



Analyzing the critical factor for music streaming platform selection by using the AHP model

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Keywords

Modified Delphi Method, Analytic Hierarchy Process (AHP), Music Streaming Platform, Critical Factor

Abstract

The widespread adoption of the internet has shifted music consumption from purchasing physical albums to online streaming. This digital transformation has led to the rise of numerous music streaming platforms, each offering unique services to enhance consumer satisfaction and gain a competitive edge. However, understanding the key factors that influence consumer willingness to use and subscribe to these platforms is essential. This study reviews relevant literature on music streaming platforms to identify these factors. Using the Analytic Hierarchy Process (AHP), the study determines the weights of these factors, ranks various platforms, and provides an optimal subscription plan. The research findings reveal that pricing and user experience are the most influential factors in platform selection, emphasizing the importance of competitive pricing and seamless service integration. Additionally, social influence, particularly recommendations from friends and online feedback, plays a significant role in shaping consumer preferences.

1. Introduction:

According to a 2024 survey report by Forbes, music streaming services account for 89% of the total revenue in the music industry (Forbes, 2024). This statistic reflects a significant shift from traditional sources of music revenue, such as physical sales and digital downloads, towards streaming media. It underscores the extent to which streaming has fundamentally transformed the distribution, accessibility, and monetization of music. Between 2010 and 2020, music streaming revenue experienced rapid growth, increasing from USD \$400 million to USD \$13.6 billion, a remarkable 34-fold increase. As of 2022, music streaming global revenue amounted to approximately USD \$ 17.5 billion.

The *Engaging with Music 2023* report of the International Federation of the Phonographic Industry (IFPI) indicates that, on average, people worldwide spend 20.7 hours per week listening

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to music, a slight increase from 20.1 hours in 2022 (IFPI, 2023). This rise equates to approximately 13 additional three-minute songs per week in 2023. Furthermore, 73% of individuals reported listening to music through licensed audio streaming services, including both subscription-based and ad-supported platforms. From the earliest human societies, music has not only served as a profound cultural and emotional bridge across generations (Naveed et al., 2017; Larsen et al., 2009, 2010), but also offered a deeply intertwined and contextualized experience that embodies cultural traditions and attitudes (Crooke et al., 2024). From the earliest human societies, music has held profound significance, serving as a cultural and emotional bridge across generations (Naveed et al., 2017; Larsen et al., 2009, 2010).

Music, as a reflection of human society, has become intricately intertwined with modern life, permeating daily experiences whether passively consumed or actively engaged with. The advent of the internet has profoundly transformed the popular music industry, shifting its primary focus from physical album sales to the provision of expansive streaming content through subscription-based models. Furthermore, research highlights the pivotal role that fans play in the evolving relationship between social media and the music industry, actively shaping this transformation (Gamble et al., 2019). While this shift may seem inevitable, it carries significant implications for the economy, technology, and culture (Anderson, 2013; Burkart, 2013; Burkart & McCourt, 2006; Garofalo, 1999).

Recent studies on music consumption emphasize the digitalization of the industry, leading to a decline in the tangibility of music and a diminished sense of ownership (Bartmanski & Woodward, 2015; Fox, 2004). This transition is exemplified by the shift from purchasing physical albums to consuming music through digital platforms. Moreover, some users continue to access music via illegal channels. Whether through unauthorized means or legitimate digital platforms, this trend marks the dawn of the internet era, presenting significant challenges for traditional industries to adapt.

In the third quarter of 2023, Spotify solidified its position as the largest digital service provider (DSP), holding 31.7% of the global market share with 226 million subscribers, a slight increase from its 31.3% share in the same period in 2022. Tencent Music Entertainment followed as the second-largest DSP, capturing 14.4% of the market with 102.7 million subscribers, surpassing Apple Music, which held 12.6% of the market with 89.8 million subscribers. Other key players included Amazon Music with an 11.1% market share and 78.9 million subscribers, YouTube Music with 9.7% and 69.1 million subscribers, and NetEase with 6.1% and 43.7 million subscribers. Additionally, Yandex and Deezer held 3.4% and 1.3% of the market, respectively, while the remaining 9.7% of subscribers were distributed among smaller platforms, contributing to the overall diversification of the music streaming market (Midia, 2024). For music platform subscribers, they only need to pay a small monthly subscription fee to listen to a large amount of music and gain psychological ownership of the music (Brown et al., 2014)

Given the crucial role of music in reflecting societal sentiments and trends, this study seeks to investigate the key factors influencing consumer evaluations of various music subscription platforms. The primary objective is to develop a comprehensive model for assessing these platforms and identifying discrepancies between platform offerings and consumer expectations. By doing so, this research aims to provide platform providers with insights to refine their strategies and conduct self-assessments for continuous improvement.

