



Soundscapes of Electronic Music: A Critical Analysis of Its Historical, Cultural, Economic and Technological Impact in the Digital Era

Xiaokai Feng^{1,*}, Yufei Chen²

¹Beijing No.80 High School, Beijing, China

²Loyola Marymount University, Los Angeles, CA, USA

*StevenFengXK@outlook.com

yufeichen0808@gmail.com

Abstract. This paper explores the origin and evolution of electronic music, from its early experimental age to today's mainstream genre, investigates its cultural and historical impacts in the US and internationally, and discusses its future development in the age of digital media and AI. In this paper, I conduct a critical analysis of three aspects surrounding the electronic music industry: 1) the commercialization of this musical genre and the clout-chasing phenomenon of electronic music producers. 2) the segregation of ethnicity and gender in the industry, highlighting the minority groups had driven the starting stages of development while facing serious barriers. 3) the increasing application and reliance of AI and interactive media tools in music production and the potential crises to emotional expression and creativity. Through this comprehensive analysis, the paper provides a thorough understanding of the past, present, and future of electronic music, with consideration of social justice and cultural representation and timely discussion during the 4th Industrial Revolution.

Keywords: Electronic music, EDM genre, music history, commercialization, social justice, AI music, interactive technology.

1 Introduction

In thousands of years of human history, music has always been an indispensable art form. From the most primitive percussions to today's sophisticated symphonies. Unquestionably, music has transformative prowess, reflecting not only emotions, love, culture, and politics, but also the advance of technology. Among the countless genres and styles that emerged in the past decades, electronic music has demonstrated the huge creativity and innovation of human artists and scientists.

Electronic music is deeply settled in the pioneer attempts of the 20th century and has gone through a significant evolution led by technologies and popular cultures. From the first discovery of the noise of electric current to the prevalence of contemporary EDM (Electronic Dance Music), this genre has outdistanced an enormous field of sounds,

rhythms, and melodies, consistently refreshing itself and breaking through the boundaries of stereotypical definitions. Electronic music propagates everywhere in our daily life: club DJs, movie sound effects, game soundtracks, and even background music of advertisements possess the presence of electronic music.

Being an individual in the digital age where convenience is achieved thoroughly by technology, limitations of physical distance are gone. In this era, music does not exist only as a music genre, but also as a representation of future horizons. In this paper, “Soundscapes of the Future: Electronic Music in the Digital Era,” we will have a journey through the evolution of electronic music, derive its origins, explore its present artistic forms of expression, and predict its prospects in future times.

In the following pages, we will explore electronic music in multiple dimensions, analyze its texture, reveal its historical narrative, and contemplate its profound impact on artistic expressions for the future. Through comprehensive academic analysis, art criticism, and speculative exploration, our goal is to unravel the mysterious allure of electronic sound and identify the outline of the music landscape waiting for us in the coming years.

2 Historical Review - The Birth of Electric Music

The specific work and date of the birth of electric music have been controversial among musicians, producers, and scholars. However, it was through three stages from the 1870s to the 1950s that the genre of electronic music was recognized by the music industry.

Electronic music has generally gone through three stages: the initial stage of utilization, the early electronic music dominated by electronic instruments and cassette music, and the recent EDM music dominated by computer software [1]. The first primitive stage was the development of sound technologies, where technology and music had not yet segregated into a distinct idea. In 1876, Alexander Graham Bell invented the telephone, which could convert sound into electronic signals. In 1877, Edison invented the phonograph. Although Edison's phonograph was only a hand-cranked mechanical device driven by gears, the recording of “Mary Had a Little Lamb” with his invented phonograph declared the arrival of the era of mechanical replication [2]. Regardless of whether it sounds industrial or not, the history of electronic music itself is a history of sound technologies, and without machines, there would be no electronic music.

These technological foundations prompted electronic music to enter the second stage of development - the electronic instrument stage. The so-called electronic instruments refer to those instruments that rely on electronic circuits as the essence of sound, distinguishing them from traditional instruments that produce sound by physically striking the instrument. The discipline of electronic instruments has not been isolated from the tag of experimental since its inception. It includes various fields such as electroacoustics, electro-engineering, and electronic bands. Each discipline in these fields has influenced the others in its development and is mutually complementary and constantly improving on a common basis [1].

