THE SOUND OF PROGRESS: HOW DIGITALIZATION IS RESHAPING THE MUSIC INDUSTRY

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Abstract: In the 21st century, digitalization has revolutionized the music industry, reshaping every facet of how music is created, distributed, and consumed. "The Sound of Progress: How Digitalization is Reshaping the Music Industry" explores the impact that technological developments - such as streaming platforms, artificial intelligence, and digital production tools - are having on artists, producers, and audiences alike. Our work, created based on a comprehensive literature review method, synthesizes current research and case studies to analyse the shift from physical albums to digital streaming, the broadening access to music production technology through accessible software, and how Artificial Intelligence is transforming music composition and recommendation systems. The literature review highlights how digitalization is presenting both opportunities and challenges that are transforming the sound, reach, and economics of music. This article aims to provide an overview of these changes, offering insights into the future of the music industry in the digital age.
Keywords: Music digitalization; Artificial Intelligence in music; Technology impact.
JEL Classification: O14, O32, Z11

Introduction

Digitalization has revolutionized the cultural and artistic sectors, while the music industry in experiencing significant transformations. Existing studies explore how digital tools have reshaped the processes of music creation, circulation, and consumption, introducing both new opportunities and distinct challenges. This literature review aims to integrate key themes from academic and professional discussions, offering a holistic overview of current knowledge. It delves into historical advancements, obstacles in digital adoption, successful case studies as well as the role and impact of emerging technologies. By observing gaps and opportunities, this work emphasizes directions for future research and practical applications. This field presents numerous challenges for project management, including financial constraints, infrastructure-related obstacles, and planning difficulties. Efforts to manage the entire subset of industries collectively have consistently failed. It is essential to consequently identify the most effective segmented approach and develop a model that optimally balances centralization and decentralization (Walcott, 2004). Technological advancements have consistently influenced the evolution of the music industry, from the invention of the phonograph to the rise of digital streaming platforms that are well-known in our times. Each innovation has transformed the ways music is produced, distributed, and experienced, encouraging global connectivity and collaboration. In today's digital era, tools such as Artificial Intelligence (AI), Virtual Reality (VR) and Augmented Reality (AR) are not only elevating artistic expression but also revolutionizing project management within the industry. Since 2020, digital platforms have surged in popularity, with YouTube emerging as a dominant hub for streaming art-related content. Although debates persist over traditional versus digital methods of promoting and experiencing music, the online

environment has demonstrated its potential to transcend cultural boundaries. Numerous studies emphasize the often-overlooked role of algorithmic systems in classifying cultural goods (Arioldi, 2021). The integration of digital tools in music management encounters several notable challenges. Traditionalists express concerns that digitalization could compromise artistic authenticity, while infrastructural and economic inequalities limit the adoption of advanced technologies in developing regions. This study explores the transformative potential of digital tools in managing musical projects, emphasizing their ability to enhance management processes and providing practical solutions to bridge the gaps between the artistic and business aspects of the music industry.

Literature review

The transition from analog to digital music represented a very important moment for the industry. Early innovations, such as compact discs and MP3 files, transformed music consumption, while streaming platforms like Napster and later Spotify democratized access to music. Early 2000s literature examines how these changes disrupted traditional business models, compelling artists and producers to adapt. Meanwhile, recent studies emphasize the dual impact of streaming services: empowering independent artists with global reach while introducing challenges such as algorithmic bias. This historical perspective lays the groundwork for understanding the current landscape of digital music.

The cultural boundaries of art continue to face challenges related to legitimacy, copyright, and the actual issue of piracy, particularly within the audiovisual industry. In the realm of music, innovation is being explored through the application of digital tools on major live performance stages. Researchers are examining how live music venues of varying types and degrees of legitimacy align with or diverge from one another in their selection of choirs, orchestras, bands, and solo artists. This analysis deepens the understanding of this strong relationship between legitimacy and innovation in cultural production (Tai, 2023).

Research also explores how Artificial Intelligence (AI) contributes to the music creation process through prototype applications that generate melodies by adjusting specific algorithmic parameters, such as Ant Colony Optimization (ACO), technique inspired by the natural behaviour of ant colonies, that was first introduced as an algorithm in 1991 by Marco Dorigo (Dorigo, et al., 1991). The principle behind ACO involves observing how ants navigate from their nests to locate food, optimizing for the shortest and quickest paths. The studies considered for this literature review experiment with various composition methods, incorporating the ACO algorithm. These studies detail the entire process, from theoretical analysis and system design to implementation, experimentation, and conclusion-drawing (Boryczka, et al., 2023). Several of the reviewed works examine different facets of musical performance and audience preferences, providing valuable insights into how music interplays with technology and its influence on consumption patterns. The technical and creative challenges of performing music online are discussed in detail, highlighting the effects of third-party digital mediation on synchronization and the aesthetics through which music is experienced (Wilson, 2020). Additionally, studies analyse how social and demographic factors shape listeners' musical preferences, with the help of advanced data analysis techniques to uncover recurring trends among online users (Shakhovska & Fedushko, 2021). Economic aspects of music streaming are also explored, focusing on how platforms encourage artists to share their work with audiences and examining the effects of "multi-homing" strategies on artists' income (Bender, et al., 2021).

