The Effect of Digital Transformation on the Music Supply Chain: From Analog to Algorithm

By

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Abstract

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The Effect of Digital Transformation on the Music Supply Chain: From Analog to Algorithm

This thesis examines the digital transformation of music, tracing its evolution from vinyl records to algorithm-driven streaming, with guitar-oriented rock as a focal point. It explores how this shift—from analog production and distribution to digital consumption—has reshaped the music industry, particularly its economic and cultural implications for artists. The study contrasts the ownership model of the analog era, characterized by robust revenue streams and cohesive albums, with today's streaming landscape, dominated by singles and fragmented playlists. It argues that digital transformation has not only altered production and distribution methods but also fundamentally disrupted revenue models, often favoring major label artists despite the promise of universal consumer access. For guitar-oriented rock, this transformation has diminished its cultural prominence, relegating it to a niche market amplified by streaming algorithms that limit its visibility. Consequently, even established bands must pursue alternative income sources to sustain their careers, highlighting the profound impact of this technological shift on the genre's legacy and viability.

Table of Contents

The Effect of Digital Transformation on the Music Supply Chain: From Analog to Algorithm **1**

Abstract **2**

Chapter 1: Historical Evolution of the Music Supply Chain: From Analog to Digital Systems **4**

1.1 Dominance of Analog Supply Chains: Vinyl, Compact Discs, and Record Label Authority 4

1.2 Digitalization of the Supply Chain: MP3 Formats, Peer-to-Peer Networks, and Online Dissemination 7

1.3 Streaming Paradigm: Reconfiguration of Supply Chain Consumption 11

1.4 Synthesis: Dynamics of Music Supply Chain Transformation 15

Chapter 2: Long Tail Theory and Its Effects on the Digital Music Supply Chain **17**

2.1 Conceptual Foundations: Elucidating the Long Tail Model 17

2.2 Empirical Analysis: Guitar-Centric Rock in the Digital Supply Chain 22

2.3 Algorithmic Curation: Playlists and Gatekeeping in Supply Chain Dynamics 23

Chapter 3: Socioeconomic Effects of Digital Supply Chain Transformation **29**

3.1 Comparative Analysis: Revenue Frameworks in Analog and Digital Supply Chains 29

3.2 Remuneration Dynamics: Streaming's Effect on Artist Compensation 31

3.3 Curatorial Systems: Playlists and Algorithmic Influence on Supply Chain Outcomes 33

Chapter 4: Strategic Responses to Digital Supply Chain Challenges **35**

4.1 Resurgence of Live Performances: A Primary Revenue Channel 35

4.2 Diversification of Revenue Streams: Merchandising and Crowdfunding Strategies 37

4.3 Direct Artist-Audience Engagement via Digital Supply Chain Platforms 39

4.4 Case Studies: Independent Artists Navigating Digital Supply Chain Constraints 41

Chapter 5: Genre Transformation: Effects of Supply Chain Shifts on Guitar-Centric Rock **43**

5.1 Evolution of Rock: Subgenres and Marginalization of Traditional Configurations 43

Chapter 6: Artist Agency and Intellectual Property in the Digital Supply Chain **46**

6.1 Catalog Monetization: Strategic Divestiture of Established Repertoires 46

6.2 Navigating Uncertainty: The Post-Digital Supply Chain Era 47

6.3 Analog Media Resurgence: Vinyl and Radio in Digital Supply Chain Contexts 48

Chapter 7: Conclusion: Negotiating the Digital Supply Chain Frontier for Guitar-Centric Rock **50**

References ..... Error! Bookmark not defined.

Chapter 1: Historical Evolution of the Music Supply Chain: From Analog to Digital Systems

1.1 Dominance of Analog Supply Chains: Vinyl, Compact Discs, and Record Label Authority

The genesis of audio recording and production began on February 19, 1877 with patent filing by Thomas Edison titled, “Improvement in phonograph or speaking machines”. Edison had developed the phonograph, which was actually a cylinder of tin which could record audio (Thomas Edison National Historical Park, n.d.). Further improvements to Edison’s invention by Alexander Graham Bell and Charles Sumner Tainter would bring forth the improved audio fidelity of the graphophone; which used cylinders as well, however they were made of wax to improve audio and were more durable than the tin drums Edison first used (Reppert, 2023). A few years later, in 1887, Emile Berliner released the gramophone, which differed from Edison and Bell and Tainter’s devices by using flat discs made of zinc and vulcanite. Berliner’s gramophone set the foundation that was followed ever since by recording music into "grooves" in the disc, from which a needle would ride and amplify the sound to a horn (Reppert, 2023).

The gramophone gained popularity as both a recording medium and as the distribution medium to consumers. The gramophone continued to be improved upon throughout the decades. It became the standard media for audio playback until the advent of digital music. Additionally, the jacket of which the discs were sold became popular in their own regard based on the “liner notes” and effort and creativity put into

the album jackets and were considered works of art in their own right, as noted by Sophia Gkiosasi (n.d.). By 1948 the first Columbia Records had standardized on the 33 1/3 RPM (Revolutions Per Minute) of a disc, which provided for approximately 30 minutes of audio on each side of a disc. For the remaining decades records remained the dominant medium for music distribution (Corday, 2022).

However, for music production, Musician and inventor Les Paul was already in possession of a magnetic tape machine (courtesy of Bing Crosby) and was already thinking of how he could transpose his multi-disc recording idea into a modern multi-track tape recorder (Les Paul Foundation, n.d.). Magnetic tape had been invented decades earlier but had not gained traction yet as a medium for audio recording, for which it was superior to recording to disc. By the 1950s studios, partially based on advances developed by Les Paul, ushered in the use of magnetic tape into recording studios in lieu of disk recording, of which Abbey Road Studios was one of the first in the 1950s. Abbey Road studios had multi-track recording, based on the work of Les Paul which afforded new improvements in recording methods, such as instrument isolation, overdubs, and "layering" of sound, where perhaps a guitar part is recorded on different tracks so when played back, the sound is fuller and more nuanced (Reppert, 2023). The Beatles recorded many seminal albums at Abbey Road Studios that used the early 8-track multitrack recorders such as Sgt. Pepper's Lonely Hearts Club Band (Reppert, 2023).

By the early 1960s the studio magnetic tape, which was typically 2 inches wide, had given birth to a consumer version of magnetic tape, called the cassette tape. Developed by a consortium led by William T. Lear, of Lear Jet, the original cassette tape

was more portable and durable than a record (Ultraferric, n.d.). The first version of a cassette tape was an open loop 8 track, which meant it would play its 80 minutes of music in a constant loop; had no rewind, was prone to jam in the players, and was inferior audio-wise to both reel-to-reel tape and records (Legacybox, n.d.).

By 1963, Philips had responded to the inferiorities of the 8-track with the creation of a smaller version of the cassette, simply called the "compact cassette" (Ultraferric, n.d.). This cassette featured two reels for better tape control, markedly improved sound quality, a durable hard plastic cartridge and a significantly reduced size, making it even more portable. The cassette was originally marketed for Dictaphones but was followed by music releases on cassette as well.

For guitar-oriented genres, vinyl's significance resided in its capacity to preserve the timbral richness of analog recordings and it remained the dominant playback medium for music until the digital transformation. Jing Guo (2023) asserts that its "analog sound quality, warmth, and unique imperfections" rendered it particularly amenable to audiophiles' preferences (p. 8). This fidelity was exemplified by Led Zeppelin's early pressings, where, as Every Record Tells a Story (2014) details, UK plum-label and US editions of Led Zeppelin III achieved exceptional clarity (para. 4). Manager Peter Grant's intervention further refined this quality; in a 1989 interview, he described vinyl manufacturing's use of acid vats—cleaned biannually for rock/pop records but every ten days for classical ones—securing the latter's cleaner process to enhance the sonic integrity of Jimmy Page's guitar work and John Bonham's percussion (Every Record Tells a Story, 2014, para. 17).

Vinyl sales peaked at 341.3 million units in 1977 but dropped to 204.2 million by 1982 as cassettes, bolstered by the Sony Walkman's 1979 debut, surged from 163.8 million to 366.4 million units by 1983, overtaking vinyl as the dominant medium (Recording Industry Association of America, n.d.; Lupo, 2020). By 1982, Sony's Compact Disc player introduced CDs, which offered 70 minutes of non-degradable digital audio, surpassing LPs by 1987 and cassettes by 1991, reaching 95.7% of music sales by 2002 (Reppert, 2023; Perry, 2022).

1.2 Digitalization of the Supply Chain: MP3 Formats, Peer-to-Peer Networks, and Online Dissemination

By the late 1990s, there began a monumental challenge to the reign of physical media of all types, driven by a persistent and growing demand for increasingly portable music and made possible by accelerating technological innovation that stretched far beyond vinyl records and cassette tapes. In the early 1990s, the Moving Picture Experts Group (MPEG) debuted the MP3 format—a method of file compression that significantly reduced file sizes while maintaining excellent audio fidelity; this innovation presented a new opportunity for digital distribution and charted a new course for how music would reach listeners (Guo, 2023; Reppert, 2023).

