Democratizing Music Distribution and Discovery with Blockchain Technology

A Research Paper submitted to the Department of Engineering and Society

Presented to the Faculty of the School of Engineering and Applied Sciences University of Virginia • Charlottesville, Virginia

In Partial Fulfillment of the Requirements for the Degree

Bachelors of Science, School of Engineering

Muhammad Al-Atrash

Fall 2024

On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

Advisor

Kathryn A. Neely, Associate Professor of STS, Department of Engineering and Society

I) Introduction

"For us, this is not about business. This is about culture – about fighting for what's right" – Jay-Z (2015). Jay-Z's words capture the core tension in today's music industry: the struggle between centralized control and artistic freedom. Three major record labels control 70% of the global recorded music market (Billboard, 2017), while streaming platforms like Spotify use algorithmic playlists as modern gatekeepers (Vulture, 2017). In this system, independent artists face a stark reality: earning just \$0.003 per stream while fighting for visibility in an increasingly centralized landscape (Ditto Music, 2022).

However, emerging technologies and past precedents suggest alternatives are possible. The brief but transformative "SoundCloud era" of 2015-2017 demonstrated how a more democratic platform could spark musical innovation, launching careers of numerous hip-hop artists who bypassed traditional gatekeepers entirely (Michigan Daily, 2021). Now, blockchain technology and Web3 platforms offer a new paradigm for music distribution, enabling automated royalty payments and tokenized artist-fan relationships (Audius Whitepaper, 2022). Yet we lack adequate frameworks to understand how such disruptive innovations might create lasting change rather than being absorbed by existing industry powers, as happened with SoundCloud.

The stakes of this centralized control are significant – when streaming platforms and major labels maintain their gatekeeping power, it leads to homogenization of musical culture. The SoundCloud era's collapse demonstrates these costs, as its vibrant experimental hip-hop scene largely disappeared after traditional industry acquisition (Pitchfork, 2021). Without viable decentralized alternatives, we risk stifling the next wave of musical innovation and advancements in human creative expression.

To understand how blockchain-based music platforms might succeed where previous democratization attempts failed, this research applies the Multi-Level Perspective framework to analyze two key cases: the rise and fall of SoundCloud (2015-2017) and the emergence of Audius, a decentralized music platform. In this paper, I argue that emerging, disruptive technologies (like blockchain technology) can democratize music distribution and discovery by enabling transparent revenue systems, direct artist-fan interactions, and recognition of niche subgenres, though new sociotechnical frameworks are needed to understand how such disruptive technologies can create resilient alternative ecosystems that are resistant to corporate consolidation.

II) The Music Industry's Cyclical Pattern of Innovation and Consolidation

A) The Music Industry's Pattern of Centralizing Innovation

The music industry's history is marked by cycles of technological disruption and corporate consolidation. From the emergence of recorded music to radio broadcasting in the 1920s, each innovation - from vinyl records to cassettes to CDs - followed a similar pattern: initial disruption followed by corporate consolidation. By the 1980s, six major labels controlled roughly 80% of the recorded music market, eventually consolidating into today's "Big Three" (Billboard, 2017).

The modern streaming landscape represents the latest evolution in this pattern of centralized control. The "Big Three" labels – Universal Music Group, Sony Music Group, and Warner Music Group – have successfully adapted their traditional gatekeeping role to the digital era through exclusive rights management and strategic partnerships with streaming platforms. This consolidation extends beyond market share; these conglomerates control crucial

infrastructure including distribution networks, marketing channels, and critically, data about listener behavior.



The transition to streaming has actually intensified this centralization. Spotify's launch in 2008 promised to democratize music distribution, but instead created new forms of gatekeeping through algorithmic curation. As digital platforms generate 84% of recorded music revenue (Illustrate Magazine, 2020), major labels have gained disproportionate influence through favorable licensing deals (Vulture, 2017). This control manifests in streaming economics - Spotify's "pro-rata" payment model inherently favors major label artists who can generate massive stream counts through playlist placement and marketing muscle (Medium, 2021), leaving independent artists with a fractional share despite significant collective streaming activity.