2. Evaluation Model

2.1 Digitalization of Music

Leading companies in the music industry have historically been hesitant to fully embrace digitization, primarily due to concerns that making digitized music available on the internet would encourage widespread piracy (Krasilovsky & Shemel, 2003). As a result, while many record labels experimented with digital formats as early as the 1990s, they were generally only willing to provide low-quality listening samples (Easley et al., 2003). However, the primary barrier to digitalization was not the fear of piracy alone, but rather the disruptive potential of this new technology, which posed significant risks to traditional music practices. Consequently, music companies in the 1990s lacked both the interest and perceived need to adopt digital innovations. It was only in the 2000s, with the rapid expansion of the internet, that the rise of music streaming platforms forced the industry to accept the inevitability of digital music.

2.2 Modified Delphi method

The modified Delphi method is a technique for collective decision-making among experts that operates under conditions of anonymity. In this process, experts are evaluated and asked to address a specific issue or predict a future event through individual surveys, followed by anonymous group interactions. Through a structured and iterative approach, the method seeks to integrate the knowledge, opinions, and speculative insights of experts to achieve consensus. By creating an environment free from external interference, the modified Delphi method enables the deduction of potential future events, effective forecasting of trends, or consensus on a particular issue (Linstone & Turoff, 1975; Murry & Hammons, 1995).

The primary objective of employing the modified Delphi method in this study is to enable experts to exchange and express opinions anonymously, while streamlining the otherwise complex questionnaire process. This approach ensures a smooth research process and facilitates the achievement of consensus among the expert group. The modified Delphi method process involves two key steps: collecting relevant factors and evaluating the consensus (Linstone & Turoff, 1975; Murry & Hammons, 1995).

In recent years, several research topics have adopted modified Delphi analysis, including exploring the factors needed to enhance the quality and success of youth entrepreneurship in the post-COVID-19 era (Swaramarinda et al., 2022), evaluating the applicability of outsourcing logistics companies in reducing logistics costs while maintaining service quality during the COVID-19 pandemic (Tsai et al., 2021), identifying the capabilities required by health insurance companies to gain a technology-driven competitive advantage (Nayak et al., 2021), assessing business models in the hospitality industry to provide accurate evaluation pathways for establishing sub-brands in the hotel sector (Chang et al., 2021), constructing a risk management indicator model for travel agencies to be used in risk management and competitive strategy (Tsai et al., 2020), and determining the quality attributes of B2B cross-border e-commerce platforms (Ho & Chuang, 2023).

2.2.1 Collect the factors

The process began with a comprehensive literature review on the factors influencing and shaping the strategies of music streaming platforms, complemented by expert input. Following this, a structured questionnaire was developed using a Likert scale to assess the importance of these factors, ranging from 7 (indicating very important) to 1 (indicating very unimportant), with 5 representing a neutral response. The definitions and classifications of each indicator were then iteratively revised based on feedback from the expert group, with revisions continuing until a unanimous and stable consensus was reached.

2.2.2 Evaluate the consensus

The consensus of expert opinions is primarily used to observe the distribution of opinions among a group of experts for each factor. This article analyzes using the method of average importance and interquartile range. Interquartile range represents half the distance of the distribution of opinions within the middle 50% of the group. A smaller interquartile range indicates a more concentrated opinion, while a larger one indicates more divergence. If the interquartile range is greater than or equal to 1.000, it indicates that a consensus has not been reached (Faherty, 1979). In this article, an interquartile range less than 1.000 is considered as achieving consensus among expert opinions, with an average importance set at 4.000 as the benchmark.