The third stage of electronic music began in the mid-1960s with the invention of semiconductors. With calculative computers, musicians and scientists waived the building of cumbersome oscillators (An oscillator is an electronic circuit that produces periodic waves of signals or sounds) and electronic instruments. Instead, a new trend of software instruments emerged. Nowadays, musicians and producers use a DAW (Digital Audio Workstation is a general term for software specialized for music production and audio editing) to compose music, and the usage of frequency and spectrum synthesis technologies distinguish contemporary electronic music from the previous stages [1].

3 Characteristics and Main Genres of Electronic Music

As shown in Table 1, the evolution of electronic music is marked by the developments of its subgenres, making transformations of popular aesthetics at different times [3]. A noteworthy milestone would be the emergence of Disco in the 1970s, which introduced the concept of EDM into the cultural soundscape. Then, electronic music became an independent music genre but no longer a dependent or successor of other genres. Over time, five particularly prevailing subgenres emerged: Disco, House, Trance, Dubstep (Dubstep (2-step) means half-time drum grooves. However, as this genre typically emphasize using low notes to do sound designs, Dubstep and its relative genres can also be generalized as “Bass Music”), and Techno. These will be the focus of our review. The following subsections explore the rise and current trend of five different subgenres, with respect to different decades, the societal and cultural movements, and technological advancement.

Table 1. Overview of Main Genres of Electronic Music

genre	age	Origin
Disco	1970s	New York
House	1980s	Chicago
Techno	1980s	Detroit
Trance	1990s	Frankfurt
Dubstep	2000s	South London

3.1 Before EDM

Before 1970, electronic music had been mostly experimental (an exploration of variety) rather than a practice of musical composition. Musicians explored the possibilities of creating sound that cannot be achieved by traditional instruments as their expression of meanings. One influential form of composition during this period was the *Musique Concrète*, pioneered by French composer Pierre Schaeffer in the early 1940s [4]. This form of composition concentrates on the manipulation and transformation of audios of quotidian sounds such as environmental noises, human voices, and everyday objects.

The practice of *Musique Concrète* marked a departure from traditional composition rules and had a huge impact on the development of the electronic music and sound design industry. It emphasizes the exploration of sound as raw materials for artistic expression and challenges conventional notions of music.

3.2 Disco 1970s

The 1970s is the decade of Disco music. Disco music emerged in New York City, United States during the late 1960s and reached its peak popularity in the 1970s. With its infectious beats, groovy basslines, and soaring vocals, disco became synonymous with liberation and carefree joy [5]. There are some general signature sounds and features in this genre. For example, low cut and reverbed saw pads with chorus (Chorus is an audio effect that duplicates individual sound and outputs the processed inputs parallelly, creating thickness and saturation for one sound) effect and OTT (Over The Top is a type of multiband compression that is used to dynamically balance the volume of sound within multiple frequency ranges) compression, funky keyboard leads, electric guitar ear candies, and thump basses.

Not only the musicality of Disco, but it had also been powerful voices of underrepresented minority groups. Disco music was born out of the Black, Latinx, and LGBTQ+ communities. Associating with a vibrant nightlife culture: glamorous clubs, flashy fashion, and inclusive dance floors, Disco served as a platform for liberation and self-expression, particularly within marginalized communities and minorities, including LGBTQ+ and African American communities who fight for their rights in a discriminated society through their music [5].

3.3 House 1980s

House music, which began in the 1980s, was a re-emergence of disco music, featuring a four-on-the-floor (It is a groove in 4/4 time in which the kick drum (or any accent) is played on every beat) groove and the most typical tempo of 128 (120-130) beats per minute. This genre, an extension of disco music, originated from the underground dance scenes in Chicago. Most of the prominent clubs were held in warehouses, the genre was named after it as “House” [6]. Different from Disco, using band-like orchestrations, house music features more synthesizers (A synthesizer is an electronic instrument that generates audio signals by circuits and mathematical functions), electronic drum machines and samplers, resulting in a thorough departure from traditional genres like Funk or Jazz.