B) Financial Pressures Force Independent Platforms to Compromise Their Democratic Mission The rise and fall of SoundCloud exemplifies both the potential and challenges of creating sustainable alternatives to major label control. Between 2015-2017, SoundCloud emerged as a powerful democratizing force in hip-hop music, enabling a new generation of artists to bypass traditional gatekeepers. The platform created what The Michigan Daily calls "a lawless creative playground" where artists could freely share music without label oversight, leading to innovative subgenres and new forms of artistic expression (Michigan Daily, 2022). Through its open architecture and community-driven discovery, SoundCloud helped launch the careers of artists like XXXTentacion and Lil Uzi Vert, demonstrating the cultural impact possible when artists can reach audiences directly.



However, SoundCloud's trajectory reveals how financial pressures often force independent platforms to compromise their democratizing mission. According to Pitchfork, pressure from major labels and mounting licensing costs forced SoundCloud to increasingly align with traditional industry interests (Pitchfork, 2021). After signing a landmark deal with Universal Music Group in 2016, SoundCloud began implementing automated copyright detection and removing unofficial remixes, effectively dismantling the creative ecosystem that had made it revolutionary (Vice, 2016). The platform's transformation from an open creative space to a more controlled environment mirrors a common pattern in music industry democratization attempts.

This pattern of corporate absorption extends beyond SoundCloud. As streaming platforms have become the primary means of music consumption, their algorithms and curated playlists increasingly favor established artists with major label backing, making it harder for independent artists to reach new audiences organically (Illustrate Magazine, 2020). These examples demonstrate how traditional market forces and existing power structures consistently undermine attempts at democratization.

C) Blockchain Technology Presents Novel Mechanisms for Democratization

Unlike previous democratization attempts, blockchain technology - a decentralized digital ledger system that enables transparent and tamper-resistant record-keeping - introduces fundamental changes to how music platforms can operate. First introduced by Bitcoin's creator Satoshi Nakamoto, blockchain allows for secure peer-to-peer transactions without the need for traditional intermediaries (Bitcoin Whitepaper, 2008). In the context of music distribution, this means artists and listeners can interact directly, with automated systems handling payments and rights management without relying on centralized authorities like record labels or streaming platforms.

As outlined in the Audius whitepaper, blockchain enables three key innovations in music distribution: transparent and automated royalty payments through smart contracts (self-executing

agreements that automatically distribute revenue), direct artist-fan relationships through token-based economies (where fans can own digital assets tied to their favorite artists), and decentralized governance that resists corporate consolidation by giving voting power to platform users (Audius Whitepaper, 2022). Built on Ethereum, the leading blockchain platform for decentralized applications, Audius represents one of the first attempts to create a music streaming service where platform governance and economic incentives are aligned between artists and listeners.

Sony Music's recent development of "Sonerium," their own blockchain-based rights management system, signals that even major industry players recognize blockchain's transformative potential (Sony, 2024). However, this also raises questions about whether blockchain technology will truly democratize the industry or simply be absorbed by existing power structures, as happened with previous innovations. The technical capability for decentralization does not guarantee its adoption – understanding how these platforms might succeed where previous attempts failed requires examining both technological and social factors

D) Technical Capabilities Alone May Not Guarantee Lasting Change

The history of the music industry reveals a clear pattern: technological innovations that initially promise democratization are consistently absorbed by existing power structures. From radio to digital streaming, each new technology has ultimately reinforced rather than disrupted centralized control. The SoundCloud era demonstrated both the potential for independent platforms to spark musical innovation and the financial pressures that can compromise their democratizing mission. While blockchain technology introduces novel mechanisms for decentralization - including automated royalty payments, token-based economies, and

community governance - the industry's history suggests technical capabilities alone may not guarantee lasting change.

What remains unclear is how decentralized music platforms might resist the pattern of corporate absorption that has defined previous democratization attempts. The Multi-Level Perspective framework, with its focus on how niche innovations interact with established systems and broader societal trends, offers a useful lens for analyzing this challenge. By examining both SoundCloud's trajectory and Audius's emerging model through this framework, we can better understand the conditions necessary for sustainable alternatives to centralized control.