When the average importance is greater than or equal to 4.000 but the interquartile range is greater than or equal to 1.000, it indicates that the factor is important but there is divergence in expert opinions, requiring the factor to be retained for further rounds. When the average importance is greater than or equal to 4.000 and the interquartile range is less than 1.000, it indicates that the factor is important and there is consensus among expert opinions, hence it is significant.

Conversely, if the average importance is less than 4.000 but the interquartile range is greater than or equal to 1.000, it suggests that although the importance of the factor is low, due to divergence in expert opinions, it cannot be determined whether the factor is unimportant, therefore it needs to be retained for further evaluation. If the average importance is less than 4.000 and the interquartile range is also less than 1.000, it indicates that the factor is unimportant and there is consensus among expert opinions, thus the factor undergoes consistent deletion. As shown in Fig. 1, which illustrates the process of evaluating expert consensus, repeated iterations through this process lead to convergence.

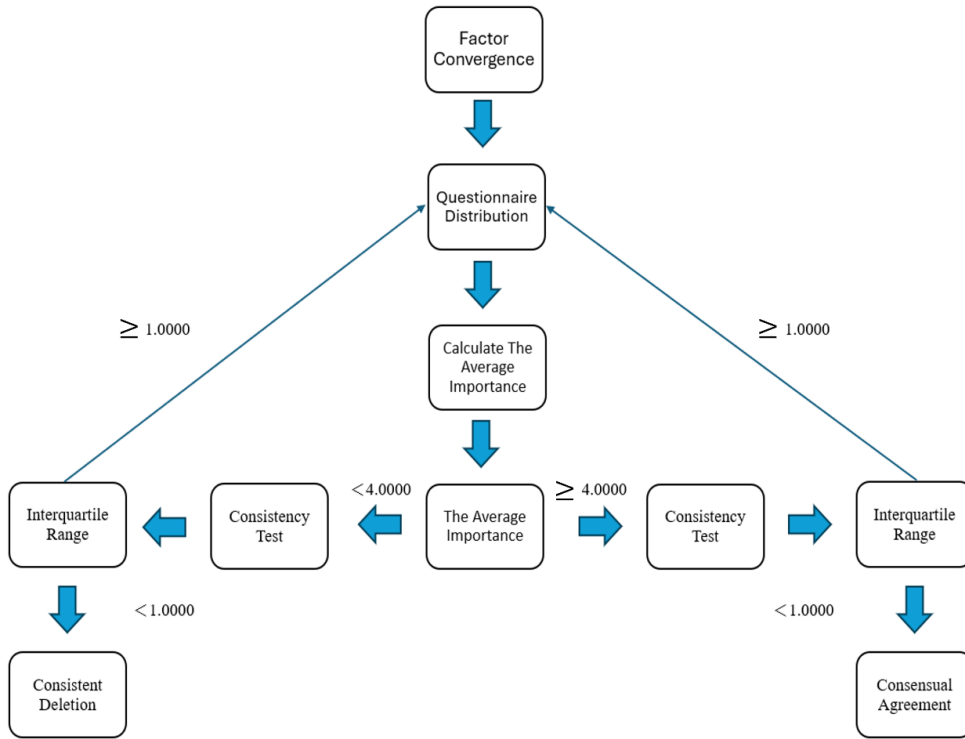


Fig. 1 *The Process of Evaluating Expert Consensus*

2.3 Analytic Hierarchy Process

The Analytic Hierarchy Process (AHP) is a subjective quantitative analysis method introduced by Saaty in 1980, which he originally proposed in 1971 during his research on contingency planning for the U.S. Department of Defense. AHP is primarily utilized for decision-making problems characterized by uncertainty and multiple evaluation criteria. The evaluation process involves the following steps: establish hierarchical structure, questionnaire design, calculation of weights for factors at each level and calculate the overall weight (Deng & Tzeng, 1989).

2.3.1 Establish hierarchical structure

The construction of an AHP does not follow a fixed procedure. Common approaches include literature reviews, the modified Delphi method, focus group discussions, or brainstorming sessions. When establishing the hierarchy, the top level represents the overall goal of the assessment, while the lowest level represents the alternative solutions. Elements of similar importance should be placed within the same level, and ideally, each level should not contain more than seven elements. Moreover, the elements within each level must be independent of one another (Saaty, 1980).

