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FROM THE AVANT-GARDE TO THE DIGITAL AGE: HOW TECHNOLOGY CHANGED THE ART OF MUSIC IN THE TWENTIETH CENTURY

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SUMMARY. The twentieth century is characterized by the rapid development of technology, including in the field of sound recording and the production of electric musical instruments. The purpose of this study is to find out what changes technological innovations have led to in the art of music, and what areas of musical art they have led to. The paper presents tables of key inventions in the field of sound recording, development of electric musical instruments and software that were key to the development and emergence of new areas of musical art. The role of electric musical instruments is considered from the standpoint of enriching the timbral palette of musical art: electronic technologies open up the possibility of generating timbres that have no analogues among acoustic instruments and thus significantly enrich the field for creative research. The role of technology in the formation of rock music, electronic dance music, algorithmic music, and the emergence of folk electronics is clarified. The author shows the sociological aspect of musical creativity, which in the XX century is characterized by the acceleration of

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information exchange between musicians, the expansion of the amount of musical material available for listening to users due to the possibility of their fixation on material media, and at the end of the XX century – transmission via the Internet.

Keywords: digital art, contemporary music, music of the 20th century, electronic music

Introduction

Throughout the twentieth century, various art forms experienced rapid renewal. This period saw several scientific discoveries and technological innovations that opened up new horizons for artistic development, including recording technologies and electromusical instruments, which, according to Lerch[6], "shaped the way music is created, performed, distributed, and consumed".

The latest technologies allow not only to record but also to generate sounds with specified parameters, thus expanding the space of the artist's creative imagination. The digital age that began at the end of the 20th century opened up new possibilities for information processing, led to the emergence of the Internet and the latest means of communication, which later became an integral part of our lives and also affected the development of the arts.

The twentieth century was an era of extraordinary diversity of stylistic trends and movements in music. The beginning of the twentieth century saw the coexistence of modern and late romantic movements, while the last third was the postmodern era, characterized by stylistic pluralism, "the diffusion of great styles and the mixing of artistic codes" (Siuta, 15[7]). What role did new technologies play in the process of stylistic and genre diversification, and which musical trends became possible thanks to the development of new technologies? This question is the starting point of this paper. Therefore, the purpose of this paper is to identify and characterize the newest forms of musical art that emerged in the twentieth century.

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[6] Lerch, Alexander. "The Relation Between Music Technology and Music Industry." Springer Handbook of Systematic Musicology, edited by Rolf Bader, Springer, 2018, pp. 899–909. https://doi.org/10.1007/978-3-662-55004-5_44.

[7] Siuta, B. Musical Creativity of the 1970s–1990s: Parameters of Artistic Integrity. Hramota, 2006.

Literature review

An analysis of the literature of recent years shows the predominance of research on the use of computer technologies for creating or analyzing musical material, ascertaining their capabilities and prospects for development.

In the last 5 years, the most widely presented research has been on music information retrieval (MIR) technologies aimed at solving commercial problems, namely, helping online radio stations categorize music tracks by style in order to create a more comfortable user experience. The analysis of the research suggests the development of various competing technologies designed to solve the problem of analyzing music tracks based on their spectrogram and oscillogram and, as a result, to obtain a decision on the style characteristics of the corresponding music track. In particular, the goal of Wu & Pan's research is to develop an intelligent system that utilizes music information retrieval (MIR) and artificial intelligence (AI) techniques to provide music selection and matching suggestions for dance creations. The authors focus on the derivative-free optimized refined random forest technology (Wu & Pan, 1)[8], and conclude that this technology has great potential to help choreographers and dancers select music of the style they need. Instead, Naidu et al. (2025) use convolutional neural networks (CNNs) and recurrent neural networks (RNNs) to recognize music genres and also conclude that a “broad shift” in the music industry is being achieved through the use of these technologies. In recent years, not only popular music but also certain forms of folk music have become the subject of machine analysis. Moore et al.[9] investigate algorithms for analyzing video recordings of ritual music of the West African Akan tribe, and Jayanthi and Upendran[10] analyze recordings of Indian classical raga.