III) Applying the Multi-Level Perspective to Analyze Democratization Attempts

A) The Multi-Level Perspective Framework Explains Traditional Innovation Adoption

The Multi-Level Perspective (MLP) framework, developed by Frank Geels, provides a structured approach for analyzing how new technologies interact with established systems and broader societal trends. The framework examines technological transitions through three interacting levels: niches (where radical innovations emerge), sociotechnical regimes (established practices and rules), and landscape developments (broader contextual trends). These levels exist in a nested hierarchy, where regimes are embedded within landscapes, and niches exist as protected spaces where innovations can develop without immediate pressure from existing market forces.



In the music industry context, the regime represents the established system of major labels, streaming platforms, and traditional distribution networks. Niche innovations, like the early SoundCloud platform, develop in protected spaces where new models can mature before facing mainstream pressure. Landscape developments, such as the rise of internet culture and digital music consumption, create opportunities for these niches to challenge existing regimes. Typically, successful innovations are gradually adopted by the regime, while those that fail to align with regime interests remain confined to niche markets or disappear entirely.

B) MLP Reveals Different Trajectories in Music Platform Evolution

The Multi-Level Perspective framework illuminates contrasting trajectories between SoundCloud and Audius as attempts to democratize music distribution. SoundCloud initially succeeded as a niche innovation by creating a protected space for independent artists, particularly in hip-hop, to distribute music outside traditional channels. However, landscape pressures from streaming economics and regime resistance from major labels ultimately forced SoundCloud to comply with industry interests. The platform's implementation of automated copyright detection and removal of unofficial remixes after its Universal Music Group deal in 2016 exemplifies how niche innovations often compromise their original mission when attempting to scale within existing industry structures.



Audius presents a different pattern by leveraging blockchain technology to resist traditional adoption pressures. Unlike SoundCloud, which relied on traditional revenue models, Audius uses tokenized governance and automated smart contracts to create economic alignment between artists and listeners. This structure potentially enables the platform to scale while maintaining independence from traditional industry gatekeepers. However, MLP's traditional focus on regime adoption rather than regime adaptation limits its ability to fully explain how blockchain platforms might create resilient alternative ecosystems.



C) MLP Framework Falls Short in Explaining Disruptive Technologies

While MLP effectively explains how niche innovations are typically absorbed into existing regimes, it lacks mechanisms for understanding how disruptive technologies can force regimes to adapt. Bitcoin provides an instructive example outside the music industry - rather than seeking adoption by traditional financial institutions, it created a parallel ecosystem so resilient that banks, regulators, and governments have been forced to adapt their own practices. The SEC's evolving stance on cryptocurrency regulation and institutional investors' growing Bitcoin adoption demonstrate how disruptive technologies can compel existing power structures to change rather than simply absorbing the innovation. (Forbes, 2024)

This limitation of MLP is particularly relevant when analyzing blockchain music platforms. Traditional frameworks assume innovations either get absorbed by existing systems or remain confined to niche markets. However, blockchain technology, with its combination of economic incentives, automated governance, and decentralized control, may enable platforms like Audius to achieve mainstream adoption while resisting corporate consolidation. Understanding how these platforms might succeed requires expanding MLP to account for technologies that create parallel systems rather than just examining how innovations integrate into existing ones.

D) Analyzing Blockchain's Potential for Creating Resilient Alternatives

The limitations of traditional frameworks in explaining disruptive technologies necessitate a new approach for analyzing blockchain-based music platforms. While MLP helps explain why previous democratization attempts like SoundCloud ultimately failed, understanding Audius and future blockchain platforms requires examining how decentralized technologies might enable alternative ecosystems that resist corporate absorption rather than seeking integration with existing industry structures.

This analysis bridges the gap between MLP's traditional focus on regime adoption and the emerging reality of disruptive technologies that force regime adaptation. Just as Bitcoin created parallel financial systems that traditional institutions had to acknowledge and adapt to, blockchain music platforms might establish alternative distribution models that major labels and streaming services must ultimately respond to rather than absorb. Understanding this potential

requires examining both technical capabilities and social factors that contribute to ecosystem resilience.