Over 40 more years of development, despite the rise and fall of countless music genres, House music has become one of the most prevailing EDM genres nowadays. With leading producers and past celebrities like Daft Punk, Avicii, Martin Garrix, Vicetone, KSHMR, Deadmau5 or Alan Walker, content creators of house music and its subgenres have overwhelmed the DJ Mag Top 100 DJs [21] for several years.

Through the whimsy creativities of composers, House music has evolved into countless subgenres and each has its unique vibe and production techniques. For example, Progressive House often elaborates an uplifting motif with heartstring melodies played

by saw leads, clean basslines, chord stacks, and striking drumbeats. Tropical House utilizes more woodwind instruments and percussions such as marimbas, creating a chill and happy tone. Another case in point would be Future House, which features with lead sounds controlled by plucky envelopes (an envelope describes how a sound changes over time) with low sustain values in the ADSR (the most common envelope generator is controlled with four parameters: attack, decay, sustain and release) parameters [34]. Instead of using supersaw (supersaw is a type of synthesizer waveform that was debuted in 1996 by Roland with their JP-8000 and JP-8080 analog synthesizer product line) chords to fill out the mid-frequencies, future house producers preferred using piano chords to avoid aesthetic fatigues. Eventually, these multifarious subgenres and the prosperity of house music indicate that it would be an unforgettable mark in the history of electronic music.

3.4 Techno 1980s

Techno, an abbreviation of the term 'technology', was born in Detroit, Michigan, USA in the early 1980s. Techno music is characterized by its repetitive beats, futuristic sounds, and minimalist arrangements [9]. Unlike house music at the same time, techno does not concentrate on melodies and music theory at the point of appreciation, but it strives to create a hypnotic and immersive sonic experience through rhythms and engaging sound designs [10].

Techno music is often associated with motifs such as futurism and urban decay. Its artistic values were fulfilled mostly by raves (a rave is a dance party at a warehouse, club, or other public or private venue, typically featuring performances by DJs playing electronic dance music) instead of appreciation and singing along [8]. Specifically, techno has the best effect when it is played by a DJ in raves. At rave parties, there is not only intense and deafening music, but also various forms of lighting effects that complement it on-site. From this perspective, the complete significance of Techno does not stagnate at simply a song or a tune, it is an underground cultural phenomenon with multiple sensory stimuli [11].

On the production side, techno utilizes saw waves for most of its featured sound. With the primary technique of low sustain envelopes modulating low pass (Low-pass filters pass through frequencies below their cutoff frequencies and progressively attenuate frequencies above the cutoff frequency) filters (an audio filter is a frequency-dependent circuit, working in the audio frequency range, of 0 Hz to 20 kHz. Audio filters can amplify (boost), pass, or attenuate (cut) some frequency ranges) with different amount resonance, various futuristic lead and bass sound can be created. Moreover, Techno producers, with the concept of minimality, often avoid filling the drops with compact melodies and instrument effects [8]. However, they will use gaps, and fill the vacancy with the release of reverb effects, creating hollowness and futuristic vibes.

3.5 Trance 1990s

In Frankfurt Germany, a genre of its own, Trance music had emerged, and it was burgeoned by early pioneer artists such as Jam & Spoon, Cosmic Baby, and Sven Väth [7].

Trance Music is named for its power of bringing listeners into a state of enchantment and fascination by its strong pathos and musical aura [9]. Trance music is often lengthy, 6 to 8 minutes, for its attention towards the build-up and release. It has long opening, and closing sections, introducing instrument layers gradually until a drop (a drop is a sudden change of rhythm, or typically the climax of an EDM song). This kind of arrangement can captivate listeners attentions and reduce discontinuities between different sections of the music, which brings listeners into the state of “trance” more effectually [7]. Inheriting the previous electronic music genres, trance also features a four-on-the-floor drum groove and a tempo around 135 to 150 BPM (beats per minute).