Another relevant area is the creation of music using artificial intelligence (AI). The paper by Sampada[11] investigates the generation of music in ABC notation format using recurrent neural networks (RNNs). The author proposes a system that is trained on a large dataset of ABC notation and

[8] Wu, R., and Y. Pan. “Providing Music Selection and Matching Suggestions for Dance Creations Using Music Information Retrieval and Artificial Intelligence Techniques.” Journal of Computational Methods in Sciences and Engineering, 2025. https://doi.org/10.1177/14727978251318807.

[9] Moore, S., et al. “Ndwom: A Multimodal Music Information Retrieval Dataset for Akan Musical Videos.” 2025. https://doi.org/10.21203/rs.3.rs-5876078/v1.

[10] Jayanthi, J., and V. Upendran. “Raga Recognition of Indian Classical Music Using Meerkat Optimization Based MFCC and Fine Tuned BILSTM-XGBOOST.” Circuits, Systems, and Signal Processing, 2025. https://doi.org/10.1007/s00034-025-02999-w.

[11] Sampada, K. S. *Algorithmic Orchestration: Deep Learning Techniques in Music Generation*. 2025. http://dx.doi.org/10.52783/pst.1623

generates new music tracks in MIDI and WAV formats. Alessandra Corbelli[12] raises ethical, aesthetic, and legal issues of using AI to create music. The author believes that AI can be "a powerful tool that can support, assist, and facilitate the work of the composer" but that the shortcomings of AI [...] still "require the intervention of musicians, who are and will remain indispensable to give the musical object the status of a work of art" (Corbelli, 186). Oleksandr Kravchuk[13] analyzes the use of artificial intelligence by the musicians of the band "Okean Elzy" and concludes that at the current stage "the use of artificial intelligence technologies is not a factor in the popularity of a particular product of the band", but states "an increase in demand for the use of AI" (Kravchuk, 85).

Some studies are devoted to software that can be considered traditional in the twenty-first century, such as digital workstations (DAWs) designed to create and mix phonograms without the participation of artificial intelligence. In particular, Yang[14] compares modern DAW programs such as Apple Logic Pro X, Cubase 12, and Ableton Live Lite 11. The work has a practical orientation and is intended to guide independent producers in choosing software when working on musical compositions.

Methodology

The study is based on empirical and analytical methods. In order to identify the innovative influence of technology on the development of musical art, the musicological literature and the works of composers from different countries who used the technologies available to them, in particular, electromusical instruments and electronic computing were studied. To identify the specific features of musical works written with the help of such technologies, the methods of musicological analysis, in particular formative, harmonic, and textural analysis, are applied. The results obtained make it possible to systematize the latest compositional techniques, to outline the vectors of their further development, which is important for understanding the modern musical language and the processes of its transformation.

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[12] Corbelli, A. "Beyond the Algorithm. Ethical and Aesthetic Challenges of AI in Music." *Itinera*, no. 28, 2024, pp. 172–186. https://doi.org/10.54103/2039-9251/27842.

[13] Kravchuk, O. "Application of Artificial Intelligence in the Music Industry of Ukraine: An Analytical Approach." *Bulletin of Kyiv National University of Culture and Arts. Series in Musical Art*, vol. 6, no. 1, 2023, pp. 79–88. https://doi.org/10.31866/2616-7581.6.1.2023.277888.

[14] Yang, Y. "Analysis of Different Types of Digital Audio Workstations." *Highlights in Science, Engineering and Technology*, vol. 85, 2024, pp. 563–69. https://doi.org/10.54097/6vvy8z41.