IV) Cultivating Resilient Alternatives to Corporate Absorption

A) Technical Architecture Creates Unprecedented Resistance to Centralization

Blockchain music platforms introduce fundamental technical innovations that create stronger resistance to corporate control than previous democratization attempts. Unlike Spotify's closed infrastructure where algorithms, data, and payment systems are controlled by a single entity, platforms like Audius operate on permissionless networks where core infrastructure is open and transparent. Built on Ethereum, Audius leverages smart contracts – self-executing code that automates platform operations without centralized intermediaries. This technical architecture means no single entity can unilaterally change platform rules or monetization systems, a stark contrast to SoundCloud's vulnerability to label pressure.

The architectural differences between traditional and blockchain-based streaming platforms reveal why previous democratization attempts failed to resist corporate absorption. Spotify's centralized architecture requires artists and listeners to trust the platform's decisions about content distribution, revenue sharing, and algorithmic promotion. When SoundCloud faced pressure from major labels, its centralized infrastructure meant that implementing automated copyright detection and removing unofficial remixes required only changes to their central servers (Vice, 2016). In contrast, Audius's decentralized architecture distributes these critical

functions across a network of independent nodes, making unilateral changes technically impossible without community consensus (Audius Whitepaper, 2022).

Smart contracts provide another layer of technical resistance by automating core platform operations through transparent, immutable code. While traditional platforms can modify their payment systems or content algorithms at will, blockchain platforms encode these rules in smart contracts that execute automatically and cannot be modified without community approval. This ensures that artists' rights, revenue shares, and content availability are governed by transparent code rather than corporate policies. As demonstrated in the Audius whitepaper, even platform governance itself is automated through smart contracts, preventing the kind of corporate takeover that transformed SoundCloud from an open creative space into a traditional streaming service.

B) Token Economics Enable Novel Artist-Fan Relationships

Blockchain platforms introduce innovative economic models that fundamentally reshape artist-fan relationships and create resilient alternatives to traditional music monetization. Unlike Spotify's fixed streaming payment model, where artists earn fractions of cents per stream through complex intermediary structures, blockchain enables direct tokenization of artistic value. Through this model, artists can effectively create their own "music stocks" by tokenizing future streaming rights or revenue potential, allowing fans to become early investors in artists they believe in. This direct economic alignment between artist and fan success creates stronger resistance to corporate control than previous platforms could achieve.

The tokenization of music rights represents a paradigm shift in how artistic value is captured and distributed. While SoundCloud initially empowered direct artist-fan connections, it lacked mechanisms for fans to capture value from their early support of emerging artists. In

contrast, blockchain platforms enable what might be called a "stock market for artists," where fans can invest directly in an artist's future success. For example, an emerging hip-hop artist could tokenize 20% of their future streaming revenue, allowing early supporters to both fund their development and benefit from their eventual success (MIT Sloan, 2018). This model creates powerful network effects – as more fans invest in an artist, they become incentivized to promote and support that artist, creating organic growth resistant to traditional gatekeeping.

Community tokens also enable new forms of platform governance that align economic incentives across all participants. Traditional platforms maintain control through centralized decision-making, but blockchain platforms distribute governance rights through token ownership. Token holders – both artists and fans – can vote on platform decisions, from feature development to revenue models. This economic alignment makes corporate takeovers more difficult, as any changes that harm the community's interests would face resistance from token holders whose economic interests are directly tied to platform independence.

C) Cultural Alignment Powers Adoption and Resilience

The cultural context and values alignment between blockchain music platforms and emerging music scenes, particularly in hip-hop, plays a critical role in driving adoption and sustaining resilient alternative ecosystems.

The rise of the "SoundCloud era" in hip-hop during 2015-2017 demonstrated the power of direct artist-fan relationships and community-driven discovery. As noted earlier, SoundCloud provided a "lawless creative playground" that enabled a new generation of artists to bypass traditional gatekeepers and industry intermediaries. This aligned closely with hip-hop's longstanding ethos of independence, authenticity, and DIY entrepreneurship. Similarly, the blockchain music community's focus on decentralization, community governance, and economic empowerment of creators resonates strongly with the values that propelled the SoundCloud era's success. The tokenization of music rights and direct fan investment in artists mirror the grassroots, communal spirit that fueled the breakout of many SoundCloud-affiliated artists.