2.3.2 Questionnaire design

The AHP primarily relies on the factors from the previous level in each hierarchy as the basis for evaluating the factors at the current level, which are then subjected to pairwise comparisons. If there are n factors within a level, then $n(n - 1)/2$ pairwise comparisons are required. This approach simplifies the complexity of the decision-making process by allowing decision-makers to focus on the relationship between two factors at a time.

2.3.3 Calculation of weights for factors at each level

Each decision-maker conducts pairwise comparisons for decision factors, assigning relative importance. These values must be consistent; otherwise, decision-makers should redo the pairwise comparisons until consistency is achieved. Finally, all comparison results provided by decision-makers are aggregated using the geometric mean (Saaty, 1980). The calculation procedure is as follows: establish a pairwise comparison matrix, calculate the feature vector, consistency testing and calculate the overall weight.

2.3.3.1. Establish a pairwise comparison matrix

Establish a pairwise comparison matrix A, where is a set of factors, and the quantitative judgment of the paired factors can be expressed as the matrix A multiplied by as follows:

$$\begin{matrix} & C_1 & C_2 & \dots & C_n \\ A = [a_{ij}] = & \begin{bmatrix} 1 & a_{12} & \dots & a_{1n} \\ 1/a_{12} & 1 & \dots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ 1/a_{1n} & 1/a_{2n} & \dots & 1 \end{bmatrix} & & & \end{matrix} \tag{1}$$

When $a_{ij} = 1/a_{ji}$, $i, j = 1, 2, 3, \dots, n$, a quantified relative importance judgment is given to a pair of two factors (C_i, C_j). In the matrix A, it (a_{ij}) is represented by a numerical value (W_1, W_2, \dots, W_n), and expressed as a quantified weight of n factors, which can reflect the recorded judgment value. The relationship between its weight (W_i) and (a_{ij}) judgment can be simply expressed as $W_i/W_j = a_{ij}(i, j = 1, 2, 3, \dots, n)$, and:

$$\begin{matrix} & C_1 & C_2 & \dots & C_n \\ A = & \begin{bmatrix} W_1/W_1 & W_1/W_2 & \dots & W_1/W_n \\ W_2/W_1 & W_2/W_2 & \dots & W_2/W_n \\ \vdots & \vdots & \ddots & \vdots \\ W_n/W_1 & W_n/W_2 & \dots & W_n/W_n \end{bmatrix} & & & \end{matrix} \tag{2}$$

The relative importance of the two elements is represented by an evaluation scale of 1, 3, 5, 7, and 9, as detailed in Table 1.

Table 1 *The Meaning and Explanation of the AHP Evaluation Scale*

Evaluation Scale	Definition	Illustrate
1	Equally important	The contributions of the two comparison scenarios are equally important.
3	Slightly more important	Experience and judgment slightly favor one solution over the other.
5	Quite important	Experience and judgment strongly favor one solution over the other.
7	Extremely important	There is a very strong preference for one solution.
9	Absolutely important	There is sufficient evidence to definitively prefer one solution.
2, 4, 6, 8	Median value between adjacent scales	A compromise value is applied when necessary.

2.3.3.2. Calculate the feature vector

The pairwise comparison matrix A multiplied by the weight vector (x) of the element is equal to (bx) , at this time, (x) is the eigenvector (b) of the eigenvalue. Since (a_{ij}) is the subjective judgment given by the decision-maker when making a pairwise comparison, there must be a certain degree of difference between the real value (W_i/W_j) , Therefore, $Ax = bx$ cannot be established. Saaty (1980) suggested to use the maximum eigenvalue λ_{max} of A matrix to replace b that is:

$$\lambda_{max} = \sum_{j=1}^n a_{ij} \frac{W_j}{W_i} \tag{3}$$

2.2.3.3. Consistency testing:

The analytic hierarchy process uses the Consistency Index ($C.I.$) to measure the consistency of the pairwise comparison matrix to correct unreasonable evaluation values. The consistency index is defined as equation 4:

$$C.I. = \frac{\lambda_{max} - n}{n - 1} \tag{4}$$

A consistency index equal to zero ($C.I. = 0$) means that the previous and later judgments are completely consistent. Saaty suggested that $C.I. \leq 0.1$ is an allowable bias (Saaty, 1980). Table 2. shows that different n values produce different $C.I.$ values, called Random Index ($R.I.$). Under a matrix with the same n value, the ratio of the $C.I.$ value to the $R.I.$ value is called the Consistency Ratio ($C.R.$) is equation 5, If $C.R. \leq 0.1$, consistency is satisfied.