The shift toward portability was not occurring in isolation, as the Apple II, Commodore 64, Amiga, and IBM 8088 computers entered the market from the late 1970s to mid-1980s, signaling a broader consumerization of technology (Computer

History Museum, n.d.). Of note, the earliest Amiga computers already emphasized music and video production, and by 1983, MIDI—an established standard—facilitated digital communication between devices for control and automation, with MIDI adapters available for Apple and Amiga systems (Computer History Museum, n.d.). These standards foreshadowed the digital transformation of large studios and the rise of modern home studios.

The digital transformation of music was not limited to only consumer-facing distribution as digital transformation was occurring in the recording studios as well. Digidesign released its first version of Pro Tools, a Digital Audio Workstation (DAW) in 1989, further ushering the digital transformation of commercial studios, but eventually also empowering small studios and individuals to produce quality digital recordings (Reppert, 2023). While initially limited to two tracks and expensive, Pro Tools evolved as technology progressed and it became an industry standard for recording by the mid-1990s. This reduced the reliance on large studios like Sound City Studios, which was struggling against digital technologies in the 1980s (O'Grady, 2020; Reppert, 2023). This "democratization" of music production allowed independent musicians, in particular those of guitar-oriented rock, to produce and distribute music outside traditional systems (O'Grady, 2020). Artists with home studios could now work in conjunction with a large studio via standardized tools, protocols and file types, or could work completely independently if they were not part of a record label. This also allowed collaboration globally via file sharing of common file types. It should, however, be noted that while the digital transformation and integration of studios may seem to make large studios obsolete, they still possess the professional studio space with tuned acoustic

environments, the expensive microphones, the tube amplifiers and consoles that many times are the heart of the sound and are still in very high demand even in the digital age because of their intangible "something" they are believed to bring to recorded music.

Large-scale recording studios were still instrumental in the commercial music recording ecosystem. Patrick O'Grady (2020) underscores Sound City Studios' role, where the Neve 8028 console captured seminal guitar-driven works, its centrality likened by producer Butch Vig to "the centre of the space ship" (Creative Industries Journal, p. 8). These facilities, supported by substantial label investment, produced recordings that defined rock's sonic landscape. While the transformation of audio recording for major studios was not cutting edge, they were incorporating technology to not be left behind.

By 1998, the first commercial MP3 player, the MPMan F10 by SaeHan Information Systems, emerged, delivering 32 MB of storage—approximately 40 songs—a breakthrough in portable digital playback (Brandenburg, 2011). Unlike the Walkman's tape-based system and the portable CD player, the digital format has no quality degradation with repeated plays of a song, eliminated issues like rewinding or tape jams, and improved battery life and durability due to the elimination of moving parts, further accelerating the move away from physical media. This continuation of the consumer trend toward portability is an evolution of the Walkman tape player and portable CD player, and its impact on guitar-oriented rock and album music would be immense.

In 1999, Napster launched as a peer-to-peer (P2P) file-sharing application,

allowing users to download full MP3 files from others' computers for local storage, ushering in an era of rampant piracy that completely undermined the physical sales model supporting vinyl and CD dominance (Guo, 2023; Gkiosasi, n.d.; Brandenburg, 2011). During the cassette era, copying existed via dual-cassette recorders—coveted devices that played one tape while recording onto another—but this "unauthorized duplication" paled in scale compared to Napster's wholesale disenfranchisement of musicians and record companies, critically wounding revenue streams (Guo, 2023; Brandenburg, 2011). Not only were record companies and artists financially devastated, this wholesale sharing of albums in the digital format also demolished their model of curating albums; the technological shift to digital had put the ubiquitous practice of creating a "mix tape" into hyperdrive, with consumers allowed almost unfettered access to curate their own music, picking and choosing only the "best tracks."

By 2001, Apple opened its iTunes Store and released its first iPod, creating a legal digital marketplace that championed individual track purchases over album purchases. At this time, music was still not streaming, but sold as downloadable MP3 files, and from a technical perspective it was easier to download a single, which might be 10MB versus an album, which could be 100MB or more. iTunes was immediately successful, selling 70 million songs in its inaugural year (Apple Inc., 2003; Guo, 2023; Reppert, 2023). Yet, even as the shift toward digital formats as a consumer distribution medium gained momentum, CDs continued to dominate in 2000 with 942.5 million units shipped ($13.2 billion). However, by 2004 this had declined to 649.2 million units ($9.4 billion), a decline that was overshadowed by iTunes' modest 5.5 million album-equivalent units ($190 million) that year (Recording Industry Association of America,

n.d.). Predictably, vinyl continued to lose relevance and declined to 1.5 million units in 2000, and 1.7 million in 2004, a mere fraction compared to CDs' dominance (Recording Industry Association of America, n.d.).

1.3 Streaming Paradigm: Reconfiguration of Supply Chain Consumption

The shift from Napster's (1999) peer-to-peer (P2P) file-sharing system to the centralized iTunes-based model to the cloud-based model of streaming music services like Spotify (launched in 2008) fundamentally altered music delivery. Instead of users downloading and storing full MP3 files locally, streaming sends small audio chunks from servers for instant playback, adjusting quality to internet speed and avoiding permanent downloads. This technological change, enabled by faster networks and server infrastructure, offered scalable, licensed access, unlike Napster's decentralized, piracy-prone approach (Fanning, 1999, as cited in Lessig, 2004; Guo, 2023).

"Spotify's launch—first in Sweden in 2006, then in the U.S. in July 2008—marked a turning point in music consumer distribution and consumption, driven by a subscription model as well as a free ad-supported model (Gkiosasi, n.d.). Unlike iTunes, which required users to purchase individual tracks which then had to be downloaded to a single device, Spotify offered instant streaming of a vast library of songs, eliminating both the need for users to store music themselves and the time to perform the download. This accessibility and immediacy proved highly appealing, and by 2010, Spotify had already gained 10 million users in Europe, establishing streaming as the next consumer distribution medium (International Federation of the Phonographic

Industry, 2015)."

The maturation of mobile technology, particularly the advent of smartphones like the iPhone (introduced in 2007) and the widespread availability of 3G and 4G networks, played a pivotal role in further accelerating the shift towards streaming (Computer History Museum, n.d.). The emergence and widespread consumer adoption of the smartphone represented a techno-cultural revolution. This revolution also demonstrated a growing consumer acceptance of subscription-based access to applications, music, and video, versus a 'buy-to-own' option. This consumer trend paralleled a shift in corporate strategies from a Capital Expenditure (CAPEX) model, focused on purchase and ownership, towards an Operational Expenditure (OPEX) model which prioritizes subscriptions and access-based costs. While U.S. digital album sales peaked at 117.6 million units by 2013, streaming services—including platforms such as Pandora (launched in 2005) and YouTube (2005)—were already starting to challenge this dominance, evidenced by the dramatic rise in subscriptions from a negligible level in 2010 to over 7 million by 2014 (Recording Industry Association of America, n.d.; International Federation of the Phonographic Industry, 2015).

The mid-2010s showed the growing dominance of streaming as the consumers preferred method of music consumption, and thus distribution, marking a significant shift in the music industry. Global revenue grew from $13.1 billion in 2014 to $15 billion in 2015, driven by streaming's rapid consumer adoption (International Federation of the Phonographic Industry, 2015). This trend accelerated in the U.S., where streaming revenue overtook downloads in 2016, hitting $4.1 billion (51.4% of total revenue) compared to downloads' $1.7 billion (21.6%), while at the same time physical sales

continued experiencing significant declines, falling to $2.1 billion (25.7%) (Recording Industry Association of America, n.d.).

By 2020 streaming was the dominant music distribution mechanism, with U.S. revenue at $10.1 billion (85% of total), and both physical sales and downloads reduced to single percentages of overall distribution revenue; ($0.6 billion, 5%) and ($0.5 billion, 4%) respectively. Globally, streaming comprised 62.1% of recorded music revenue ($13.4 billion), fueled by platforms like Spotify (446 million users by 2022), Apple Music (launched 2015), and Amazon Music (Guo, 2023).

Through subscription or ad-supported tiers, streaming provides access to an immense, cloud-based library of music, marking a significant departure from the traditional model of purchasing individual tracks or albums (Guo, 2023). Platforms such as Spotify operate by aggregating millions of songs and distributing royalties to artists and labels through licensing agreements tied to stream counts, a system that depends on internet infrastructure rather than the production of physical goods (Gkiosasi, n.d.). This model further reduces music, particularly genres like guitar-oriented rock that benefit from a cohesive album experience, into its individual songs, virtually eliminating the album's curatorial aspect.

Streaming disrupted unit sales, with U.S. labels earning $14.6 billion from 942.5 million CDs in 1999. This dropped to $4.1 billion in revenue by 2016 via streams ($0.006–$0.008 each), but rebounded to $21.6 billion globally by 2020, though favoring platforms and labels over artists. CD shipments continued to decline and fell from 649.2 million ($9.4 billion) in 2004 to 31.6 million ($0.4 billion) by 2020 (Recording Industry

Association of America, n.d.; Guo, 2023; International Federation of the Phonographic Industry, 2015).