On the production side, trance is composed unprecedentedly featuring its arpeggiated melodies. Instead of variations between notes, trance melody is written by steps of octaves (An octave is a term to describe the pitch interval between two notes, one having twice the frequency of vibration of the other). Specifically, composers would shorten the duration of each note and fill the gaps between notes with the root note of the current chord progression at different octaves lower than the melody line [12]. Also, the usage of lowpass filter automations (automation is the process of making changes on any parameters automatically over the course of the song) adds even more building up besides risers and drum builds.

3.6 Dubstep 2000s

Dubstep emerged around 2000 in South London, incorporating elements from Broken Beat, Grime, and Garage. In its early times, dubstep music had only broadcasted in small towns around in London [13]. Until 2005, the debut of YouTube made dubstep music thrive all over the world [12]. Most recently, the 2024 Grammy’s Best Electronic/ Dance Recordings (the winners of the 2024 Grammy’s best Electronic/ Dance Recordings are Skrillex, Fred Again..., and Flowdan - “Rumble.” <https://www.grammy.com/awards/66th-annual-grammy-awards-2023>) is a dubstep track.

Dubstep features, breaking through from most EDM genres, half-time drum grooves, and a tempo of 140-160 beats per minute. Different from melodic expressions of other EDM genres, dubstep focuses more on its bass line and sound design as a representative of atonal music [13]. Particularly, the drop of dubstep music uses only one low note as the midi (Musical Instrument Digital Interface is a term that generalizes the communication protocol, digital interface, and electrical connectors that connect any kind of electronic instrument or computer) input of synthesizers. Movements and morphing of bass sounds were praised highly in dubstep music. Especially, bass sounds were tuned using an oscillator in a subtractive (subtractive synthesis is a method of sound synthesis in which the waveforms of a sound are determined first, with post-processing using various audio effects happening afterward) synthesizer, with other obvious low frequency effects such as frequency modulation (frequency modulation is a processing method which it modulates the frequency of one waveform to change the instantaneous frequency of another waveform), distortion (distortion is a kind of audio effect done by clipping audio signals), algorithm filters and more [14].

After approximately a decade of development, various subgenres, keeping half time grooves but innovating in sound designs, emerged. For example, Brostep, the U.S. reformed version of dubstep, specializes in filling out the whole frequency spectrum with bass sounds. Despite the heavy bass lines, high frequency textures are also incorporated into the sounds. Melodic dubstep, a genre advocates emotional and graceful melody lines, with combination of fierce bass lines, is another iteration of dubstep's subgenre [22]. Most recently, Color bass originated around 2017 by producer Chime and his label Rushdown [23]. This genre is unique in its concept of adding tonal harmonics and resonances into atonal bass sounds by audio effects such as Vocoders (a vocoder is a kind of audio effect that analyzes the characteristics of one sound source and then applies them to another sound source), Fast Fourier Transform Tuners, and Convolution Reverbs (convolution reverbs are reverbs that use an impulse response as the reverberated characteristic of a sound).

4 Impact of Electronic Music

4.1 Where Could Electronic Music be Found in Life of Western Cultures?

The Impact of the Electronic music industry has been disseminated worldwide, with the west being the starting point of culture [16]. Electronic music has been mitigated with multiple media and embedded into people's lives. Modern movie soundtracks are not only composed by classical orchestra sets but integrated with increased electronic elements [15]. For example, *Interstellar* (2014) original soundtracks, composed by Hans Zimmer, features a combination of orchestra and synthesizers. Another case in point would be the commercial and advertisement side. Starting from iPhone 8, the background music of Apple's Advertisements has included increasingly more electronic elements [18]. Most recently, the official advertisement for the M3 MacBook Pro [17] cited Rumble by Skrillex as its background music, which we once again refer as the Grammy winning Dubstep track.