Results

The analysis of the development of musical technologies, mainly from the perspective of electronic music (in particular Holmes[15], Lazarev[16], Bondarenko[17], Yuferova[18], Nyakayo[19]), shows three categories of technologies that influenced the development of musical art in the twentieth century: recording devices, electric and electronic musical instruments, and computer sound synthesis software. Hanna Yuferova distinguishes three stages of technology development: the preparatory stage (1857–1945), the progressive stage (1945–1990), and the modern stage (1991–present) (Yuferova, 27). The relevant chronology is presented below (Table 1).

Table 1

Title	Inventor	Country	Year
Phonograph	Edouard-Léon Scott de Martinville	France	1857
Phonograph	Thomas Edison	USA	1877
Gramophone	Emile Berliner	USA	1887
Magnetic tape recorder (magnetic tape)	A. Pfleumer (base), AEG	Germany	1928–1935
Multi-track recorder	Les Paul, Ampex	USA	1948
Cassette recorder	Lou Ottens, Philips	Netherlands	1963
DAT (Digital Audio Tape)	Sony	Japan	1987
CD recorder	Sony, Philips	Japan, the Netherlands	1982–1990
MiniDisc	Sony	Japan	1992

The chronology of the production of sound recording devices in the late nineteenth and twentieth centuries. Source: developed by the authors

[15] Holmes, Thom. *Electronic and Experimental Music: Technology, Music and Culture*. 3rd ed., Routledge, 2008.

[16] Lazarev, S. H. *Electronic Music as a Socio-Cultural Phenomenon (Second Half of the 20th Century – Early 21st Century)*. PhD dissertation, National University of Culture and Arts, 2018.

[17] Bondarenko, A. *Electronic Music in Ukraine at the Beginning of the XX Century*. PhD dissertation, Kyiv National University of Culture and Arts, 2021.

[18] Yuferova, H. V. *Musical Computer Technologies in Communication Processes in Contemporary Ukrainian Music*. PhD dissertation, Kyiv, 2021.

[19] Nyakayo, O. A. "The Intersection of Science and Art: Collaborative Approaches." *Newport International Journal of Engineering and Physical Sciences*, vol. 5, no. 1, 2025, pp. 1–6. https://doi.org/10.59298/NIJEP/2025/511600.

The advent of sound recording had a significant impact on the course of music history. On the one hand, the dissemination of musical works on gramophone records, and later also on radio and television, expanded the horizons of the musical space, accelerated the processes of information exchange, facilitated the integration of non-European musical traditions into European art and vice versa – the mastering of European music by non-European peoples, and already in the first half of the twentieth century led to the emergence of an unprecedented variety of styles and trends in musical art. On the other hand, the ability to mix, that is, to combine two or more audio recordings into one, opened up new ways of experimenting with musical material (Bondarenko 2022, 15).

The spread of sound recording resulted in the formation of "phonoculture" – a special culture of artificial sound, which is "a conglomerate of high technology and art, technical means and theoretical knowledge in the field of sound recording, cultural objects (recorded sound events on a physical medium), dialectical relations that arise at the junction of aesthetic and industrial principles" (Kushch, 2013, p. 11). In addition, with the invention of sound recording, it became possible to preserve not only the musical text itself, but also the specific performance, and thus convey its interpretive and stylistic nuances (Piddubnyk, 2024, p. 72).

Table 2 presents the chronology of the production of electric musical instruments in the late nineteenth and twentieth centuries.

Table 2

Title	**Inventor**	**Country**	**Year**
Music Telegraph	Elisha Gray	USA	1876
The singing arc	William Duddell	Great Britain	1899
Intonarumori	Luigi Rusolo	Italy	1913
Optophone	Vladimir Baranov-Rossine	Russia/France	1916
Termenvox	Leo Termen	Russia	1919
Marteno waves	Maurice Martenot	France	1928
Trautonium	Friedrich Trotwein	Germany	1928
Termen cello	Leo Termen	USA	1930
Hammond organ	Laurence Hammond	USA	1935
Newchord	Lawrence Hammond	USA	1939
RCA Mark II	Herbert Belar, Harry Olson	USA	1957
Moog Modular	Robert Moog	USA	1964
EMS VCS 3	Peter Zinoviev, David Cockrell, Tristram Carey	United Kingdom	1969