The evolution of music distribution, from analog formats to digital streaming, demonstrates a series of disruptive transformations, beginning with the dominance of vinyl in the mid-20th century, progressing through cassettes' portability and CDs' digital precision to downloadable MP3's, to streaming's cloud-based, subscription-driven access in the early 21st century (Reppert, 2023; Guo, 2023). Each of these transformations—from the distribution of 341.3 million vinyl units in 1977 to streaming's 85% share of U.S. music revenue ($10.1 billion) by 2020—involved technological advancements that significantly altered music production, distribution and consumption patterns. They disrupted the legacy revenue models which relied on physical format sales while catering to the changing consumer preference for portability, immediacy, subscription-based access to music (Recording Industry Association of America, n.d.). Contemporary streaming platforms, like Spotify, provide access to millions of tracks, creating an unprecedented catalog breadth that presents both a challenge to the economic viability of genres like guitar-oriented rock and an opportunity for niche music—a duality explored through the Long Tail theory (Guo, 2023; Anderson, 2006), which will be examined in chapter 2.

While the disruption and realignment of music distribution might seem to be the only outcome of the digital transformation in music, it must also be understood that a major factor in distribution is the production of music itself, the creative process, and that has been profoundly understood as a positive transformation for musicians. As noted, with the advent of ProTools in the 1990s and scores of high-end competitors in

the DAW market now, independent music can and is being produced by individuals in home studios, or in studios with a fraction of the resources available to the still existent “major studios” (Reppert, 2023; O’Grady, 2020). Spotify and other streamers now distribute millions of tracks produced by independent or small studios, providing a viable avenue for exposure that didn’t exist. Knowing where we stand now, it’s time to put in context the new paradigm of the music supply chain. Today, platforms like Spotify host millions of tracks, enabling unprecedented catalog depth that challenges the economic viability of guitar-oriented genres yet opens avenues for niche music—a dynamic poised for analysis through the Long Tail theory (Guo, 2023; Anderson, 2006).

1.4 Synthesis: Dynamics of Music Supply Chain Transformation

One of the reasons guitar-oriented rock flourished in the vinyl days was because of their expansive songs and embrace of atmospheric concepts that weaved songs together into a coherent album (Sharma). This ability to have a dynamism within an album of songs of differing characters and tempos created albums which were something more akin to a movie than a TV show. By comparison, singles are more like a TV show, they are less thematic, more concise, obviously shorter, and like a TV show, their commercial value in the early days was clearly as a means to provide content, around which "commercials" could be placed, just like in television.

As noted by *Rolling Stone Staff* (2022), a concept album is generally a collection of songs tied together by a common theme, mood, or stylistic elements. Albums such as *Pink Floyd’s The Wall*, *The Beatles’ Sgt. Pepper’s Lonely Hearts Club Band*, *David Bowie’s The Rise and Fall of Ziggy Stardust and the Spiders from Mars*, and *The Who’s*

Tommy are often regarded as definitive examples of the rock concept album. Even to a lesser degree, many rock albums were designed to be experienced as cohesive works, intended to be listened to in full rather than consumed as isolated hit singles. It is not uncommon to hear a rock song and immediately recognize the album it comes from based on its sonic characteristics—even if the album itself is not a strict concept album. While the concept album is not exclusive to rock—Frank Sinatra's *In the Wee Small Hours* (1955) is a notable early example—rock music more fully embraced the album as the atomic unit of musical expression. In contrast, pop music has traditionally treated the individual song as the core product (Rolling Stone Staff, 2022).

Therefore, a grave challenge to guitar-oriented music was the dissection of the album into its song components by digital and then streaming formats. While singles had existed since the vinyl days, in particular for guitar-oriented rock, the album was the more dominant format, and songs were carefully selected by record companies and artists for distribution as a single; the key takeaway here is who determined what songs could stand alone from the album. For instance, Led Zeppelin's "Heartbreaker" leads into "Living Loving Maid," Pink Floyd's "Happiest Days of Our Lives" into "Another Brick in the Wall, Pt. 2," Beatles' "Sgt. Pepper's" into "With a Little Help from My Friends," Van Halen's "Eruption" into "You Really Got Me"; just some examples of the thought process on creating an album versus a single where the emphasis was to create an overriding theme of which each song was a component (Every Record Tells a Story, 2014).

Additionally, while many guitar-oriented albums contain the songs you may know and love from the radio, one of the levers the artists and record companies used to both sell albums and make more money was to not put out singles, thus forcing people to

buy the entire album. But this also meant that buyers were often introduced to the other song components of an album, and because they often share an overarching “feel” and consistency, they are received in context and appreciated. Again, very unlikely one would download Van Halen’s “Intruder” as a single, but when it’s a lead-in to “Pretty Woman,” it makes sense because of how the artist and record company curated the listening experience as part of a cohesive album. A key point is that at this time the artists and record companies were still able to create albums and, at their choosing, release singles to somewhat control how an artist is presented to consumers. While this curatorial aspect does exist to some extent in pop music today, its perspective is driven by the song as the atom unit of music, i.e., for rock, the song fits the album, whereas for pop the album is a wrapper around various songs.

Chapter 2: Long Tail Theory and Its Effects on the Digital Music Supply Chain

2.1 Conceptual Foundations: Elucidating the Long Tail Model

To understand the concept of Long Tail theory, it’s best to contrast it with a typical retail record store from the 1990s like Tower Records, or a physical bookstore like Borders. Because they are brick and mortar, their available display and inventory space is finite. A record store would carry maybe multiple Led Zeppelin albums or many Van Halen albums, because they are popular and a known commodity, and they will sell and make money for the store. This applies to virtually all physical items that are for sale.

In addition to spatial constraints, a physical record store's customer base is limited by its geographical reach. A store in Ann Arbor, for instance, would typically serve customers from the town and its surrounding neighborhoods. It's unlikely that a customer would travel from a distant location such as Florida to Ann Arbor just to visit that store. As a result, the store's potential market is inherently limited. This limitation necessitates carefully curating the store's inventory to prioritize fast-selling records and optimize retail space. Consequently, genres with limited appeal, such as 1930s Italian Jazz, are rarely given prominent shelf space, as they are considered an inefficient use of resources.

The Long Tail Theory arose from Chris Anderson’s observations as Wired magazine editor and was initially articulated in an October 2004 article inspired by digital music platforms like Rhapsody, where sales of niche tracks collectively approached those of mainstream hits (McDonald, 2008; Coelho & Mendes, 2019). Anderson further developed the theory in his 2006 book The Long Tail: Why the Future of Business Is Selling Less of More, in which he argued that the internet’s virtually unlimited distribution and low-cost storage capacity would drive a shift in demand away from a small number of blockbusters toward a vast range of niche products, thus flattening the demand curve away from the "head" (Tan et al., 2017). In essence, the Long Tail Theory suggests that the internet allows a business to function like a Tower Records with the capacity to stock every record ever made and the market reach to operate a retail outlet in every neighborhood, offering unlimited inventory, including even niche genres like 1930s Italian Jazz, to service every potential customer base (Lewis, 2016).

The Long Tail Theory rests on the principle that popularity is distributed unevenly: a small number of highly popular items receive the majority of attention, while a vast quantity of less popular items extend behind them, forming a long tail (McDonald, 2008; see Figure 1).

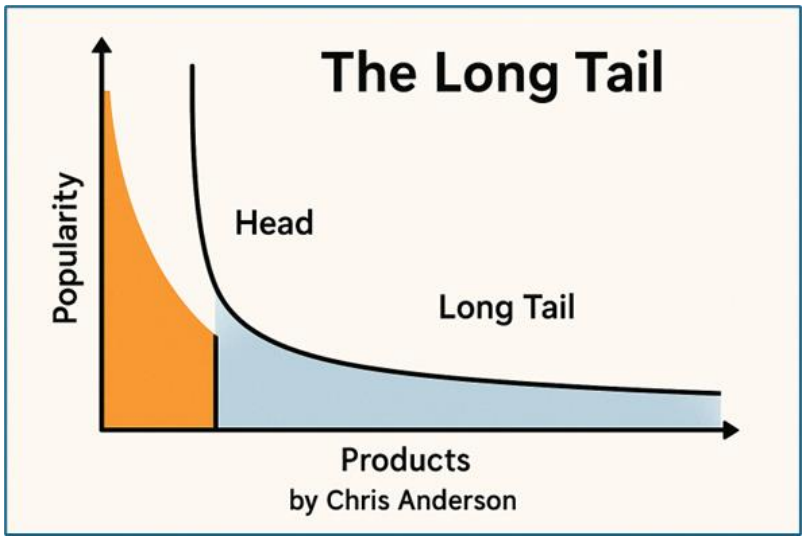


Figure 1. Diagram of the Long Tail Distribution Note. Image generated by ChatGPT (OpenAI, 2025) using the prompt “Create image of Long Tail by Chris Anderson.” Used under OpenAI’s academic use permissions.