$$C.R. = \frac{C.I.}{R.I.} \tag{5}$$

Table 2 *Stochastic Indicator Value Table of N-order Positive Reciprocal Matrix*

n	1	2	3	4	5	6	7	8	9	10	11
R.I.	0.00	0.00	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49	1.51

Resource: Saaty (1980)

2.3.4 Calculate the overall weight

After calculating the weights of the elements at each level, the overall level weight is calculated. Finally, the best solution for the final goal is determined based on the weights of each alternative. If it is a group decision, the weights of each alternative are integrated.

3. Case Study

Through a review of the literature and analysis summarized in Table 3, we identified 13 influential factors and their definitions, obtained through the execution of the modified Delphi method.

Table 3 *Factor Definitions and Sources*

Factors	Definition	Authors
No advertising	No ads will be pushed when using.	(Jonathan et al., 2013)
Subscribers have unlimited access to a library	Subscribers will not have playback restrictions	(Lee et al., 2011)
Listening in multiple media devices	Music can be listened to on different media	(Hagen, 2016)
Allows users to tag, rate and leave comments about content	Allows users to tag, rate and leave comments about content.	(Knowles ,2007)
Overall satisfaction	Users' satisfaction towards the entire platform.	(Jones, 2020)
New music discovery	Will recommend new songs.	(Lee et al., 2011)
Divides the music along other lines	Ability to categorize playlists according to activities, moods, and years.	(Morris & Powers, 2015)
Personalized playlists	Make personalized recommendations based on past historical records.	(Hracs & Webster, 2021)
Price	Price identifies the amount of money that consumers are willing to pay each month for a subscription on the platform.	(Jones, 2020)
Pricing tiers	Set different prices for different status and number of people.	(Jones, 2020)
Try out the products before purchasing	Can try it out before spending money to subscribe.	(Gopal et al., 2006)
Positive recommend dations from a friend	Positive recommendations from a friend	(Nielsen, 2012)
Positive feedback from a blog or chat room	Positive feedback from a blog or chat room	(Nielsen, 2012)

Figure 2 illustrates the hierarchical structure established based on Table 1, categorizing the factors into four groups: Music Service Category, Usage Service Category, Cost Category and Recommendation. The AHP is then applied to calculate both the relative overall weights for each category.