4.2 Electronic Music's Huge Impact on Eastern Cultures, Represented by Japan

On the other side of Earth, in the East, the most significant instance would be the anime culture originated in Japan. To a certain degree, the anime culture would not have existed without the association with electronic music. No need to say the most renowned Vocaloid (vocaloid is a singing voice synthesizer software product) project Hatsune Miku (Hatsune Miku is a vocaloid software voicebank developed by Crypton Future Media and its official anthropomorphic mascot character, a 16-year-old girl with long, turquoise twin tails), which thoroughly explored the potentials of voice synthesis, electronic music had also casted shadows on every nook and cranny in the anime culture [33]. Specifically, ambient and electronic music elements were utilized nearly in every Japanese animation soundtrack, familiar examples include *NARUTO*, *Attack on Titan*, *GUNDAM*, *Sword Art Online*, *Demon Slayer*, etc. [32]. Plus, nearly every single background music in Japanese music games were electronic music, popular games include

Phigros [24], Maimai [25], Arcaea [26], Muse Dash [27] etc. Starting from the establishment of Roland cooperation in 1972 which marked the initiation of electronic music culture in Japan [28], electronic music in the east had developed into an independent culture with its unique style. Undisputedly, Japan has the biggest and most representative electronic music community in Asia.

5 Critiques on Electronic Music

5.1 Commercialization and Clout Chasing

The rise of clout chasing in the EDM community has brought about concerning shifts in the culture and values of the genre. Being one of the most controversial phenomena, clout chasing means the act of making music only to attain fame and commercial values instead of artistic fulfillment. In the case of EDM, producers who create music based on previous successful songs' templates, tediously replicate styles with similar techniques, and serve up reheated leftovers (simply editing previous works without new inspirations) are called clout chasers.

Folk comments have been pointing to several top-notch producers: Alan Walker's most used melody leading sound had barely changed ever since his success on Faded in 2015; Vicetone's "brand new" releases Nevada (Speed Up) and Nevada (Vicetone Lofi Mix) is simply a speed up and slow down edit of the original song; and R3HAB's slap house had used an unchanging template, or using formulaic production techniques, for many of his recent albums. Except these, there are more examples shown in Table 2.

Table 2. Cases of Commercialized EDM Songs

Artists	Album/Singles	Release Date	Category of Commercialization
Vicetone	Nevada	09/08/2023	Bpm changed leftovers
Alan Walker	Sped Up	07/22/2022	Bpm changed leftovers
Alan Walker	Slowed	07/15/2022	Bpm changed leftovers
R3HAB	All Around the World (La La La) (Slowed Down)	12/30/2022	Bpm changed leftovers
Armin van Buuren	Blah Blah Blah	05/18/2018	Formulaic production
Tiësto	Lay Low	01/06/2023	Formulaic production
Marshmello	Solteiro Sou um Perigo	06/02/2023	Nominal collaboration
David Guetta	Baby Don't Hurt Me	04/06/2023	Formulaic production
Alan Walker	Fire! (Feat. YUQI ((G)I-DLE), JVKE)	12/14/2023	Formulaic production

One prominent factor contributing to this clout chasing phenomenon could possibly be the livelihood of electronic music producers. It seems to be a dilemma when it comes to the conflict between making money and making music. There are two options to be made generally when an electronic music producers achieved preliminary success in their career: they could rather be signed to large companies, such as Sony, or remain as independent producers, releasing songs on labels and music platforms. For the former option, producers will get a stable income, yet to follow the plans of the company and be aimed for commercial success due to contracts and regulations signed. On the other hand, the latter option will provide much more variability and freedom, but they can barely make money by click-through rates and playback numbers. There are countless examples of second-tier producers, better than amateurs but not as experienced as experts, struggling with their education background but not reconciling to letting the music be only their part-time sideline.

5.2 Race and Ethnic Disparities

For the mentioned electronic genres in part 3 (Characteristics and Main Genres of Electronic Music) it is copious to discover that these genres were mostly invented by the minorities (including African Americans, Latin, Mexicans and the LGBTQ+ communities), but with most of the leading figures to be the majorities nowadays (such as Martin Garrix for House, Above & Beyond for Trance, Anyma for Techno, and Skrillex for Dubstep). This phenomenon reflects the discrimination of music education to different music genres and musical education resources different groups of people can access.

