

THE APPLICATION OF ELECTRONIC TECHNOLOGIES IN MUSIC

Cherniavskaya M.A.

Belarusian State University of Informatics and Radioelectronics, Minsk, Republic of Belarus

Perevyshko A.I. – senior lecturer at the department of foreign languages

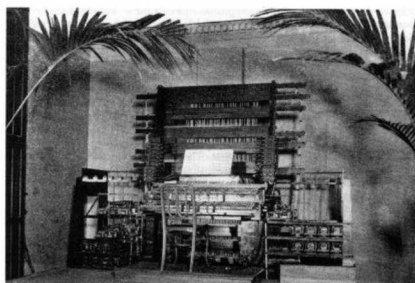
Annotation. Main subject of the article is the history of electronic technologies' development in music industry. At the beginning it is pointed out the impact of technologies on music. Next the article gives a valuable information on the invention of the earliest electronic instruments. Then it is spoken about the introduction of first synthesizers. Further on much attention is given to the application of digital technologies and artificial intelligence in music industry. At the end the influence of technology on music production is noted.

Keywords. the Telharmonium, the Hammond organ, the Moog synthesizer, electronic dance music (EDM), frequency modulation (FM), MIDI

Introduction. Throughout history, music has played an essential role in human society, changing and adjusting as time goes on. Beginning with primitive tribal songs and leading to the intricate compositions of the classical period, music has the ability to evoke emotions, narrate tales, and bring people together. In recent years, advancements in technology have greatly impacted the music industry, revolutionizing the way music is produced, distributed, and consumed. [1].

The development of music is directly related to the needs and desires of composers. Throughout history, composers have modified sounds to create the unique timbres of their imaginations. In the 20th century, composers have seen the emergence of electronic technology as a means to broaden and improve their auditory range. Musical innovators of the early to mid-20th century devised ways to use analog and digital machines to produce and manipulate sound. These experiments have directly led to the production methods used in modern popular music. [2].

Main part. The first electronic instruments were not entirely successful musically and were physically cumbersome. Thaddeus Cahill's 1906 invention of the Dynamaphone or the Telharmonium, was designed to allow music to be played over the telephone wires to a distant listener. Sound quality was poor. It was over 60 feet long, weighed over 200 tons, and cost over \$200,000. Despite this fact, it was still considered as the first example of "scientifically perfect music." [3].



Picture 1 – the Telharmonium

The earliest electronic instrument to achieve success was the Hammond organ, which was created in 1935 by Laurens Hammond. This instrument was equipped with drawbars that enabled the player to manipulate the sound. The Hammond quickly went from an avant-garde invention to a commonly used instrument in popular music, signaling a clear glimpse of the future. [4].



Picture 2 – the Hammond organ

Since the 1950s, with the growing availability and reduced costs of technology, popular music has become associated with consumerism in the capitalist market. This led to the creation of The Moog synthesizer, developed by American engineer Robert Moog in 1964.

The first Moog synthesizers were made up of separate modules that produce and modify sounds, and are connected using patch cords. Modules include voltage-controlled oscillators, amplifiers, filters, envelope generators, noise generators, ring modulators, triggers and mixers. Its oscillators produce waveforms, that can be modulated and filtered to shape their sounds.

The Moog synthesizer was brought to the mainstream by *Switched-On Bach* (1968), a bestselling album of Bach compositions arranged for Moog synthesizer by Wendy Carlos. Mort Garson used the Moog to create the soundtrack for the televised Apollo 11 moonwalk, associating synthesizers with space in the public's mind. In the late 1960s, it was adopted by rock and pop musicians including the Rolling Stones and the Beatles. [5].



Picture 3 – The Moog synthesizer

In the early 1970s the electronic music industry discovered a whole new technique of sound production. John Chowning, a respected composer and professor of Stanford University, developed an innovative way to create sounds using frequency modulation (FM). This method allowed the creation of the synth sounds that are as versatile as naturally occurring sounds. Unlike previous synthesis methods, FM was able to replicate the complexity of real instrument timbres. By 1974, Yamaha had licensed Chowning's FM and integrated it into their DX-7 commercial synthesizer. With a price tag of just \$2,000, the DX-7 opened up endless creative possibilities. [6].

In 1983, programmers introduced a technology which had a significant impact on both experimental and mainstream music — MIDI. MIDI is an acronym that stands for Musical Instrument Digital Interface. It is a method for linking electronic instruments and sound-controlling devices, such as synthesizers, samplers, and computers, so that they can communicate through MIDI messages. This lets one keyboard trigger sounds on another synthesizer, and it makes it possible to record music with functions of easy note editing, flexible orchestration, and song arrangement. The invention of MIDI coincided with the rise of personal computers, so any musician could have an unlimited “orchestra” at their disposal any time they desire. [7].