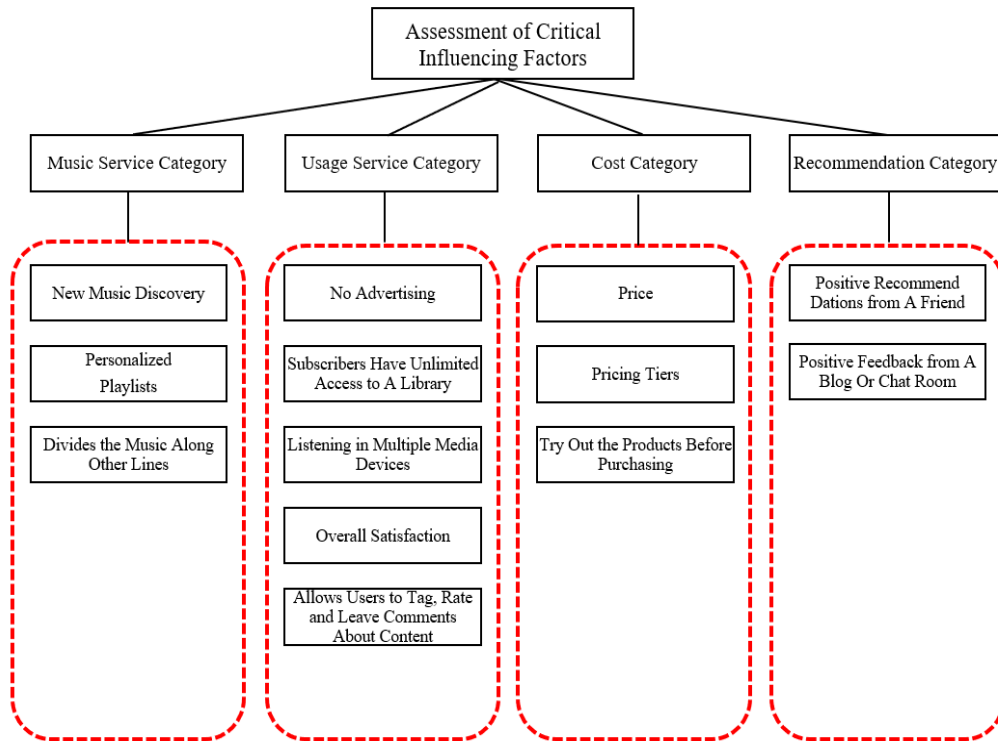


Fig 2. *Research Framework*

3.1 Category weights

The categories of this research framework that include: music service category, usage service category, cost category, and recommendation category. The comparison matrix of level 2 is shown in Table 4.

Table 4 *Categories Matrix*

Goal	Music service category	Usage service category	Cost category	Recommendation category	Weight
Music service category	1.000	1.056	2.251	2.570	0.137
Usage service category	0.938	1.000	2.128	2.438	0.331
Cost category	0.413	0.860	1.000	1.153	0.350
Recommendation category	0.395	0.411	0.867	1.000	0.182
Sum	2.746	3.327	6.247	7.161	1.000
C.R. = 0.067					

3.2 Music service category

Regarding the music service, including new music discovery and personalized playlists, and divides the music along other lines. From the weight of the three factors, consumers care more about “personalized playlist” and are less concerned about other basic functions of music.

Table 5 *Music Service Category Matrix*

Music service category	New music discovery	Personalized Playlists	Divides the music along other lines	Weight
New music discovery	1.000	1.797	1.915	0.274
Personalized Playlists	0.571	1.000	1.119	0.480
Divides the music along other lines	0.502	0.925	1.000	0.246
Sum	2.073	3.722	4.034	1.000
C.R. = 0.006				

3.3 Usage service category

Regarding the “use of music streaming platforms” service, it includes no advertising, subscribers have unlimited access to a library, listening in multiple media devices, overall satisfaction and allows users to tag, rate and leave comments about content. From the above factors, it can be inferred that consumers place significant emphasis on overall enjoyment when using music platforms. They desire an uninterrupted listening experience, unlimited access, the ability to tag their favorite albums or songs.

Table 6 *Usage Service Category Matrix*

Usage service category	No advertising	Subscribers have unlimited access to a library	Overall satisfaction	Listening in multiple media device	Allows users to tag, rate and leave comments about content	Weight
No advertising	1.000	1.356	2.632	2.23	3.31	0.344
Subscribers have unlimited access to a library	0.815	1.000	2.127	1.776	2.565	0.271
Overall satisfaction	0.389	0.475	1.000	0.851	1.138	0.127
Listening in multiple media devices	0.456	0.6123	1.200	1.000	1.424	0.154
Allows users to tag, rate and leave comments about content	0.311	0.392	0.785	0.689	1.000	0.104
C.R. = 0.008						

3.4 Cost category

The costs associated with using the platform and its benefits include price, pricing tiers, and trying products before you buy. Price is often the first consideration for consumers, and streaming platforms often offer different pricing plans to attract more users and expand the market. In addition, they may provide discounts based on user status (such as student discounts) or provide trials to allow consumers to experience the platform’s services for themselves.

Table 7 *Cost Category Matrix*

Cost category	Price	Pricing tiers	Try out the products before purchasing	Weight
Price	1.000	1.415	2.308	0.467
Pricing tiers	0.723	1.000	1.643	0.333
Try out the products before purchasing	0.427	0.606	1.000	0.200
C.R. = 0.001				

3.5 Recommendation category

Choosing a music streaming platform through recommendations from others includes Positive recommend dations from a friend and positive feedback from a blog or chat room. Humans are often influenced by the behavior and thoughts of their friends and family, so their recommendations carry significant weight. Additionally, with the proliferation of the internet, there is an abundance of information and user experiences regarding music platforms online, which can also influence decisions through positive online feedback.