This contrasts with the operational model of traditional retail stores, which historically prioritized stocking high-volume products aimed at the average consumer, resulting in a bell-shaped distribution curve, the ends of which were limited by finite store capacity. Anderson posited that digital technology, driven by the exponential growth in computing power and affordability as posited by Moore’s Law, eliminates the limitations of physical retail space, revealing a potential consumer preference for niche products over mainstream hits (Coelho & Mendes, 2019). In the context of music, this implies that less widely known guitar-oriented music or 1930s Italian Jazz, previously excluded from physical record shops, can gain prominence in the online environment

(Coelho & Mendes, 2019). For music, this means lesser-known guitar songs, ones you'd never find in a record shop, could finally get a chance to shine online.

Across both retail and music industries, the Long Tail Theory elucidates how digital platforms facilitate a fundamental shift in consumption, moving it away from a focus on mass-market 'hits' and toward a greater emphasis on niche products (McDonald, 2008; Coelho & Mendes, 2019; Tan et al., 2017; Lewis, 2016). Three digital drivers underpin the theory: global market scale with massive customer base, reduced storage costs, and negligible distribution costs (McDonald, 2008). Coelho and Mendes (2019) note that platforms like iTunes and early peer-to-peer networks "stock virtually everything," catering to specialized tastes (p. 455). While a local music store may stock 5,000 CDs locally whereas digital distribution has a virtually unlimited stock of millions globally, with niche sales—like "ones-ies and twos-ies"—forming a significant share (McDonald, 2008). Lewis (2016) extends this, arguing that pre-internet retail expansion—e.g., malls and specialty stores—already fostered niche proliferation, suggesting the Long Tail predates digital disruption. Of key importance in Anderson's theory is that it believes that the breadth of volume of the tail provides not just access to the market, but actually that the high-volume sales of unpopular media would ultimately add up to more than the high volume of popular media.

As a consequence of the dynamics described by the Long Tail Theory, niche products have proliferated to such an extent that they now outnumber traditional 'hits' by orders of magnitude (McDonald, 2008; Coelho & Mendes, 2019; Lewis, 2016). Artists such as Billie Eilish, Lorde, and The Weekend exemplify the Long Tail. Arguably, all these artists progressed from the "tail" of the music distribution inventory to the

Superstar "head" of the distribution curve. Proponents of the Long Tail would contend that this exemplifies how independent artists are discovered due to the virtually limitless variety of artists available on the internet, a phenomenon unlikely in the era of physical media, when their anonymity would have precluded them from securing a coveted slot in a record, tape, or CD bin at a local record store (Lewis, 2016). Essentially, the theory posits that an artist on the tail—a niche artist outside the purview of a Tower Records—gains exposure and either: a) achieves mainstream popularity, moving towards the 'head' of the curve, or b) contributes to the aggregate sales of many 'one-off' artists, which can surpass the sales volume of popular artists like Taylor Swift at the 'head'.

The Long Tail Theory appears to be supported by the success of artists like Billie Eilish; however, alternative theories, notably the Superstar theory (Hefti & Lareida, 2021), present a different interpretation whereby real-world information overload and competition come into factor in a way that is absent from Long Tail's predictions on consumer behavior. Superstar Theory says that consumers have limited attention that ultimately gets concentrated on the smaller group of “superstar” products, in this case, artists, which then creates market imbalance favored towards those superstars and away from the niche, as proposed by Long Tail (Hefti & Lareida, 2021). The analysis will further explore how algorithms and playlist curation within streaming platforms influence song recommendations and plays. This analysis will indicate that while streaming offers broader access to niche artists, the methods of artist promotion on these platforms often mirror the playlist-driven gatekeeping of traditional radio, albeit with greater sophistication (Coelho & Mendes, 2019).

Anderson’s initial vision in 2004—influenced by platforms like Rhapsody and

early shifts towards digital platforms such as Napster—imagined a music market where niche guitar tracks and Italian jazz could compete with mainstream hits (McDonald, 2008; Coelho & Mendes, 2019). That is, the aggregate sales volume of niche guitar music, Italian jazz, etc. would rival the sales volume of single superstars that occupy the 'head'. However, this optimistic view is challenged by Tan et al. (2017), who argue that increasing variety leads to a dilution of demand across all products, allowing hits to maintain their appeal due to consumer familiarity (p. 646). Further complicating the theory's applicability to music, Lewis (2016) contends that the growth of niche retail even before the internet (e.g., specialty apparel brands) casts doubt on the internet's exclusive role in fostering niche consumption.

The conflicting evidence presented thus far frames a crucial question for guitar-oriented music: does the Long Tail Theory fulfill its potential to empower niche subgenres, as Anderson originally envisioned, or does it ultimately serve to reinforce the prominence of superstars, as later findings suggest? While the theory's genesis in early digital music platforms represented a transformative moment, its development has also exposed certain limitations, necessitating further examination within the context of streaming platforms (Tan et al., 2017; Lewis, 2016).

2.2 Empirical Analysis: Guitar-Centric Rock in the Digital Supply Chain

For guitar-oriented and niche music genres like rock, blues, and indie, the Long Tail Theory suggests an expansive consumer reach for niche music. Digital platforms—such as Spotify, YouTube, and Bandcamp—leverage virtually limitless storage capacity

to allow independent artists within these genres to access a worldwide consumer base, unconstrained by the geographic or inventory restrictions inherent in traditional retail (McDonald, 2008). This shift in distribution models theoretically enables niche guitar-oriented and niche music, previously limited by physical distribution, to find a viable audience, as the digital environment facilitates a market where the combined demand for less popular works may rival that of mainstream products (Coelho & Mendes, 2019).

Several examples illustrate this potential for niche artists to achieve mainstream prominence in the digital space. Arguably, guitarists like Tosin Abasi, Guthrie Govan, Misha Mansoor, Mateus Asato, and Matteo Mancuso—whose innovative techniques and distinctive styles initially garnered attention through online platforms, demonstrate how being on the tail facilitated the exposure necessary to garner popularity. However, it's important to emphasize that online metrics like views, hits, likes, and subscriptions indicate recognition and notoriety but do not translate to financial success through music sales.

2.3 Algorithmic Curation: Playlists and Gatekeeping in Supply Chain Dynamics

However, this optimistic interpretation is countered by the countervailing force of the Superstar effect, a phenomenon in which a small number of prominent artists disproportionately dominate consumption within a market, thus overshadowing lesser-known contributors (Rosen, 1981). Similar to the dynamics of physical media, streaming exhibits a clear concentration of attention around major artists who possess the advantage of pre-existing popularity (as a known commodity) and the backing of major

labels, which exert influence on secure top placement in playlists and algorithms. Additionally, the Superstar effect, as posited by Hefti and Lareida (Hefti & Lareida, 2021), notes the real-world factors to the unlimited choices available in the Long Tail Theory: namely, the concept of Choice Overload.

Coelho and Mendes (2019) emphasize the extreme skew on streaming services like Spotify, where roughly 1% of artists receive almost 80% of total streams, a result of algorithmic curation and promotional strategies that favor established acts (p. 458). This digital replication of traditional gatekeeping—similar to how radio playlists are curated—implies that despite the theoretical access afforded to niche artists, including those in guitar-oriented genres, their visibility is still limited by systems that prioritize commercially dominant entities, thereby challenging the Long Tail's predicted diffusion of demand (Tan et al., 2017).

Although the Long Tail Theory appears conceptually robust, its practical efficacy is constrained by the realities of consumer behavior amidst vast digital catalogs. The theory's premise might suggest that providing access to millions of music tracks—or, analogously, 10,000 television channels—ensures that each listener can discover (and purchase) content aligned with their preferences. In practice, however, individuals are unlikely to manually sift through such an extensive array of options unassisted, a limitation that parallels the impracticality of navigating thousands of television channels. This phenomenon of choice overload (Hefti & Lareida, 2021) restricts the theory's capacity to democratize access to niche guitar-oriented music which may exist at the far reaches of the "tail", as the sheer volume of available content exceeds typical user engagement thresholds.

The pivotal challenge to the Long Tail Theory arises from the indispensable role of algorithmic assistance within streaming services, which fundamentally mediates music consumption. Platforms such as Spotify develop algorithms to recommend tracks, ostensibly based on inferred user preferences but also potentially designed to promote specific content (Coelho & Mendes, 2019). These algorithms may serve music that aligns with perceived listener tastes—often mainstream selections—or reflect the platform's commercial interests, such as prioritizing artists with favorable licensing agreements. Consequently, while niche guitar-oriented works are theoretically accessible, their discoverability is contingent upon algorithmic prioritization, which frequently reinforces established patterns of consumption rather than broadening exposure to the tail.

The algorithms and playlists are shaped by key stakeholders, notably streaming platforms and major record labels, whose economic leverage—stemming from their control over extensive music catalogs, substantial revenue streams, and historical equity stakes in platforms like Spotify—enables them to lobby for their artists' prominence. Streaming services craft algorithms using proprietary data analytics, integrating collaborative filtering, content analysis, and user behavior metrics, yet the process remains opaque (Tan et al., 2017). Universal Music Group (UMG), Sony Music Entertainment (SME), and, until 2018, Warner Music Group (WMG) held significant stakes in Spotify—UMG at 3.5%, SME at 2.85% post-2018 sales, and WMG at 2% before full divestment—securing financial influence that parallels their historical radio lobbying power (Stassen, 2018). These labels negotiate with platforms to prioritize their artists in curated playlists and algorithmic recommendations, suggesting a resurgence

of label dominance over digital distribution, potentially at the expense of independent guitar-oriented artists unless they secure comparable representation (Coelho & Mendes, 2019).