Moreover, the broader cultural trends around Web3, crypto, and "culture as an investment thesis" further strengthen the appeal and stickiness of blockchain music platforms. The appetite for speculative investment in cultural crazes (ex. memecoins like DOGE, which is sitting at a market cap of \$47.5 billion as of 11/11/24) and other crypto assets mirrors the mentality of fans who are eager to become active stakeholders in the careers of emerging artists. This fusion of music fandom and crypto investment culture creates a powerful network effect, as fans become incentivized to promote and support the artists they're invested in.

D) Bitcoin Provides Blueprint for Sustainable Alternative Ecosystems

While the technical capabilities and economic incentives of blockchain music platforms create stronger resistance to corporate consolidation, they still face potential challenges and limitations that require further examination.

Regulatory uncertainty, particularly around the legal status of crypto-based music rights and payments, could present barriers to mainstream adoption. Scalability issues with underlying blockchain networks may also limit the ability of these platforms to handle large-scale user growth and transaction volumes (Solana Whitepaper, 2017). Perhaps most importantly, the entrenched power dynamics of the traditional music industry pose persistent obstacles, as major labels and streaming services may attempt to co-opt or undermine emerging blockchain alternatives.

However, the case of Bitcoin provides a blueprint for how disruptive technologies can create sustainable alternative ecosystems even in the face of such challenges. Rather than seeking adoption by existing financial institutions, Bitcoin established a parallel monetary system so resilient that banks, regulators, and governments have been forced to adapt their own practices in response.

Blockchain vs Centralized Database	
There is no dependence on third parties.	Databases have central controls and administrators.
The data cannot be changed / deleted.	Authorized users can change / delete data.
Adding / removing parties; no change in system architecture is required.	Adding / removing parties; requires a change in system architecture.
Database management / maintenance costs are low.	Database management / maintenance costs are high.
High level verification is done with certificate verification.	User authentication; provided with username and password.
The process flow is determined without the need for changes in the system architecture.	Changing process flow requires a change in system architecture.
All users have «Open Ledger», where data is held.	The data are kept in a single centre.
It is compatible with the deed transfer process steps in the existing structure.	It is necessary to adapt the deed transfer process steps of the existing structure.
Users are provided to manage transactions in groups (Smart Contracts).	There is no structure like grouping transactions.
The blocks are stored with time stamp.	The timestamp can be added only manually.
Suitable where trust between parties is not required.	Central reliable authority is needed.
The process flow is kept together with the data in the blocks.	Process flow can be added manually with the logging mechanism.

The key lessons from Bitcoin's trajectory that may apply to blockchain music platforms include:

1. Technical innovations that resist centralized control: Bitcoin's decentralized, open-source architecture makes it virtually impossible for any single entity to unilaterally alter or shut

down the network.

- Economic incentives that align community interests: The Bitcoin network's native token (BTC) creates powerful incentives for a diverse array of participants – miners, developers, users – to contribute to the ecosystem's growth and stability.
- Cultural momentum that drives organic adoption: The grassroots ethos of financial empowerment and independence that underpins Bitcoin has resonated with a passionate global community, fueling its adoption despite regulatory uncertainty.

These factors have enabled Bitcoin to establish a parallel financial system that traditional institutions have had to acknowledge and adapt to, rather than simply absorb. Similarly, blockchain music platforms that can leverage technical, economic, and cultural alignment may be able to create resilient alternative ecosystems that major industry players are compelled to respond to, rather than simply integrate into existing power structures.

Ultimately, the conditions necessary for blockchain-based music distribution platforms to achieve lasting independence and impact go beyond just the innovative capabilities of the technology itself. Drawing on the Bitcoin blueprint, these platforms must also cultivate the economic incentives and cultural resonance needed to build parallel systems that are resistant to corporate consolidation and absorption.