Minimoog	Robert Moog	UNITED STATES	1970
ARP 2600	Alan Perlman	USA	1971
EMS Synthi 100 Digital Sequencer	EMS	United Kingdom	1971
Synclavier	New England Digital	USA	1977
Fairlight CMI	Piter Vohel, Kim Ryrdon	Australia	1979
Fairlight CMI (with built-in Page R sequencer)	Fairlight	Australia	1979
Roland TR-808	Roland	Japan	1980
Roland TB-303	Roland	Japan	1981
Yamaha DX7	Yamaha	Japan	1983
Roland TR-909	Roland	Japan	1983
Telharmonium	Thaddeus Cahill	USA	1895–1900

The chronology of the production of electric musical instruments in the late nineteenth and twentieth centuries
Source: developed by the authors

The influence of electric instruments on the development of musical art is mainly in the expansion of its timbral palette. At the beginning of the twentieth century, electric instruments were mainly used to perform arrangements of classical works, but by the middle of the twentieth century, the first works written specifically for electric instruments appeared, primarily works by French composers for Martenot Waves, including Fête des belles eaux (1937) and Turangalîla-Symphonie by O. Messiaen (1948).

In the 1930s and 1940s, the mass production of keyboard instruments began, which were used in jazz music, and in the 1960s – in rock music, especially progressive rock music. The most popular of these was the Hammond organ, which gained popularity due to its versatility, "allowing both chords and the main melody to be played, and allowing a choice between a quiet and clear sound and a sticky, aggressive, almost distorted, angry sound" (Macan, 34[20]).

The same period saw the development of electric guitars, which in the 1950s became the leading instrument of rock music. According to Millard (2004), the electric guitar has become "an American symbol that has transformed

[20] Macan, Edward. *Rocking the Classics: English Progressive Rock and the Counterculture*. Oxford University Press, 1997. https://doi.org/10.1093/acprof:oso/9780195098884.001.0001.

the soundtrack of our lives with its wide range of sounds, from seductive chimes to wailing distortion". Ostberg and Hartmann[21] call the electric guitar "a symbol of youthful rebellion", in their opinion, the possibility of using the distortion effect, which had an emotional impact on listeners and musicians themselves, played a decisive role in the popularization of the electric guitar. "What was once designed to convey a pure guitar sound opened the gates to the distortion madness of rock guitar sound as we know it" (Ostberg & Hartmann, 4).

In the 1970s, electronic keyboards also gained popularity among rock bands, in particular in the work of Tangerine Dream and Kraftwerk, which paved the way for the emergence of electronic dance music (EDM). The TB-303 bass line synthesizer and the TR-808 and TR-909 drum machines had the greatest influence on the formation of the EDM timbre space. As in the case of the electric guitar, these instruments were not initially positioned by the manufacturer for the electronic scene, and only a creative, imaginative approach to the use of these devices made them iconic for the electronic mass music industry" (Lazarev, 61).

In parallel, certain innovations took place in the field of experimental music. In 1951, P. Schaeffer founded the Groupe de Recherche de Musique Concrète (Concrete Music Research Group) at the French Broadcasting Company (Radiodiffusion-Télévision Française, RTF), which existed until 1958 and influenced many later famous composers, including Edgar Varez, Olivier Messiaen, Yannis Xenakis, and Pierre Boulez (Bondarenko, 25[22]). At the same time, in Germany, W. Meyer-Eppler organized an experimental electronic music studio at the Nordwestdeutscher Rundfunk radio station in Cologne, where composers Herbert Eimert and Karlheinz Stockhausen worked.

