcılarına yüksek kalite vaat ediyor fakat zaten ilk etapta düşük yüklenmiş bu repertuar.

Bora Turan: Bu vaat aslında bir *bussiness* (iş modeli) yalanıydı. Artık o da bitti. Apple Music Dolby Atmos içeriğini açıyor ve yeni bir iş modeli sunuyor artık. En çok içerikmiş en kaliteli içerikmiş üzerinden yapılan iş modeli rafa kalkıyor. Bundan sonra Apple Music standardı belirlemiş oluyor ve ona ayak uydurmazsan başın belada demektir. Artık herkes eninde sonunda kulaklarıyla kalite farkını fark edebilecek ve kalitesiz repertuarı olan platformlardan uzaklaşacak.

Mustafa K. Öztürk: Peki bu durumda eski kalitesiz repertuara ne olacak?

Bora Turan: Apple onları zorlayacak. Bundan sonra *lossless* (kayıpsız ses dosyası) olmayan repertuarı istemiyorum diyecek çok yakında şirketler de kayıtlarını ya *lossless* hale getirecekler ya da platformdan düşecekler.

Mustafa K. Öztürk: Anladım. Yani kalitesiz repertuarın ayırımını yapacak Apple Music.

Bora Turan: Evet yapacak.

Mustafa K. Öztürk: Peki bu bir dezavantaj getirir mi? Benim bu yaptığım araştırmada platformu kullanma sebeplerinde arşivi için yani diğer platformlarda o şarkıları bulamıyorum cevabı yüksek oranda var. Bu anket Türkiye için bu geçerli ama orada eğer Apple Music kalitesiz olan arşivi çıkartırsa bir dezavantaj oluşabilir.

Bora Turan: Bunlar böyle düşük kalite diyeceklerdir. İstiyorsanız alın ya da kaldırıyoruz diyeceklerdir.

Mustafa K. Öztürk: Peki bu son dönemde sisteme yeni yüklemeler sırasında karşılaştığınız en büyük sorunlar neler oluyor?

Bora Turan: Kullanıcıların bilgisizliği oluyor. Biraz da tembelliği. Biz bir sürü bilgi istiyoruz. Şu sözü kim yazdı, beste kime ait ve birçok ayrıntı. Bunları girmekte tembellik yapıyorlar. Ama artık bir şeyi engelledik bu bilgileri girmeden ilerlemelere izin vermiyoruz. Bu şekilde bir çözüm bulduk.

Mustafa K. Öztürk: Anladım yani kaliteye dair bir sıkıntı yaşamıyorsunuz. 24 bit kayıt edemedim 16 göndersem olur mu gibi sorunlarınız olmuyor diye anladım.

Bora Turan: Daha çok müzik videoda problem yaşanıyor. Müzik videolarının standartları çok yüksek. Başında başlık olacak mı? Olmayacak mı? Reklam olsun olmasın vs. bir sürü standardı var. Video herkes yükleyemiyor ama ses dosyası konusunda bir problem yok.

Mustafa K. Öztürk: Tamam, peki bir de son olarak da şu soruyu sormak isterim. Sistem bir ara yüz kullanıyor, oraya yüklüyor ve oradan otomatik dağıtıyor değil mi? Fizy, Muud, Spotify ve Apple Music aynı dosyalar gidiyor.

Bora Turan: Sistemden hiçbir platform bir şey çekmiyor. Hepsinin bir standardı var. Sen dağıtımcıysan sistemini kurarken okuyorsun bu standartları. Muhtemelen en yüksek kalite standardında olanını kendi standart edinmek zorundasın. En yükseğe göre standardını ayarlıyorsun ve daha müşteri girerken bunları koyarken sen müşteriyi zorluyorsun bana böyle göndereceksin bu standartta vereceksin diyorsun. Geldiği zaman da otomatik gidiyor ayrıca bir el prosesi yok.

Mustafa K. Öztürk: Anladım o zaman teşekkür ediyorum. Daha çok vaktinizi almayayım. Merak ettiğim şeyler bunlardı çok teşekkürler.

Translated (English) Version

Mustafa K. Öztürk: In what year and how did Eğlence Fabrikası upload its first MP3 files to which systems?

Bora Turan: Eğlence Fabrikası never uploaded MP3 files. From the beginning, Eğlence Fabrikası always insisted on "lossless" formats for the companies it worked with. So, we always sent wave files everywhere. Only TTnet couldn't accept wave files, they wanted MP3 files. So, only for them, after receiving from the customer, we converted them ourselves to MP3 by degrading the quality and provided them in the requested format. We never used any other format from the beginning.

Mustafa K. Öztürk: Okay, let me ask this: for example, how many kilobits per second did TTnet want for the MP3 files back then? Did they want different types, like high-quality and low-quality, in separate formats?

Bora Turan: No, they didn't. They only wanted one type of MP3. Actually, distinguishing between high-quality and low-quality was initially introduced by Apple Music. Apart from Apple Music, I don't remember the specifics from the beginning, maybe it was 16 bits at first, then they switched to 24 bits. I think they wanted that. For instance, I don't know if you're following, but now Apple Music wants Dolby Atmos.

Mustafa K. Öztürk: I didn't know that.

Bora Turan: Actually, Apple has been pushing for all these quality standards so far. If you provide Dolby Atmos, they offer you better deals, trying to push you towards higher quality.

Mustafa K. Öztürk: Okay, yes, thank you. So, do you remember something? Were the MP3 files you initially sent to TTnet, for example, 128 kbps or 256 kbps?

Bora Turan: Whatever the standard was at that time, but I don't remember exactly.