Major labels' control over "must-have" catalogs further entrenches their influence, a point emphasized by Google in its submission to the UK's Competition and Markets Authority: "Having a full set of licenses from the major record labels is non-negotiable for streaming services," with the potential loss of a catalog like Universal's deemed "fatal" due to its considerable negotiating strength (Stassen, 2022). According to Google, this control is based on three factors: the majors labels ownership of essential repertoires, the varying importance of streaming services in the market, and the relative ease with which consumers can switch platforms if vital content is absent, coupled with the labels' larger profit share compared to streaming providers (Stassen, 2022). This ongoing leverage illustrates an adaptive approach by record companies, who, following initial setbacks during the analog-to-digital transition, have adapted to the digital environment by prioritizing artist catalog control to retain significant influence—if not direct command—over the music supply chain (Lewis, 2016).

For instance, if Spotify lacked access to Taylor Swift's catalog—a cornerstone of Universal's offerings—it risks losing subscribers to competitors, illustrating how labels wield authority through catalog control, a mechanism that echoes their historical dominance and constrains the Long Tail's promise for niche guitar-oriented artists lacking such backing. Swift's catalog, emblematic of Universal's "must-have" repertoire, underscores the precarious position of streaming services, which depend on securing licenses from major labels to retain market viability, thereby reinforcing the hierarchical

structure that favors established artists over independent guitar-centric creators.

To further emphasize the market balancing act that occurs in streaming we can look to legacy rock star Neil Young. In 2022 Young pulled his music from streaming giant Spotify over his objections to Spotify hosting the #1 podcaster in the world, Joe Rogan, who he accused of spreading disinformation (Savage, 2024). Regardless of the claims, Spotify simply did a calculus of the value of maintaining the massive Joe Rogan audience, and the ad revenue it afforded, compared to maintaining access to the music catalog of a popular rocker. This was an attempt by Young to leverage his catalog strength in brutalist form to modify the streaming playlists (in a sense). Obviously in this case he was the underdog, but if this was Taylor Swift, The Beatles, or a consortium of artists one can project the potential effect they could have on the curatorial aspect of streaming playlists.

A primary challenge to the Long Tail Theory stems from the essential role of algorithmic curation within streaming services, which fundamentally shapes how music is consumed. Streaming platforms like Spotify utilize algorithms to recommend tracks, purportedly based on inferred user preferences but also potentially designed to promote specific content for commercial reasons (Coelho & Mendes, 2019). These algorithms may prioritize mainstream selections aligned with perceived listener tastes or favor artists with advantageous licensing agreements, reflecting the platform's commercial interests. As a result, while niche guitar-oriented music is theoretically available, its discovery depends on algorithmic prioritization, which often reinforces existing consumption patterns instead of expanding exposure of music at the tail. Of course, this is neither surprising nor wrong, as listeners likely prefer popular music. Streamers, in

turn, aim to maximize listeners for increased ad revenue, which is a core business objective.

The application of the Long Tail Theory to guitar-oriented music in the digital age reveals a landscape of both unprecedented opportunity for niche artists to access broad markets they could never reach before while also being confronted with algorithmic gatekeepers that favor superstar dominance on curated playlists. Lewis (2016) notes that niche proliferation predated digital platforms, suggesting an inherent resilience within guitar-centric genres, yet contemporary streaming dynamics underscore the Superstar effect's enduring influence (Coelho & Mendes, 2019). This dichotomy necessitates a nuanced examination of how digital mechanisms—such as algorithmic prioritization and playlist curation—mediate the exposure and discoverability, and thus the economic viability of guitar-oriented niche music.

Chapter 3: Socioeconomic Effects of Digital Supply Chain Transformation

3.1 Comparative Analysis: Revenue Frameworks in Analog and Digital Supply Chains

The ownership model of physical media relied on unit sales, delivering predictable revenue streams that favored guitar-oriented genres. Vinyl, at its 1977 peak, generated $2.56 billion from 341.3 million U.S. units at $7.50 each (approximately $12 billion in 2025 dollars), while CDs in 1999 yielded $14.6 billion from 942.5 million units at $15.50 each (Recording Industry Association of America, n.d.). For artists, a $10 CD sale at a 20% royalty produced $2–$3 per unit, enabling albums like The Eagles' Their Greatest Hits (1971–1975)—with 38 million copies sold by 2020—to amass over $76 million in artist revenue alone (assuming $2 per sale), funding expansive guitar-driven production (Recording Industry Association of America, n.d.).

This ownership model capitalized on guitar music's strengths, as LPs (30 minutes per side) and CDs (74 minutes total) supported extended compositions like Led Zeppelin's "Stairway to Heaven" (8:02) or Lynyrd Skynyrd's "Free Bird" (9:08), with labels bundling hits and deeper cuts to maximize sales (Every Record Tells a Story, 2014). Peter Grant, Led Zeppelin's manager, famously barred the release of singles, compelling fans to purchase entire albums like Led Zeppelin IV to enjoy "Stairway to Heaven." This boosted revenue beyond the $0.50 a single might have earned (Ashlock, 2018) to the full album price—around $7.50 for a cassette—unveiling a powerful

marketing strategy that enhanced both record company and artist earnings.

In contrast to the ownership model, the access model significantly dilutes the direct revenue to the artist, as streaming pays fractions of a cent per play, requiring a massive volume of listeners to rival ownership's per-unit earnings. This shift fundamentally alters the economic landscape for artists, particularly those in genres like guitar-oriented music that rely on fewer, longer tracks rather than high-frequency plays. Where Grant's strategy ensured consumers bought Led Zeppelin IV for "Stairway to Heaven," generating $2–$3 per $10 album, streaming's access model, on the other hand, allows listeners to isolate the track for $0.004 per play, undermining the revenue pull of top songs and cohesive albums (Ashlock, 2018).

The ownership model had transitioned with digital downloads, remaining unit-based purchasing of music. However, even as iTunes' retained the ownership revenue model the $0.99 tracks generated a meager $0.20–$0.30 per artist—significantly less than the $2–$3 per artist from a $10 CD (Apple Inc., 2003). To illustrate, a guitar album like Pink Floyd's The Wall, which amassed $46 million in artist revenue from 23 million copies sold by 2020 (at $2 per $10 CD), would necessitate a staggering 153 million track downloads at $0.30 each to achieve the same revenue, a dramatic reduction in per-unit value (Recording Industry Association of America, n.d.). Streaming furthered this shift toward full access, where revenue is tied to plays rather than purchases, further disadvantaging cohesive guitar-oriented music.

In contrast, streaming's access model generated $20.7 billion globally in 2024 (70% of $29.6 billion total revenue), with subscription streaming (apart from ad-based

streaming) accounting for $15.15 billion from 752 million users (Stassen, 2025). At $0.004 per stream, a $10 CD's $2 artist share requires 500 streams, but a 7-minute track like Rush's "2112" needs over 5,800 streams to hit $23.20—far exceeding a CD's single-sale return (Guo, 2023; Stassen, 2025). Spotify's 10,000th-ranked artist earned $131,000 in 2024 from 32.75 million streams, while a million streams of Tool's Fear Inoculum's 10 tracks (80 minutes total) yields just $4,000, versus $2.7 million from 270,000 debut-week CD sales in 2019 (Spotify, 2023; Billboard, 2019).

3.2 Remuneration Dynamics: Streaming's Effect on Artist Compensation

Unlike the ownership model, where artists directly earned money from their music sales, streaming operates on a pro-rata system. In this system, revenue from all streams is pooled and then distributed based on overall play counts, a mechanism that inherently favors high-volume artists. If we reflect on the idea of Long Tail theory, this would mean those niche artists at the end of the tail, earning very little, are having their small earnings pooled with high-volume artists, and then the aggregate is divided based on streams. This contrasts sharply with the tangible returns of ownership, where, for example, 5,000 CD sales at $2 each yielded $10,000 for artists. In the streaming access model, generating comparable revenue demands a disproportionate 2.5 million streams to earn a comparatively meager $10,000, a disparity that is worsened for niche genres with typically lower play counts (Spotify, 2023). This imbalance is further compounded by major labels, who leverage their negotiation power and historical equity stakes (e.g., Universal's 3.5% pre-2018) to dominate 81% of Spotify's top 100 playlists (Amos, 2021;

Stassen, 2018).

Proponents argue streaming broadens revenue distribution, with 71,000 artists earning $10,000+ and 1,500 exceeding $1 million on Spotify in 2024—80% uncharted in the Top 50—versus the CD era's top 50 artists taking 25% of $14.6 billion ($3.65 billion) (Spotify, 2023). However, guitarists like Tosin Abasi still face a steep climb: 2.5 million streams for $10,000 vs. 5,000 CD sales for $10,000. Ownership's direct revenue model dwarfed access's trickle of revenue; even $1 million (250 million streams) is less than a million-CD album's $2 million.