The creative search of these studios developed in two competing directions – "concrete music" (P. Schaeffer) and electronic music itself (K. Stockhausen). While the former involved the recording and subsequent processing of sounds from the natural or man-made environment, the latter focused on the synthesis of sounds using electronic technologies. In particular, the first piece of concrete music, "Étude aux chemins de fer" by P. Schaeffer, uses samples recorded directly on the railway transport. On the other hand, K. Stockhausen's first electronic work "Studie I" is based on sounds that are a sinusoidal tone. At the same time, Stockhausen used contemporary compositional techniques common in instrumental music, in particular, in

[21] Ostberg, J., and B. Hartmann. "The Electric Guitar – Marketplace Icon." *Consumption Markets and Culture*, vol. 18, no. 5, 2015, pp. 402–10. https://doi.org/10.1080/10253866.2015.1046255.

[22] Bondarenko, A. I. *Modern Musical Art and Computer Programs: A Textbook*. Lira-K Publishing, 2022.

Stockhausen's[23] “Studie II” he uses a serial technique in combination with 81-step octave division (Stockhausen, 37), which makes this work innovative not only in timbre but also in harmony.

Both trends were continued in other countries. For example, a unique example of “concrete music” with satirical overtones was the work by Ukrainian composer V. Hodziatsky “Scherzi Domestici” (1964), the acoustic basis of which was the sounds of domestic life recorded on a tape recorder (Manulyak, 23)[24]. This technique was also used sporadically in some rock bands' works, for example, “Revolution9” by the Beatles (1968), and had a significant impact on film and theater scores. In turn, K. Stockhausen's algorithmic approach to creating electronic compositions influenced the works of J. Xenakis, L. Nono, L. Grabowski, and many others. Moreover, we are talking not only about electronic works, but also instrumental ones, the scores of which were developed on the basis of complex algorithms, which were processed using electronic computers.

The transition to digital technologies, almost simultaneously in the field of sound recording (the first audio CDs were released in the 1980s) and in the field of music creation (music software appeared in the late 1980s), intensified the processes of expanding the timbral diversity and genre diversification of musical art. The transition from analogue to digital sound can be observed, for example, when comparing early dance electronics compositions (for example, “Hot Butter” by Gershon Kingsley, 1969) with compositions of various EDM trends written after the 2000s (for example, Armin van Buuren and Azotti). The capabilities of digital equipment compared to analog equipment are more flexible and diverse, providing better precision in setting sound effects and sound synthesis parameters, although some analog effects are still inaccessible to digital equipment (Bondarenko, 74)[25].

[23] Stockhausen, Karlheinz. *Texte 2: Aufsätze 1952–1962 zur Musikalischen Praxis*. Edited by Dieter Schnebel, Verlag M. DuMont Schauberg, 1964.

[24] Manulyak, O. “Changes in the Structure of the Sound Material of Electroacoustic Works by Ukrainian Composers of the End of the 20th – Beginning of the 21st Century in the Context of Socio-Political Changes.” *Scientific Collections of the Lviv National Music Academy Named after M. V. Lysenko*, vol. 49, no. 2, 2023, pp. 22–27. https://doi.org/10.32782/2310-0583-2023-49-04.

[25] Bondarenko, A. I. *Modern Musical Art and Computer Programs: A Textbook*. Lira-K Publishing, 2022.

Table 3

Name	Inventor / Developer	Country	Year
Cubase	Steinberg	Germany	1989
Finale	Coda Music Technology	USA	1988
Pro Tools	Digidesign	USA	1991
Cakewalk	Twelve	USA	1987
Logic (originally Creator)	C-Lab	Germany	1992
Max/MSP	Miller	France/USA	1986/1997
ReBirth RB-338	Propellerhead Software	Sweden	1997
Reaktor (originally Generator)	Native Instruments	Germany	1996

The Chronology of software releases for personal computers at the end of the 20th century. Source: developed by the authors

The end of the twentieth century saw the first attempts to combine electronic sound with ethnophonisms, such as the characteristic sound of folk instruments or folk vocals (Broiako[26]). For the first time, such attempts were made in the works of O. Nesterov and A. Zahaykevych – in their works, Ukrainian folk singing, the manner and timbre of which differs significantly from academic singing, is combined with electronically generated experimental sounds. Later, in the twenty-first century, ethnophonisms entered the genres of popular music and formed the style of folk electronics as a kind of World music.