To be specific, the minority groups in the U.S. and Europe generally had an inferior social status and economic condition comparing to those majorities. Therefore, it is not surprising that these people had less access to music education resources, such as instructions from professionals or recording studios, back then [20]. The DIY (do-it-yourself) ethos prevailed in the music cultures of these minorities: as electronic instruments were more accessible than unpriced traditional instruments, minorities felt free and inspired to devote their creativity to the self-discovery of electronic music.

Another aspect is related to School education. At the time when electronic music had not burgeoned, even now, schools tend to focus principles of music teaching into classical and traditional music [19] but not those so called “informal” newly invented folk genres like hip-hop or electronic music.

Granted the advantage in the accessibility of electronic music to traditional music, it is undeniable that music is always still a costly subject to study, even for electronic music. Unlike the primitive state of electronic music in the past, maturely developed electronic music, just like other genres, requires a certain level of financial capacity to produce higher-quality and more complex music. Not to say those overwhelmed 3rd party software instruments, effect plugins, and hardware equipment, only the DAWs would cost for hundreds of dollars: Take the most popular applications, Logic Pro by Apple sells at 199.99\$ [29], Steinberg Cubase Pro 13 costs 579€ [30], and FL studio All Plugin Version sells at 499\$ [31]. The cost of a whole set of music production

configurations could reach up to thousands of dollars. Without these installations, advanced production maneuvers cannot be done. This economic threshold creates front-end barriers for low-income minority groups to study electronic music, which can explain why after several decades of development, the inventions of the minorities were carried on by those majorities.

6 Technology and Future Trajectory

6.1 AI and Machine Learning

In this digital era, there is no reason to not discuss the influence of artificial intelligence in the field of music and sounds. There are already several developing directions that have reached a great degree of progress in terms of using AI in music production. For example, AI and machine learning technology has helped reach a high quality of voice changing, vocal splitting, AI-interactive music, and even text to music composition.

A brief introduction to the principle of AI: It is basically an imitation of human brains but substitutes neurons with coding variables called nodes. It simulates bioelectrical signals by a decimal number between 0 to 1 and improve by adjusting the weight of data transmission to approach the output to given objectives [37]. Indeed, AI designers do not have to consider the problem of energy efficiency, making AI far beyond humans in linear thinking and logic. Granted, compared to human brains that have over 10 billion neurons, nowadays AI seems to be just a parody of perceptual subjects like music. However, scientists did make some attempts to overcome this insuperable obstacle.

Scientists helped machines to understand music by the digital expression of musical notes, audio waveforms, or clefs. As training AI does not require the understanding of abstract concepts such as cognition or aesthetics, we just must represent music digitally and throw in samples for it to learn by itself. By analyzing music data through AI algorithms, extracting key features such as melodies, rhythms, harmonies, timbres and structures, AI can learn these features, identify patterns and patterns in music creation, and generate new music works from the trained knowledge and patterns [35]. Finally resulting in melody creation, harmony arrangement, rhythm composition, etc.

The trajectory of future AI music will be about to be double edging. On the positive side, future developments of AI can aim towards several beneficial concentrations: educational purposes might include teaching students about music theory actively by analyzing customized inputs instead of only following the traditional syllabus [36]. Creation purposes might include more diversified sound design and melody writing using AI, such as combining two different instruments into one, giving real-time response melodies to an input melody phrase, or reversely reconstructing a sound with a given set of instruments and audio effects [36]. On the back side, future developments of AI need to focus on the emotional expression of music creation and advance more on the true emotional depth of aesthetics and the "soul" of human creation instead of only creating quantitative, exquisite works.

6.2 Interactive Music and Possibilities of Integrating Artforms

Besides AI, interactive music and virtual reality technologies have been widely applied in stage performances of or along with electronic music since the 2010s. Please imagine a glove, after wearing it, every time you bend your finger, you can play a note, and the pitch, tone, and intensity of the note played by each finger are different. This simple and convenient interaction method brings the possibility of playing complex music to ordinary people. Again, imagine a vest, when the performer wears it, every movement of their body, such as bends, turns, or leaps, can trigger different sounds. If applied in dance performances, it can make the dancers' body movements perfectly match to the music played in real-time, bringing the best audio-visual effect to the performance [38].