This dramatic revenue contrast—ownership's $2–$3 per unit compared to access's paltry $0.004 per stream—highlights a transformational shift for guitar-oriented music. To illustrate the challenge, Tool's Fear Inoculum (2019) generated $2.7 million from 270,000 CD sales in a single week, a figure that would require an almost impossible 675 million streams to replicate via streaming, especially given its 80-minute runtime (Billboard, 2019). While streaming's $20.7 billion in 2024 significantly exceeds physical sales' $4.8 billion, its fractional per-play payouts erode the economic viability of guitar-driven genres which force artists to seek alternative income streams (Stassen, 2025).

In 2024, streaming's $20.7 billion global revenue (70% of total recorded music) has fundamentally shifted artist earnings from ownership's per-unit model to play-based payouts of a mere $0.003–$0.008 per stream, dramatically reshaping financial outcomes (Stassen, 2025; Guo, 2023). This system heavily favors major labels, who typically retain 50–90% of revenue, thus amplifying earnings for high-volume artists

while leaving independents struggling (Pandora CloudCover, n.d.). Furthermore, the major labels leverage their existing influence to negotiate more favorable revenue splits with streaming platforms, exacerbating the divide between superstar and niche artists (Pandora CloudCover, n.d.).

3.3 Curatorial Systems: Playlists and Algorithmic Influence on Supply Chain Outcomes

The influence of editorial play lists is significant for artist visibility, yet these playlists are heavily skewed toward major labels, with 81% of the top 100 tracks featuring their artists (Amos, 2021). For example, indie guitarist Bernth gained only 54,000 streams (0.54%) from editorial playlists despite active promotion, netting $41,243 from 10 million total streams, while superstars like Taylor Swift earned $387.6 million from 96.9 billion streams, and Drake $331.4 million from 82.8 billion, through such placements (Bernth, 2023; Newman, 2025). According to Hefti and Lareida (2021), this reflects a Superstar effect, where major labels' investments in attention-grabbing strategies (e.g., lobbying) secure playlist dominance.

Algorithmic playlists, like “Discover Weekly,” drive 4.2 million of Bernth’s streams (42%), outpacing editorial impact, as Spotify prioritizes engagement (Bernth, 2023). Yet, algorithms favor high-frequency genres, disadvantaging guitarists with longer tracks—e.g., Tool’s Fear Inoculum (80 minutes) yields $27 per 6,750 streams vs. $2.7 million from 270,000 CDs—limiting indie earnings to $10,000–$131,000 (Billboard, 2019; Spotify, 2023). For Swift and Drake, algorithmic boosts amplify their billions of streams, with labels taking 50–90% cuts, netting them $38.8–$193.8 million and $33.1–$165.7

million respectively after splits (Newman, 2025; Pandora CloudCover, n.d.).

User-generated play lists offer independents organic reach, yet 2.5 million streams yield just $10,000, far below 5,000 CD sales' $10,000 (Bernth, 2023; Recording Industry Association of America, n.d.). Paul Davie's $6,000 for 4.7 million YouTube views relies on cross-platform efforts, contrasting Drake's scale (Newman, 2025; Davie, 2023). Hefti and Lareida (2021) suggest this Power Law dispersion stems from competitive attention, where labels' salience outshines niche acts.

Algorithms prioritize replay able tracks, skewing against guitar genres—e.g., Fear Inoculum's low streaming yield vs. Swift's short-hit-driven success (Billboard, 2019; Newman, 2025). Mary Spender's $423,500–$1,270,500 from 84.7 million YouTube views shows blending gear content helps, yet streaming payouts lag (Spender, 2023). Hefti and Lareida (2021) argue that choice overload shrinks consideration sets and favors dominant players.

Independents counter with pitching (Bernth's 10 million streams) and diversification (Davie's $95,000 gear video), yet returns lag (Bernth, 2023; Davie, 2023). Spotify's 71,000 artists at $10,000+ show access, but 1,500 at $1 million+—80% uncharted—hint at niche potential, not parity (Spotify, 2023). Hefti and Lareida (2021) predict this Superstar bias persists as entry intensifies attention competition.

Playlists and algorithms amplify major label earnings while independents struggle, with Bernth, Davie, and Spender's earnings dwarfed by Swift and Drake's, as Hefti and Lareida (2021) link label dominance to attention scale and Power Law effects (Newman, 2025; Bernth, 2023; Davie, 2023; Spender, 2023).

Chapter 4: Strategic Responses to Digital Supply Chain Challenges

4.1 Resurgence of Live Performances: A Primary Revenue Channel

In the 1970s and 1980s, live performances functioned primarily as a promotional "loss leader," designed to stimulate album sales, which formed the music industry's core product. For instance, vinyl sales peaked at $2.56 billion in 1977 (341.3 million units at $7.50 each), with artists like Led Zeppelin earning $2–$3 per $10 LP—e.g., Led Zeppelin IV's 23 million copies generated $46 million—while Peter Grant strategically limited tours to maximize those sales (Recording Industry Association of America, n.d.; Ashlock, 2018). Today, however, streaming's meager $0.004 per-stream payout has inverted this dynamic, transforming live shows into a primary revenue stream, with Live Nation reporting 151 million fans at 55,000 events in 2024, yielding $23.16 billion (Tencer, 2025).

In the past, 1970s acts like The Who frequently incurred financial losses from touring, using it primarily to promote LPs such as Their Greatest Hits (which sold 38 million copies and generated $76 million), with costs outstripping ticket revenue (Recording Industry Association of America, n.d.). Today, however, live music has become the dominant revenue source, surpassing even streaming—as demonstrated by Live Nation's $23.16 billion in concert revenue in 2024 vs. $20.7 billion industry-wide from streaming—allowing independent artists like Paul Davie to earn $15,000 from a

smaller 500-fan performance at $30 each, tripling his $6,000 income from 4.7 million YouTube views (Tencer, 2025; Davie, 2023). While big-name performers can still make substantial revenue from streaming, mid-tier bands increasingly depend on live performance because they have a greater return for effort, and the revenue split is more lucrative for them (Newman, 2025).

Guitarist Tosin Abasi demonstrates the economic advantage of live performances, offsetting a modest streaming revenue of $188,000 from 47 million YouTube views with revenue from performing—for example again, 500 tickets at $30 each generate $15,000 for him which significantly surpasses the equivalent of 3.75 million streams (Recording Industry Association of America, n.d.). In the 1980s, touring often resulted in financial losses, serving primarily to promote $10 CDs, but today's higher ticket prices ($20–$100) and lucrative VIP packages (e.g., $200 meet-and-greets) allow artists to turn substantial profits even without significant records sales or streams. Live Nation's 60 million Venue Nation attendees in 2024 underscore the scale of this live music economy, though independent artists often lack access to such established infrastructure (Tencer, 2025). Hefti and Lareida (2021) contend that live settings provide a focused attention that mitigates streaming's choice overload.

Major labels leverage Live Nation's extensive infrastructure—projecting 65 million tickets sold in 2025 and a 60% increase in stadium shows—to generate substantial revenue, reaching into the hundreds of millions for superstar acts (Tencer, 2025). By contrast, independent guitarists like Bernth rely heavily on smaller venues, earning significant income from gigs—e.g., $45,000 from 1500 attendees at $30 each—eclipsing his $41,243 from 10 million Spotify streams (Bernth, 2023). This shift

underscores a broader trend: while streaming's $0.004 per stream struggles to sustain non superstar artists, live performances offer a viable lifeline, with 2024's $23.16 billion in concert revenue dwarfing streaming's $20.7 billion, affirming the growing primacy of live income over recorded music sales (Tencer, 2025; Stassen, 2025).

4.2 Diversification of Revenue Streams: Merchandising and Crowdfunding Strategies

Merchandising has emerged as a critical revenue stream, capitalizing on fan loyalty cultivated through live shows and digital platforms. Jack Gibson of Exodus quips, "I'm a t-shirt salesman," reflecting how merchandise now rivals music as a financial pillar in the band's revenue stream, with fans spending $20–$50 per item at gigs (Simpson, 2024). Unlike the 1980s, when touring promoted $10 CDs yielding $2–$3 per artist, today's $40 hoodies or $25 shirts at concerts offer higher margins—e.g., $15–$20 profit per sale after costs—making merchandising a lucrative complement to ticket sales (Recording Industry Association of America, n.d.). Live Nation's 2024 data shows fans spending $2 billion on venue merchandise, amplifying artists' earnings beyond streaming's trickle (Tencer, 2025).

Digital platforms enhance merchandising by enabling direct-to-fan sales, bypassing traditional retail. Mary Spender's online store, tied to her 716,000 YouTube subscribers, sells apparel and picks, while Bernth's Patreon (7,036 members) offers branded gear alongside lessons, significantly boosting income beyond his $41,243 from 10 million Spotify streams (Spender, 2023; Bernth, 2023; Graphtreon, 2025). This model leverages digital followings—Spender's 84.7 million views or Bernth's 10 million

streams—to drive sales, with Patreon tiers ($5–$50 monthly) yielding $17,000–$56,000 monthly for Bernth, dwarfing his modest streaming revenue (Graphtreon, 2025). Unlike the CD era's $2–$3 per $10 sale, digital merchandise offers higher margins and recurring income, adapting to streaming's economic constraints while leveraging both access based and ownership-based sales (Recording Industry Association of America, n.d.).