The introduction of digital technologies at the end of the twentieth century was of great importance not only in the musical and aesthetic, but also in the sociological sphere. On the one hand, the Internet, which appeared at the end of the twentieth century, provided additional mediums for the dissemination of musical works to the general public, and with the development of technology, "the number of these mediums is increasing, and the possibilities of listening along with them" (Stockfelt[27]). Digital platforms have "revolutionized the monetization of digital downloads, and streaming services such as Spotify have revolutionized the way people consume-create, listen to, share music"

[26] Broiako, N. "E. Stankovych's 'Symnoi Drimbi Zvyki' in the Aspect of Embodiment of the Neofolkloristic Tendencies." *Music Art and Culture*, vol. 1, no. 30, 2020, pp. 19–24. https://doi.org/10.31723/2524-0447-2020-30-1-3.

[27] Stockfelt, Ola. "Adequate Modes of Listening." *Keeping Score: Music, Disciplinarity, Culture*, edited by David Schwarz et al., University Press of Virginia, 1997, pp. 88–93.

(Poplavskyi & Trach, 36[28]). The Internet has become "the main tool for distributing musical works through specialized platforms, as well as an important tool for popularizing musical performers" (Marynin, 314[29]).

On the other hand, a personal computer with the appropriate software is more accessible to a wider audience, which has given a much larger number of people the opportunity to create music, including people who do not own any musical instrument or even have no musical literacy. In this regard, it is noteworthy that Brian Eno[30] admitted that he, as a person who does not even know how to play any musical instrument, could not have succeeded as a composer without the opportunities provided by the studio.

The emergence of the phenomenon of participatory music culture should also be emphasized. The emergence of recording technology has led to the destruction of the classical connection between musician and audience, and the consumer of a piece of music has become a "participant" in it. New digital technologies are now further strengthening participatory trends.

The process of intensive development of music technology did not stop in the twentieth century and is likely to continue for decades to come. The ability to find and listen to works of various musical genres on the Internet creates a situation where it is already difficult for the user to navigate among the countless musical works that the network offers to listen to and, accordingly, reduces the likelihood of a user's concentrated, thoughtful listening to a particular work. "A person who spends almost a third of his/her life in front of the TV, wandering from program to program, or in front of a PC, navigating the waves of the Internet, is able to adequately perceive only flashing signs, since their connection with what they mean implies a deeper immersion in the sphere of the sign" (Pobiedonostseva, 7[31]). This situation raises axiological questions – whether musical art will retain the ability to transmit meanings, or whether its role will be reduced to entertainment and background accompaniment of human activity.

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[28] Poplavskyi, M. M., and Yu. V. Trach. "Digitalization of the Music Industry: Trends and Prospects." *Bulletin of National Academy of Managerial Staff of Culture and Arts*, no. 2, 2022, pp. 30–39. https://doi.org/10.32461/2226-3209.2.2022.262202.

[29] Marynin, A. Ye. "Transformation of Digital Technologies in Music Industry in the Late XX – Early XXI Century." *Bulletin of National Academy of Managerial Staff of Culture and Arts*, no. 2, 2024, pp. 311–15. https://doi.org/10.32461/2226-3209.2.2024.308417.

[30] Eno, B. (2009). The Studio as Compositional Tool. In: Ch. Cox & D. Warner (Eds.), *Audio Culture: Readings in Modern Music.* (pp. 185–188). New York: Continuum. https://doi.org/10.5040/9781501318399.ch-022

[31] Pobiedonostseva, I. Ye. *Television Discourse in the Cultural Space of Postmodernism*. PhD dissertation, Kyiv, 2005.