Motion sensors contribute the most in concretizing this kind of apparatus. Its core principle is to use different types of sensors to fit the human body and receive the performers' actions. Common interactive components include pressure, bending, displacement, velocity, vibration, tension sensors, and so on. The significance of these apparatuses is the availability of mitigating different art forms, such as choreographs, visual arts, and even virtual reality with music [39].

7 Conclusion

In conclusion, this paper offers a complete summary of the evolution of electronic music and its future landscape. Further, specifically analyzed the influences of electronic music on human life and reveals, unprecedentedly, hidden problems in the industry. From early experiences to future trajectories, the paper provides valuable insights into the dynamic and multifaceted essence of electronic music.

7.1 Significance of the Study

This paper confronts the lack of research and commentary on electronic music by critically analyzing the commercialization of an art form on the aspect of social justice (wealth gap, cultural and ethnic movement, underrepresented populations). Also, this paper casts light on the 4th industrial revolution, providing information of the current music technology industry and predicts future landscapes. This paper is also a generalization of the history of electronic music to create inspiration and future study directions for others.

References

1. Wang Yi (2012). History of Electronic Music Development. *Popular Science (Science Education)* (02), 173. doi: 10.16728/j.cnki. kxdz.2012.02.166.
2. Stockhausen, K. (1971). The Origins of Electronic Music. *The Musical Times*, 112(1541), 649–650. <https://doi.org/10.2307/957006>.
3. Gilbert, J., & Pearson, E. (2002). *Discographies: Dance, music, culture and the politics of sound*. Routledge.

4. Cross, L. (1968). *Electronic Music, 1948-1953. Perspectives of New Music*, 7(1), 32–65. <https://doi.org/10.2307/832425>.
5. Easlea, D. (2004). *Everybody dances: Chic and the politics of disco* (p. 130). London: Helter Skelter.
6. Bidder, Sean (2001). *Pump Up the Volume: A History of House*. London: Channel 4. ISBN 978-0-7522-1986-8.
7. Fassbender, Torsten (2008). *The Trance Experience*. Knoxville, Tennessee: Sound Org Inc.
8. Snoman, Rick (2009). *The Dance Music Manual: Tools, Toys, and Techniques – Second Edition*. Oxford, UK: Elsevier Press.
9. Wilsmore, R. (2002). *Techno, Trance and the Modern Chamber Choir: Intellectual Game or Music to Groove to?* *Leonardo Music Journal*, 12, 61–63. <http://www.jstor.org/stable/1513352>.
10. Jerrentrup, A. (2000). *Techno Music: Its Special Characteristics and Didactic Perspectives*. *The World of Music*, 42(1), 65–82. <http://www.jstor.org/stable/41699314>.
11. Ren Shaoren. (2017). *A kind of music for "soaking" about Techno, DJ, and dance music culture*. *Music Lovers* (10), 34-37.
12. Xu Yiyuan (2015). *On the Schools and Development Trends of European Electronic Dance Music*. *Yellow River Voice* (11), 82-84.
13. Reynolds, S.(2012),*Energy Flash: A Journey Through Rave Music and Dance Culture*, Perseus Books; Reprint edition (5 January 2012).
14. Johnson, R. (1991). *Machine Songs I: Music and the Electronic Media*. *Computer Music Journal*, 15(2), 12–20. <https://doi.org/10.2307/3680912>
15. Qian Feng. (2023). *The application and development trend of electronic music production technology in film and television music creation*. *Peony* (22), 42-44.
16. Collins, N. (2012, October). *Influence in Early Electronic Dance Music: An Audio Content Analysis Investigation*. In *ISMIR* (pp. 1-6).
17. Apple (2023, October 31). *The new MacBook Pro | Apple* [Video]. YouTube. https://www.youtube.com/watch?v=0pg_Y41waaE&t=48s.
18. Kirbpoyo (2022, September 9). *Every iPhone Commercial | 2007 - 2022* [Video]. YouTube. <https://www.youtube.com/watch?v=YE4HxDsni2A>.
19. Lundquist, B. R., & Sims, W. T. (1996). *African-American music education: Reflections on an experience*. *Black Music Research Journal*, 311-336.
20. Hughes, M., & Thomas, M. E. (1998). *The continuing significance of race revisited: A study of race, class, and quality of life in America, 1972 to 1996*. *American Sociological Review*, 785-795.
21. *Top 100 DJs*. (2023, July 5). *DJ Mag*. <https://djmag.com/top100djs>.
22. *Ophelia Records*. (n.d.). *Ophelia Recods*. <https://opheliarecords.com/>.
23. *Rushdown*. (n.d.). *Chime*. <https://www.chimetunes.net/rushdown>.
24. *Phigros results on Sound Cloud*. (n.d.). *Sound Cloud*. <https://soundcloud.com/search?q=phigros>.
25. *Sond List| maimai DX International ver.* (n.d.). *Sega*. <https://maimai.sega.com/song/new/>
26. *Arcaea results on SoundCloud*. (n.d.). *Sound Cloud*. <https://soundcloud.com/search?q=arcaea>.
27. *Muse Dash on Steam*. (2023, January 16). *Steampowered*. https://store.steampowered.com/app/774171/Muse_Dash/.
28. *Roland-Company-History*. (2022, January 13). *Roland*. <https://www.roland.com/global/company/history/>.
29. *Logic Pro For Mac-Apple*. (2024, May 7). *Apple*. <https://www.apple.com/logic-pro/>.