Table 8 *Recommendation Category Matrix*

Recommendation category	Positive recommend dations from a friend	Positive feedback from a blog or chat room
Positive recommend dations from a friend	1.000	1.554
Positive feedback from a blog or chat room	0.646	1.000
C.R. = 0.002		

After calculating the weight of each level separately, we will first conduct a consistency test ($C.R. < 0.1$) to confirm that the overall hierarchical structure is consistent, and finally calculate the overall weight and rank it, as shown in Table 9.

Table 9 Overall Weight Ranking

Ranking	Factors	Overall weight
1	Price	16.34%
2	Pricing tiers	11.66%
3	No advertising	11.39%
4	Positive recommend dations from a friend	11.09%
5	Listening in multiple media devices	8.95%
6	Positive feedback from a blog or chat room	7.15%
7	Try out the products before purchasing	7.02%
8	Personalized playlists	6.55%
9	Subscribers have unlimited access to a library	5.11%
10	Allows users to tag, rate and leave comments about content	4.20%
11	New music discovery	3.74%
12	Overall satisfaction	3.44%
13	Divides the music along other lines	3.36%

4. Conclusion

The findings of this research indicate that, among the 13 factors influencing consumer preferences for music streaming platforms, price holds the greatest significance, accounting for 16.34% of the overall weight, making it the most critical factor. However, its dominance is not overwhelmingly ahead of other important factors. Pricing tiers (11.66%) and the absence of advertising (11.39%) also play substantial roles in shaping consumer decisions, highlighting that while price is a primary consideration, the overall music usage experience is equally vital.

Moreover, recommendations from friends (11.09%) and positive feedback from online sources, such as blogs or chat rooms (7.15%), significantly influence consumer choices. This suggests that social and peer influence, alongside the product's intrinsic features, are essential in determining platform selection. Therefore, it is crucial for music streaming platforms to not only focus on pricing strategies but also enhance the user experience and pay close attention to consumer reviews and feedback. By addressing these needs, platforms can improve their reputation and better meet consumer expectations.

Based on the findings, several key managerial implications emerge for music streaming platform operators, technology developers, marketing professionals, industry partners, and potential investors:

Prioritize Pricing and Tiered Strategies: The study highlights that price (16.34%) and pricing tiers (11.66%) are the two most significant factors influencing consumer decisions. Thus, platform operators should ensure that their pricing remains competitive while offering flexible tiered options to appeal to a broader consumer base. Regular market analysis and price adjustments in response to consumer expectations are essential to maintaining a strong value proposition.

Enhance User Experience to Increase Retention: Beyond pricing, the absence of advertisements (11.39%) and the ability to use the platform across multiple media devices (8.95%) are highly valued by consumers. Technology developers should focus on optimizing personalized playlists (6.55%) and cross-device integration to enhance user satisfaction. Platform operators should prioritize providing a seamless and uninterrupted music experience to improve overall retention and customer loyalty.

Leverage Social Recommendations and Online Feedback: Social influence, particularly recommendations from friends (11.09%) and positive feedback from online platforms (7.15%), plays a significant role in consumer platform choice. Marketing professionals should harness the power of social media and word-of-mouth marketing by encouraging users to share their experiences. Collaborating with influencers and community leaders can further amplify a platform's reach and reputation.

Expand Collaboration and Diversify Music Offerings: Industry partners, such as record labels and music publishers, can explore collaboration opportunities with streaming platforms to enhance offerings and attract new users. Offering trial periods (7.02%) and innovating in music discovery (3.74%) can help platforms differentiate themselves and appeal to a broader audience. These partnerships can also lead to the creation of new services that enhance user engagement.

Invest in Data-Driven Insights for Market Advantage: Potential investors should focus on platforms with a strong pricing strategy and user experience. Understanding how platforms leverage user data to enhance the listening experience, and tracking metrics such as user growth, retention, and engagement, will be crucial in evaluating the long-term viability of investments in the streaming industry.

By focusing on these key areas - pricing, user experience, social influence, collaboration, and data insights - music streaming platforms and stakeholders can better align their offerings with consumer expectations, ultimately gaining a competitive edge in the rapidly evolving digital music landscape.

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(Received May 2024; accepted November 2024)