IV) Conclusion

This research has demonstrated how blockchain technology introduces fundamental innovations that enable music distribution platforms to create resilient alternatives to the industry's historical pattern of centralization. Unlike previous democratization attempts like

SoundCloud, blockchain platforms leverage decentralized architectures, automated smart contracts, and token-based economics to align incentives between artists and fans, reducing vulnerability to corporate consolidation.

Specifically, the open, transparent infrastructure of blockchain networks prevents any single entity from unilaterally controlling platform governance or monetization. Smart contracts ensure artists' rights and revenue shares are transparently encoded in immutable code. Meanwhile, the tokenization of music rights empowers a "stock market for artists" where fans become direct stakeholders in emerging talent, generating organic growth that resists traditional industry gatekeepers.

The potential impact of these blockchain-based alternatives extends beyond just improving economic conditions for independent artists. By tapping into the values and cultural momentum of musical subcultures like hip-hop, these platforms have the ability to nurture greater diversity, innovation, and creative expression – in contrast to the homogenization that results from major label and streaming service dominance.

Ultimately, the findings of this research suggest that the technical capabilities, economic incentives, and cultural resonance of blockchain music platforms could enable the creation of parallel distribution ecosystems that major industry players are compelled to acknowledge and adapt to, rather than simply absorbing. Further examination of real-world case studies and expansion of the theoretical framework developed here will be crucial to fully understanding the long-term viability and transformative potential of this technology within the music industry.

References

- Geels, F. W. (2002). Technological transitions as evolutionary reconfiguration processes: A multi-level perspective and a case-study. Research Policy, 31(8-9), 1257-1274.
- Liu, A. (2024, November 10). Institutions to FOMO: Why ignoring Bitcoin may no longer be an option. Forbes.

https://www.forbes.com/sites/aliceliu/2024/11/10/institutions-to-fomo-why-ignoring-bitc oin-may-no-longer-be-an-option/

Israel, R. (2017). Revelator: The future of music rights and royalties. MIT Sloan.

https://mitsloan.mit.edu/sites/default/files/2018-10/Israel_Lab_poster-2017-Revelator.pdf

Medium. (2021). Streaming payment models.

https://medium.com/musicinfo/streaming-payment-models-981c7e6a1538

Michigan Daily. (2022). Look at me: The rise and fall of SoundCloud rap.

https://www.michigandaily.com/arts/music/look-at-me-the-rise-and-fall-of-soundcloud-ra

<u>p/</u>

Illustrate Magazine. (2020). The impact of streaming platforms on the music industry: How

Spotify, Apple Music, and others have changed the game.

https://illustratemagazine.com/the-impact-of-streaming-platforms-on-the-music-industryhow-spotify-apple-music-and-others-have-changed-the-game/

Vulture. (2017). How a hit happens now.

https://www.vulture.com/2017/09/spotify-rapcaviar-most-influential-playlist-in-music.ht

<u>ml</u>

New York Times. (2019, December 9). The tragic end of the SoundCloud rap era.

https://www.nytimes.com/2019/12/09/arts/music/juice-wrld-soundcloud-rap.html

Ditto Music. (2022). How much does Spotify pay per stream?

https://dittomusic.com/en/blog/how-much-does-spotify-pay-per-stream

Billboard. (2017). The big three record labels.

https://www.billboard.com/music/music-news/record-labels-billboard-explains-12352964

<u>00</u>

Solana Labs. (2017). Solana whitepaper.

https://github.com/solana-labs/whitepaper/blob/master/solana-whitepaper-en.pdf

Pitchfork. (2021). How rap's SoundCloud generation changed the music business forever.

https://pitchfork.com/thepitch/how-raps-soundcloud-generation-changed-the-music-busin

ess-forever/

Vice. (2016). SoundCloud strikes a deal with Universal Music Group.

https://www.vice.com/en/article/soundcloud-strikes-deal-with-universal-music-group/

Audius. (2022). Audius whitepaper. https://whitepaper.audius.co/AudiusWhitepaper.pdf

Nakamoto, S. (2008). Bitcoin: A peer-to-peer electronic cash system.

https://bitcoin.org/bitcoin.pdf

Sony. (2024). Sony develops blockchain-based rights management system "Sonerium".

https://www.sony.com/en/SonyInfo/News/Press/202408/24-029E/