Crowdfunding platforms like Patreon and Kickstarter further empower artists to offset streaming's low payouts. Bernth's 7,036 patrons provide a steady $17,000–$56,000 monthly, funding projects like Far Beyond the Sun without label support (Bernth, 2023; Graphtreon, 2025). In the 1980s, artists relied on label advances—e.g., $50,000 for recording—repaid via $2–$3 per CD, but today's independents use fan pledges ($5–$100) to retain creative control and revenue (Recording Industry Association of America, n.d.). This shift reflects a broader move from label dependency to fan-driven sustainability, with Patreon's 250,000+ creators earning $1 billion annually by 2023 (Patreon, 2023).

Digital engagement via YouTube and social media amplifies these efforts, turning subscribers into revenue streams. Spender's 84.7 million views translate to $423,500–$1,270,500 yearly via ads and merchandise which far exceeds streaming's $0.004 per play (Spender, 2023). Paul Davie's 5.3 million views yield $95,000 from gear videos, outpacing his $6,000 from 4.7 million streams (Davie, 2023). In contrast, 1980s artists leaned on MTV exposure to drive $10 CD sales, but today's platforms offer direct monetization—e.g., YouTube's $5–$15 per 1,000 views—making digital presence a financial lifeline if properly leveraged (Recording Industry Association of America, n.d.).

Licensing and sync deals provide another adaptation, with guitar rock finding niches in film, TV, and games. Exodus's music in Bill & Ted Face the Music reflects a growing market—$2.5 billion in 2023 sync revenue—offering lump sums ($10,000–$50,000) that exceed streaming's trickle (Simpson, 2024; Music Business Worldwide, 2023). Unlike the CD era's $2–$3 per sale, sync fees provide immediate income, though independents still face competition from label-backed catalogs (Recording Industry Association of America, n.d.). This avenue leverages guitar rock's emotive appeal, sustaining artists amid streaming's challenges.

4.3 Direct Artist-Audience Engagement via Digital Supply Chain Platforms

Beyond tangible goods and live performances, artists are increasingly cultivating direct relationships with fans through digital platforms, utilizing tools like YouTube, Patreon, and social media to create sustainable income streams that bypass the traditional gatekeepers of the music industry. This approach not only provides financial stability but also fosters a deeper connection with audiences, enhancing the artist's ability to maintain creative control and build a loyal community in the streaming era (Spender, 2023).

Legacy acts adapt differently, using catalog sales to secure financial futures. Bob Dylan's $300–$400 million Universal deal to sell his catalog rights in 2020 reflects a trend—$5.3 billion in catalog sales from 2020–2023—capitalizing on past hits streamed billions of times (Spotlight Advisory Group, n.d.; Music Business Worldwide, 2023). In the 1980s, artists earned per unit sales but today's catalog sales for established artists

offer lump sums, contrasting independents' reliance on gigs and merch (Recording Industry Association of America, n.d.). This disparity highlights adaptation's uneven landscape.

Smaller acts like Bernth blend strategies—gigs ($15,000 per 500 fans), Patreon ($17,000–$56,000 monthly), and YouTube (10 million views)—to bolster streaming's $41,243 from 10 million plays (Bernth, 2023; Graphtreon, 2025). In the CD era, 5,000 sales at $2 each yielded $10,000, but today's diversified approach nets more, though it demands constant engagement and a more self-directed artist involvement (Recording Industry Association of America, n.d.). Hefti and Lareida (2021) note this mitigates streaming's Power Law, where 1% dominate earnings.

Teaching and content creation also bolster income for some artists. Spender's gear videos and Bernth's lessons via Patreon tap into guitarists' expertise, with Bernth's 7,036 patrons funding $17,000–$56,000 monthly (Spender, 2023; Bernth, 2023; Graphtreon, 2025). Unlike the 1980s' per unit revenue model, teaching leverages digital reach—e.g., $10–$50 per lesson, or via a subscription models which offer stability beyond streaming's $0.004 per play (Recording Industry Association of America, n.d.). This reflects the shift from product to service-based revenue where the artists are beginning to leverage alternative revenue models to their favor.

Collaboration with brands, like Abasi's Ibanez deal, mirrors 1980s endorsements but scales via digital exposure—47 million YouTube views—driving gear sales and artist income (Bernth, 2023). Streaming's $0.004 per play pales against endorsement deals ($10,000–$50,000), adapting past strategies to modern platforms (Guo, 2023). This

diversification showcases guitar rock's resilience amid economic upheaval and shows a potential path to viability even in the shadow of continued dominance of major labels and their superstars in the streaming model.

4.4 Case Studies: Independent Artists Navigating Digital Supply Chain Constraints

Vinyl's resurgence offers a niche lifeline, with 43.2 million units sold in 2023 ($1.2 billion) reflecting an increasing demand for tangible goods (Richter, 2024). Acts like Tool capitalized with 270,000 CDs of Fear Inoculum sold in 2019—but independents struggle against label dominance (Billboard, 2019). Unlike streaming's $0.004 per play, vinyl's $20–$30 price yields $5–$10 per sale, echoing the CD era's $2–$3 (Recording Industry Association of America, n.d.). Again, for artists that are not dominant in the market, each additional revenue stream helped them grow a portfolio of offerings that in aggregate can be substantial.

Digital production tools like Pro Tools empower creativity—e.g., Dream Theater's complex works—but streaming's economics force reliance on live performance, merchandising, and crowdfunding (Polcaro, 2018). In the 1980s, $2–$3 per $10 CD funded recording in the major studios, but today's $0.004 per stream pushes artists to diversify (Recording Industry Association of America, n.d.). This adaptation balances innovation with survival and the net positive is that the ability for artists to record digitally in non-major studios has allowed them the capability to release albums independently while rivalling the quality previously only available in the major studios.

These strategies—live performance, merchandising, crowdfunding, digital engagement, syncs, catalog sales, teaching, endorsements, and vinyl—reflect guitar rock's resilience and more broadly the necessary diversification of revenue for all non-mainstream artists looking to have a career in music. While streaming's $20.7 billion in 2024 will continue to outpace physical sales' $4.8 billion and its $0.003–$0.008 per play will continue to force artists to innovate beyond the per unit revenue model to sustain careers in a fragmented market (Stassen, 2025; Recording Industry Association of America, n.d.).

Chapter 5: Genre Transformation: Effects of Supply Chain Shifts on Guitar-Centric Rock

5.1 Evolution of Rock: Subgenres and Marginalization of Traditional Configurations

Digital transformation in music production and distribution has reshaped guitar-oriented and band-centric rock, which has yielded less favorable impacts on it, compared to pop music's singles-driven focus. Pop music is often less musically sophisticated, has shorter songs (which favor playlists because they can get more songs into a list) and they leverage digital tools for rapid creation. Both the production cycles and the product (the song), thrive in streaming's distribution model, aligning with modern sensibilities that favor simplicity and catchiness in lieu of complexity and conceptual tracks. This is not to say that basic music is a "lesser" form of music or a judgement on the music itself. To make a simple analogy, sometimes a basic pizza is better than a fancy 5-star gourmet dinner; they each have a time and place and consumer.

Conversely, traditional rock bands, like a two guitar, bass, drums and singer like Judas Priest, AC/DC and many others, benefit from production advancements because they can get their complex arrangements and sonic nuances recorded well but face stagnation or strong headwinds under the streaming access model, as Twisted Sister's Jay Jay French notes: "The standard rock act… is by and large, over," arguing this stems from a youth culture that no longer absorbs rock as a reflection of its identity,

unlike the genre’s heyday when it dominated the collective psyche (Koe, 2024). French notes that youth no longer see guitar rock as a reflection of who they are. This is both reflective of the lack of exposure because the very nature of the music is less suited in the streaming format (as we already said because of longer play times, and greater emphasis on albums rather than singles), and a cultural shift, which also is arguably attributable to the distribution changes that disadvantage it from reaching its potential audiences.

Gene Simmons from Kiss similarly contends, “You can’t find a new big rock band—they don’t exist,” attributing this to changes in fan demographics and the collapse of the traditional business model (Johnson, 2025). He explains that rock music primarily appeals to a “predominantly white” audience tied to older groups like Iron Maiden and Metallica, with whom Kiss toured decades ago, whereas younger listeners—who drive the popularity of pop and rap—consume music without paying, undermining rock’s profitability. Simmons is pointing out two critical aspects that are directly tied to the digital transformation of the music industry: first, the access revenue model (compared to the ownership model) disproportionately benefits pop music, as evidenced by revenue and playlist data; second, the exclusion of non-pop genres reinforces their diminished cultural relevance. And additionally, the effective yet simple structure of pop music does not encourage listeners to be open to more "challenging" music that would require a longer listening period and greater focus.