30. Cubase|Four Times Your Favortie DAW for Production. (2023, September 2). Steinberg. <https://www.steinberg.net/cubase/>.
31. Create Your Best Music|FL Studio. (2022, November 7). Image-line. <https://www.image-line.com/fl-studio/>.
32. Li Huanda. (2014). Master's degree thesis on the application of ambient electronic music in Japanese animation, Northeast Normal University). https://kns.cnki.net/kcms2/article/abstract?v=r-3vL8vLwqmfOF0e-DNRsKrgC0a7VDQVGO-Q-ySLxlv-CV-189-PNa-ZM-rdm-R8v-5fPl-3GW-xdvK-WwZb-RYV-S1sd-wDjX-T_G-WR3-6lt3-8pc-L57k-cVJy-QmBgnb_wMUeicPEoDFrdBosL4MLb_Oznrq-Jyn-vsQ-8EK-A==uniplatform=NZKPTlanguage=CHSKovacic, M. (2014). The Many Faces of Popular Culture and Contemporary Processes: Questioning Identity, Humanity and Culture through Japanese Anime. *IAFOR Journal of Arts & Humanities*, 2(1).
33. Sun Wei. (2015). Two-dimensional music language and culture—taking Miku as an example to analyze the music culture of virtual singers. *Northern Music* (05), 148+150.
34. Puckette, M. (2007). *The Theory and Techniques of Electronic Music*. World Scientific Publishing Company.
35. Zhang Yue. (2023-05-15). Exploring the development path of the integration of artificial intelligence and music. *China Art News*, 002.doi:10.28155/n.cnki.ncysb.2023.001027.
36. Yang Yaxuan. Application of AI technology in music creation - technological innovation and exploration of the prospects of music creation. *Music World (Music Creation Edition)*. 11 (2023): 49-55.
37. Rashid, T. (2016). *Make your own neural network*. CreateSpace Independent Publishing Platform.
38. Zhao Yixuan. (2023). Research on interactive strategies based on real-time machine hearing in interactive music. *Music Exploration* (04), 77-87.doi:10.15929/j.cnki.1004-2172.2023.04.008.
39. Cai Biwan & Chang Wei. (2022). As extension and translation of the body: Research on the application of wearable musical instruments. *Art Design Research* (01), 56-62.

Open Access This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