Mustafa K. Öztürk: Okay, now, for example, Fizy and Muud currently request lossless formats from you, right?

Bora Turan: Muud might not be requesting lossless yet, right? I'll check that, but we send lossless to Fizy. Unfortunately, Muud is not yet in the platform category at that quality level.

Mustafa K. Öztürk: Okay, thank you. In my research, I found that there are currently five main platforms used in Turkey. These are Spotify, Fizy, Muud, Apple Music, and

YouTube. YouTube is also widely used for music listening, even though users upload content themselves, so we excluded it from the list. We downloaded from the other four platforms. We assume that the recordings coming from end-users normally come in at 24-bit 44.1 kHz or 48 kHz, but sometimes a downgraded file can come. So, you can present an MP3 as if it were a WAV file. Is there any way to check this? Or is it a matter of declaration, that we are obliged to upload what comes from the user? Or is there a point where this is checked?

Bora Turan: Our processes are automatic. When we upload a file, we use a library called FFMPEG. That library checks the Sampling Rate and Bit Rate. If it's lower than the standard our system requires, it will give an error and won't allow the upload. In short, the album can't be uploaded; we don't manually check these, the machine does.

Mustafa K. Öztürk: Okay. So, actually, if someone were to convert the audio file from MP3 to WAV first to bypass the system, the machine wouldn't notice.

Bora Turan: Why are you looking at it this way? It's not really possible to record poor quality anymore; it's even harder now.

Mustafa K. Öztürk: I'm looking at it for this reason: maybe no one intentionally does it, but someone might accidentally upload in low quality. I've heard about such situations regarding old archives.

Bora Turan: We started in 2013. From the beginning, we used 16-bit and 24-bit. We've never had such uploads. Okay, I remember now. At one point, they sent us tapes from Unkapanı, various people, but we refused.

Mustafa K. Öztürk: Okay, that's exactly what I was curious about.

Bora Turan: We're not the only ones checking; the platform also checks. Although inadequate platforms may not check, for example, you can't send an old low-quality thing to Apple Music. **Mustafa K. Öztürk:** I was wondering if you might have received old archives because cassette or vinyl converted archives may not have reached the 24-bit quality.

Bora Turan: Look, something like this happened: at first, they gave all Turkish music uploading to digital platforms to Orchard. They created a kind of monopoly. What did Orchard do? They said, "Send us whatever you have." There's no proper metadata, no accurate information about the content. That's why you can find these bad archives you've noticed. The initial concern wasn't about quality, it was about content not being absent. Therefore, all accessible archives were uploaded without sufficient care.

Mustafa K. Öztürk: At this point, I've discovered examples of this. In old archive recordings, the MP3 quality turns out to be low. But actually, all these platforms promise high quality to Premium users, but this repertoire was already uploaded in low quality from the beginning.

Bora Turan: That promise was actually a business lie. Now, that's over too. Apple Music is opening up Dolby Atmos content and offering a new business model. The business model based on having the most content or the highest quality content is being shelved. From now on, Apple Music determines the standard, and if you don't adapt to it, you're in trouble. Eventually, everyone will be able to notice the difference in quality with their ears, and they will move away from platforms with low-quality repertoire.

Mustafa K. Öztürk: So, what will happen to the old low-quality repertoire then?

Bora Turan: Apple will push them. From now on, companies will either make their recordings lossless or be removed from the platform if they are not lossless.

Mustafa K. Öztürk: I see. So, Apple Music will distinguish the low-quality repertoire.

Bora Turan: Yes, they will.

Mustafa K. Öztürk: Will this create a disadvantage? In my research, there is a high percentage of "for its archive" as the reason for using the platform, meaning I can't find those songs on other platforms. This survey is valid for Turkey, but there could be a disadvantage if Apple Music removes the low-quality archive there.

Bora Turan: They'll call them low-quality. They'll say, "If you want them, take them, or we'll remove them."

Mustafa K. Öztürk: Okay, so in recent times, what are the biggest problems you encounter during new uploads to the system?

Bora Turan: It's the users' ignorance. And a bit of laziness. We ask for a lot of information. Who wrote this lyric, who composed it, and many details. They are lazy to enter these. But now we've stopped this; we don't allow progress without entering this information. We found a solution like this.

Mustafa K. Öztürk: I understand, so you don't have any problems regarding quality. I understand that you don't have problems like "I couldn't record in 24-bit, would 16-bit be okay?"

Bora Turan: More problems occur with music videos. The standards for music videos are very high. Will there be a title at the beginning? Will there not be? Will there be ads or not? There are many standards. Not everyone can upload videos, but there's no problem with audio files.

Mustafa K. Öztürk: Okay, and finally, does the system use a user interface, uploads there, and then distributes automatically? Do Fizy, Muud, Spotify, and Apple Music receive the same files? **Bora Turan:** No platform fetches anything from our system. They all have their own standards. If you're a distributor, when you set up your system, you read these standards. Most likely, you have to adopt the one with the highest quality standard. You adjust your standard according to the highest one, and when a customer enters, you force them to comply with it, saying, "You will send it to me like this, in this standard." When it comes, it goes automatically, there's no manual process.

Mustafa K. Öztürk: I understand, then thank you. I won't take up any more of your time. These were the things I was curious about, thank you very much.

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PUBLICATIONS AND PRESENTATIONS ON THE THESIS:

- **Ozturk M.K., Ozdemir T.,** 2024: Investigating the Promised and Delivered Quality of Music Streaming Services. *Worldwide. 3rd International Graduate Research Symposium – ITU Graduate School, May 08-14, 2024,* Istanbul, Turkey.
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