What French, Simmons, Osman, and Beato collectively imply, particularly concerning guitar-oriented rock, is that the decline of "big rock" bands results from both technological factors and a cultural shift that diminishes the genre's relevance. This

involves not only the loss of revenue associated with the rock album format but also a broader reduction in the cultural importance of guitar-oriented music. Considering that algorithms are tailored to markets driven by cultural preferences, a continued decline in guitar-oriented music's cultural and financial impact is probable. Thus, returning to the Long Tail theory, we can expect that while major bands will remain prominent in the "Head" of the Long Tail, guitar-oriented rock will represent a decreasing share of the "Head" while expanding its presence in the "Tail."

While digital production empowers rock's creative evolution—enabling the production of complicated progressive metal from bands such as Dream Theater and Periphery—digital distribution skews the playing field toward pop, resulting in the decline of the traditional band's mainstream influence. According to Simmons, this fading prominence of rock is tied to shifting fan demographics and the preference for free access over band-oriented music consumption, with Foo Fighters, formed 30 years ago, representing a notable recent exception (Johnson, 2025). While guitar-oriented rock maintains a loyal, though increasingly older audience, its cultural significance has lessened and continues to decrease while younger fans gravitate more towards pop and rap music.

Chapter 6: Artist Agency and Intellectual Property in the Digital Supply Chain

6.1 Catalog Monetization: Strategic Divestiture of Established Repertoires

Legacy artists preserve their financial futures through catalog sales, a trend accelerating in the streaming era. Bob Dylan's $300–$400 million deal to sell his catalog with Universal in 2020 for 600+ songs exemplifies this, part of $5.3 billion in catalog transactions from 2020–2023 (Spotlight Advisory Group, n.d.; Music Business Worldwide, 2023). In the 1980s, artists earned $2–$3 per $10 CD—e.g., Dylan's 10 million Blonde on Blonde sales yielded $20–$30 million—but streaming's $0.004 per play offers less control (Recording Industry Association of America, n.d.). Catalog sales provide lump sums, leveraging billions of streams—e.g., Dylan's 1.5 billion Spotify plays—securing wealth amid retirement (Spotify, 2023).

Bruce Springsteen's $500 million Sony deal and David Bowie's $250 million Warner Chappell sale in 2021–2022 reflect this shift for established artists with high value catalogs, capitalizing on streaming's catalog boom—62.1% of 2020's $21.6 billion revenue (Music Business Worldwide, 2023; Guo, 2023). Unlike the CD era's $2–$3 per sale, these catalog sales monetize decades of work, with labels betting on evergreen streams—e.g., Bowie's 1 billion plays (Spotify, 2023). This contrasts with independents' live performance reliance, highlighting a generational divide between established and niche artists (Bernth, 2023).

Digital innovation complements some catalog sales, with KISS's $300 million Pophouse deal in 2024 funding digital avatars for KISS in post-retirement, extending their brand beyond physical tours (Sherman, 2024). In the 1980s, tours promoted $10 CDs, but streaming's $0.004 per play pushes legacy acts to innovate—e.g., KISS's 2.5 billion streams yield $10 million versus the potential revenue stream from avatar concerts or beyond (Recording Industry Association of America, n.d.; Spotify, 2023). This mirrors ABBA's Voyage, blending legacy with technology to create a new revenue model, albeit only accessible to those artists with a significant enough following to want to see an avatar of them from their formative years.

Re-recording, as with Taylor Swift's $100 million+ from Fearless (Taylor's re-recorded version of her album), counters label ownership of the music rights, reclaiming revenue from streams—96.9 billion total plays (Newman, 2025; World Intellectual Property Organization, n.d.). In the 1980s, artists earned 20-30% of per unit revenue but streaming's label takes (50–90%) which diminish returns significantly—e.g., $38.8–$193.8 million post-cut (Pandora CloudCover, n.d.). Swift's strategy contrasts legacy sales by targeting younger fans and maximizing her revenue because she has ownership of her own music rights, versus a label owning her music rights.

6.2 Navigating Uncertainty: The Post-Digital Supply Chain Era

Digital tools preserve legacy sonically—e.g., Metallica's Master of Puppets remasters—but streaming's economics favor pop, with 1% of artists taking 80% of plays (Coelho & Mendes, 2019; Polcaro, 2018). Legacy acts counter with catalog sales and resurging vinyl sales, while niche and independents must focus on live performance and

a broader diversification of many smaller revenue streams. (Bernth, 2023). These strategies—catalog sales, avatars, vinyl, re-recording, licensing—reflect legacy acts' adaptation to streaming's $20.7 billion dominance vs. physical's $4.8 billion in 2024 (Stassen, 2025). While the per unit revenue models continue to diminish, legacy artists secure their past, contrasting independents' survival tactics (Recording Industry Association of America, n.d.).

6.3 Analog Media Resurgence: Vinyl and Radio in Digital Supply Chain Contexts

Vinyl's unexpected revival—43.2 million units ($1.2 billion) in 2023—offers another avenue, with legacy acts like Pink Floyd (23 million Wall copies) tapping nostalgia and other bands releasing some new music on vinyl as well as digital (Richter, 2024; Recording Industry Association of America, n.d.). Unlike streaming's $0.004 per play, vinyl's $20–$30 price yields $5–$10 per sale, echoing the CD era's $2–$3 per unit take, though production costs limit scalability now that physical distribution is now considered a niche and not mainstream (Guo, 2023). This resurgence contrasts independents' digital focus, favoring established catalogs by established artists who have a nostalgic pull.

Licensing sustained legacy bands as well, with Pink Floyd's Dark Side syncs or KISS's TV placements earning $10,000–$50,000 per deal, providing more lucrative lump sum (or per unit revenue) which outpaces their streaming revenue of $0.004 per play (Music Business Worldwide, 2023). 2023's $2.5 billion sync market offers immediate income for established artists with well known music, leveraging guitar rock's

emotive pull (Recording Industry Association of America, n.d.). This bridges past and present revenue streams and helps maintain some relevance for legacy artists which provide new exposure for them, for instance, when their music is sync in a popular video game.

Chapter 7: Conclusion: Negotiating the Digital Supply Chain Frontier for Guitar-Centric Rock

The digital transformation of music, from vinyl's robust ownership model to streaming's algorithm-driven access, promised a democratized landscape where guitar-oriented rock could thrive beyond its analog peak (Chapter 1). Yet, as Chapters 2 through 5 reveal, this digital transformation and resulting shift in revenue models has only reconsolidated major label power, not leveled it. Streaming platforms, dominated by labels, echo the gatekeeping of the vinyl days, leaving independents struggling to be heard. The Long Tail's promise of niche empowerment (Chapter 2) feels like an illusion under the weight of a superstar-driven system, constraining the reach of niche music and guitar oriented rock in a manner not dissimilar to trying to get an unknown band's record into a Tower Records or Borders Music record bin in the 1980s. Economically, this transformation has devalued the album oriented music, such as rock, core output. Chapter 3's contrast between vinyl's prosperity and streaming's diminutive returns underscores a shift that forces artists into survivalist strategies—live shows and crowdfunding—pivoting guitar rock from the creative expansiveness of its heyday to a merchandise-driven grind (Chapter 4). I see this as a risk to its artistic legacy, a trade-off where sustenance overshadows the bold artistry that once defined it; where the revenue model itself becomes a compelling factor in what music is created. If created music must fit into a distribution and consumption model, these factors will almost eliminate the concept of a curated album as each song must stand as a single.

Culturally, the guitar rock teeters on irrelevance as it, because of the previously

noted loss of cultural relevance, and the rise of pop, rap and international music. Streaming's bias toward short, replay able tracks (Chapter 3) and its superstar skew in algorithmic created playlists have sidelined guitar rock's complex songs from mainstream accessibility, a decline echoed by voices lamenting the lack of new bands and the end of its reign (Chapter 5). Vinyl and FM radio (Chapter 6) tether rock music to an aging audience, not the vibrant youth culture it once commanded, leaving me to question its broader resonance.

Resilience shines through adaptation—digital platforms and innovative legacy moves—but this favors established acts over newcomers (Chapters 4–6). Catalog sales secure the past, yet the absence of fresh voices signals a genre preserved in a time capsule, not revived or vibrantly creative. As legends step back, the tools exist—digital production, vinyl's niche—but streaming's gatekeepers still dominate the access to critical listeners which is stifling the next potential wave of creative rock music.

Guitar rock thus faces a challenging crossroad: its legacy endures in niches, but the mainstream revival of rock music demands disruption of the algorithmic obstruction to vital consumer demographics necessary to revitalize the genre. Without this, its digital fate mirrors its analog past: a rich past steeped in nostalgia but not a culturally relevant force in the mainstream. Stakeholders must decide to rekindle its fire or consign it to history's margins. It would be an astute move by record companies to understand a brilliant quote from an unknown person, "pop music consumers buy the music, rock music consumers buy the band". Thus, if they were to foster a renaissance in rock music, they could create consumers of new rock bands for generations; people that will follow their bands like generations have followed the Rolling Stones, Iron

Maiden, Foo Fighters and others for a lifetime.

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