The 1990s and 2000s witnessed a massive increase in the popularity of electronic dance music (EDM) and its different subgenres, driven by the availability of digital music production tools and the emergence of computer-based software synthesizers. Instead of being limited to one specific genre, EDM covers a wide range of styles, from music without a beat to hardcore tracks with 200 beats per minute, including house music, techno, drum and bass, and dubstep among the most well-known. EDM tracks are primarily created for DJ's to play in dance clubs, blending them with other similar recordings.

Before the 21st century, DJs at clubs and raves mainly used turntables and vinyl records, making it challenging to DJ with any other type of music format. However, after 2000, new devices revolutionized the traditional methods. Furthermore, 2001 saw the debut of Ableton Live, a computer software program that enabled users to compose, manage, and mix digital tracks using a waveform display—thus eliminating the physical skills previously needed to perform an effective DJ set. [8].

During the 2010s, the development of singing synthesis technology has utilized the latest progress in artificial intelligence — deep listening and machine learning to better represent the nuances of the human voice. Advanced sample libraries, along with digital audio workstations, make it easier to make precise edits, such as changing pitch, adjusting vibrato, and making alterations to vowels and consonants. These sample libraries cover a wide range of languages and accents. Thanks to the progress in singing synthesis, some artists now use sample libraries instead of backup singers. [9].

With the development of Artificial Intelligence in the 2020s, the music industry has changed significantly. An AI music generator is a software that utilizes AI to produce unique, royalty-free music compositions. These sophisticated tools use machine learning to identify patterns in existing music, empowering them to independently create new melodies. All that is required is to provide prompts, and the AI system will compose an original musical piece based on those guidelines. Also you can imitate a voice of any person, using it in a song. That's how you can make cover. [10].

Conclusion. One of the most significant ways technology has influenced music is through the process of music production. Previously, recording music required costly and cumbersome equipment, limiting access to professional studios and skilled engineers. However, with the development of digital recording technology, the music production process has become more accessible to a wider audience. Affordable recording software and hardware now allow artists to create high-quality recordings from the comfort of their own homes. As a result, this has led to a rise in independent musicians and a broader range of musical styles, as artists are no longer bound by the limitations of traditional recording studios.

References

1. *The Impact of Technology on Music: A Deep Dive* [Electronic resource]. – URL: [https:// www.yellowbrick.co/blog/entertainment/the-impact-of-technology-on-music-a-deep-dive](https://www.yellowbrick.co/blog/entertainment/the-impact-of-technology-on-music-a-deep-dive). – Date of access: 06.02.2024.
2. Trevor J. Pinch. *Should one applaud? Breaches and boundaries in the reception of new technology in music* / Bijsterveld, Karin and Trevor J. Pinch // *Technology and Culture*. – 2003. – Vol.44. – Pp. 536–559.
3. *The 'Telharmonium' or 'Dynamophone' Thaddeus Cahill, USA 1897* [Electronic resource]. – URL: <https://120years.net/the-telharmonium-thaddeus-cahill-usa-1897> – Date of access: 06.02.2024.
4. *Hammond History* [Electronic resource]. – URL: <https://hammondorganco.com>. – Date of access: 06.02.2024.
5. *Moog synthesizer* [Electronic resource]. – URL: https://en.wikipedia.org/wiki/Moog_synthesizer. – Date of access: 07.02.2024.
6. *Electronics has changed everything: The thin line between the avant-garde and popular music worlds* [Electronic resource]. – URL: <https://www.perennialmusicandarts.com/post/2018/03/03/electronics-has-changed-everything-the-thin-line-between-the-avant-garde-and-popular-mus>. – Date of access: 07.02.2024.
7. *Introduction to MIDI and Computer Music* [Electronic resource]. – URL: <https://cecm.indiana.edu/361/midi.html>. – Date of access: 07.02.2024.
8. *electronic dance music* [Electronic resource]. – URL: <https://www.britannica.com/art/electronic-dance-music/London-and-Berlin>. – Date of access: 07.02.2024.
9. *Music technology (electronic and digital)* [Electronic resource]. – URL: [https://en.wikipedia.org/wiki/Music_technology_\(electronic_and_digital\)](https://en.wikipedia.org/wiki/Music_technology_(electronic_and_digital)). – Date of access: 07.02.2024.
10. *AI Music Generators: Tools, Techniques, and Transformations* [Electronic resource]. – URL: <https://www.appypie.com/blog/ai-music-generator-tools>. – Date of access: 07.02.2024.