Conclusion

The intensive development of technology in the twentieth century, which covered the field of sound recording, electric musical instruments, and computer software, contributed to the growth of stylistic and genre diversity in music.

Recording technologies and the ability to distribute music on physical media (gramophone records, more recently CDs) have accelerated the exchange of information between musicians from different countries and helped to familiarize a wide audience with music of different styles. The ability to mix and modify sound recordings became the basis of the “concrete music” movement, which later had a significant impact on film and theater scores.

The emergence of electric musical instruments significantly expanded the timbral palette of musical art, which also broadened the horizons for composers' creative searches and the emergence of new areas of musical art, including rock music and electronic dance music. In the late twentieth century, experiments in combining electroacoustic sounds with ethnophonies laid the groundwork for the further rapid development of contemporary ethnic music (“world music”). The emergence of the Internet at the end of the twentieth century created conditions for the development of platforms for the distribution of musical works as an alternative to distribution on material carriers, which will accelerate the exchange of musical information and the processes of devolution of musical trends in the next century.

REFERENCES

Bondarenko, A. *Electronic Music in Ukraine at the Beginning of the XX Century*. PhD dissertation, Kyiv National University of Culture and Arts, 2021.

Bondarenko, A. I. *Modern Musical Art and Computer Programs: A Textbook*. Lira-K Publishing, 2022.

Broiako, N. “E. Stankovych’s ‘Symnoi Drimbi Zvyki’ in the Aspect of Embodiment of the Neofolkloristic Tendencies.” *Music Art and Culture*, vol. 1, no. 30, 2020, pp. 19–24. https://doi.org/10.31723/2524-0447-2020-30-1-3.

Corbelli, A. “Beyond the Algorithm. Ethical and Aesthetic Challenges of AI in Music.” *Itinera*, no. 28, 2024, pp. 172–186. https://doi.org/10.54103/2039-9251/27842.

Eno, Brian. “The Studio as Compositional Tool.” *Audio Culture: Readings in Modern Music*, edited by Christoph Cox and Daniel Warner, Continuum, 2009, pp. 185–88. https://doi.org/10.5040/9781501318399.ch-022.

Holmes, Thom. *Electronic and Experimental Music: Technology, Music and Culture*. 3rd ed., Routledge, 2008.

Jayanthi, J., and V. Upendran. “Raga Recognition of Indian Classical Music Using Meerkat Optimization Based MFCC and Fine Tuned BILSTM-XGBOOST.” *Circuits, Systems, and Signal Processing*, 2025. https://doi.org/10.1007/s00034-025-02999-w.

Kravchuk, O. “Application of Artificial Intelligence in the Music Industry of Ukraine: An Analytical Approach.” *Bulletin of Kyiv National University of Culture and Arts. Series in Musical Art*, vol. 6, no. 1, 2023, pp. 79–88. https://doi.org/10.31866/2616-7581.6.1.2023.277888.

Kushch, Y. V. *Electromusical Instruments as an Evolutionary Factor of Musical Culture in the 20th – Early 21st Century*. PhD dissertation abstract, Kyiv, 2013.

Lazarev, S. H. *Electronic Music as a Socio-Cultural Phenomenon (Second Half of the 20th Century – Early 21st Century)*. PhD dissertation, National University of Culture and Arts, 2018.

Lerch, Alexander. “The Relation Between Music Technology and Music Industry.” *Springer Handbook of Systematic Musicology*, edited by Rolf Bader, Springer, 2018, pp. 899–909. https://doi.org/10.1007/978-3-662-55004-5_44.

Macan, Edward. *Rocking the Classics: English Progressive Rock and the Counterculture*. Oxford University Press, 1997. https://doi.org/10.1093/acprof:oso/9780195098884.001.0001.

Manulyak, O. “Changes in the Structure of the Sound Material of Electroacoustic Works by Ukrainian Composers of the End of the 20th – Beginning of the 21st Century in the Context of Socio-Political Changes.” *Scientific Collections of the Lviv National Music Academy Named after M. V. Lysenko*, vol. 49, no. 2, 2023, pp. 22–27. https://doi.org/10.32782/2310-0583-2023-49-04.

Marynin, A. Ye. “Transformation of Digital Technologies in Music Industry in the Late XX – Early XXI Century.” *Bulletin of National Academy of Managerial Staff of Culture and Arts*, no. 2, 2024, pp. 311–15. https://doi.org/10.32461/2226-3209.2.2024.308417.

Millard, A. J. *The Electric Guitar: An American Icon*. Johns Hopkins University Press, 2004. https://doi.org/10.56021/9780801878626.

Moore, S., et al. “Ndwom: A Multimodal Music Information Retrieval Dataset for Akan Musical Videos.” 2025. https://doi.org/10.21203/rs.3.rs-5876078/v1.

Naidu, P., et al. “Classification of Music Genres Using Multimodal Deep Learning Technique.” *E3S Web of Conferences*, vol. 616, 2025, 02012. https://doi.org/10.1051/e3sconf/202561602012.

Nyakayo, O. A. “The Intersection of Science and Art: Collaborative Approaches.” *Newport International Journal of Engineering and Physical Sciences*, vol. 5, no. 1, 2025, pp. 1–6. https://doi.org/10.59298/NIJEP/2025/511600.

Ostberg, J., and B. Hartmann. “The Electric Guitar – Marketplace Icon.” *Consumption Markets and Culture*, vol. 18, no. 5, 2015, pp. 402–10. https://doi.org/10.1080/10253866.2015.1046255.

Piddubnyk, V. “Technological Progress in the Music Industry and Its Impact on the Professional Concept of Music Creation.” *Art Education and Development of Creative Personality*, no. 1, 2024, pp. 68–74. https://doi.org/10.32782/ART/2024-1-12.

Pobiedonostseva, I. Ye. *Television Discourse in the Cultural Space of Postmodernism*. PhD dissertation, Kyiv, 2005.

Poplavskyi, M. M., and Yu. V. Trach. “Digitalization of the Music Industry: Trends and Prospects.” *Bulletin of National Academy of Managerial Staff of Culture and Arts*, no. 2, 2022, pp. 30–39. https://doi.org/10.32461/2226-3209.2.2022.262202.

Sampada, K. S. *Algorithmic Orchestration: Deep Learning Techniques in Music Generation*. 2025. http://dx.doi.org/10.52783/pst.1623

Siuta, B. *Musical Creativity of the 1970s–1990s: Parameters of Artistic Integrity*. Hramota, 2006.

Stockfelt, Ola. “Adequate Modes of Listening.” *Keeping Score: Music, Disciplinarity, Culture*, edited by David Schwarz et al., University Press of Virginia, 1997, pp. 88–93.

Stockhausen, Karlheinz. *Texte 2: Aufsätze 1952–1962 zur Musikalischen Praxis*. Edited by Dieter Schnebel, Verlag M. DuMont Schauberg, 1964.

Wu, R., and Y. Pan. “Providing Music Selection and Matching Suggestions for Dance Creations Using Music Information Retrieval and Artificial Intelligence Techniques.” Journal of Computational Methods in Sciences and *Engineering*, 2025. https://doi.org/10.1177/14727978251318807.

Yang, Y. “Analysis of Different Types of Digital Audio Workstations.” *Highlights in Science, Engineering and Technology*, vol. 85, 2024, pp. 563–69. https://doi.org/10.54097/6vvy8z41.

Yuferova, H. V. *Musical Computer Technologies in Communication Processes in Contemporary Ukrainian Music*. PhD dissertation, Kyiv, 2021.