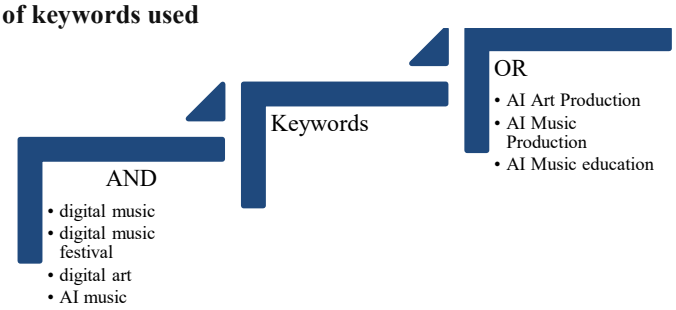
The economic and cultural influence of on-demand streaming services is profound. Wlömert and Papies' study investigates platforms such as Spotify and Apple Music, analysing how they have transformed revenue streams and distribution channels within the music industry. Their findings reveal that digital music is favoured by listeners over traditional formats (Wlömert & Papies, 2016). The research of Sinclair and Tinson explores the concept of psychological ownership within the context of music streaming. Their study examines how streaming services impact users' perceptions of ownership, loyalty, and emotional connection to music, offering a compelling comparison with traditional music formats in terms of ownership rights and consumption as it was in 2017 (Sinclair & Tinson, 2017). Another article introduces a method for identifying instrumental activity in orchestral music through hierarchical classification. This study showcases advancements in music analysis technology and its potential applications across various fields (Krause & Müller, 2023). The influence of technology in music extends to education, as evidenced by a study on integrating creativity, music, and digital skills into teaching practices. This research examines how technology enrich music educators' competencies and transforms their teaching methods (Tejada, et al., 2023). Music also acts as a bridge across various domains. For instance, Born and Devine's 2015 study explored the intersection of technology in music with gender and social class among music enthusiasts, as well as the broader effects of digitalization on educational and social shifts in the United Kingdom (Born & Devine, 2015). Nicholas Rougeux's work demonstrates a practical application of digitalization in music by reimagining musical scores through innovative visualizations. By converting complex musical data into simplified and visually engaging formats, his approach enhances the comprehension of music and provides enthusiasts with a fresh and interactive way to experience various compositions (Rougeux, 2020). The integration of advanced technologies like Artificial Intelligence (AI), Augmented Reality (AR), and Virtual Reality (VR) into the music domain has become a prominent topic of interest. In recent years, these advanced technologies have transformed traditional approaches to music education. Han's study explores the development of a VR-based music education system for vocal arts, demonstrating how VR is able to bring interactivity, boosting student engagement and learning outcomes (Han, 2022). Similarly, Yu and colleagues examine the applications of AI in music education, focusing on personalized learning experiences, intelligent music software and improved methods for assessing teaching effectiveness. These innovations facilitate tailored teaching for individual students and provide real-time feedback, effectively addressing the limitations of traditional teaching methods (Yu, et al., 2023). Another interesting study on intelligent music applications highlights innovative solutions for both musicians and listeners, illustrating how AI can be used for music composition and performance. These advancements broaden creative opportunities in music education. Together, these studies underscore the transformative role of VR and AI technologies in enhancing the efficiency, engagement, and accessibility of music education (Tabak, 2023). An intriguing perspective on digital music is shown by the exploration of the Internet of Musical Things (IoMusT) in two key studies. Luca Turchet et al. define IoMusT as networks of connected musical devices that enable multidirectional communication, with the potential to revolutionize areas such as concert experiences, public participation, remote rehearsals, music education, and production. However, challenges include ensuring network security, achieving real-time audio processing, and maintaining public engagement with music (Turchet, et al., 2018). Another study examines

how blockchain technology can enhance IoMusT by securely decentralizing music distribution and safeguarding copyrights. Potential applications include secure data exchange and smart contracts for copyright management, though challenges such as scalability, integration with IoMusT systems, and the demand for interdisciplinary collaboration remain significant (Turchet & Nam Ngo, 2022).

Methodology

During the research for this article, the team accessed and analyzed an extensive collection of scholarly articles from reputable databases, including CABI Digital Library, IEEE Xplore, Sage, Science Direct, Scopus, Springer and Web of Science. Recognized for their comprehensive collections of peer-reviewed publications, Web of Science, Scopus, and Science Direct served as primary sources for gathering relevant data. To thoroughly address the study's objectives, both qualitative and quantitative analysis methods were employed, including bibliometric analysis. These approaches provided deeper insights and highlighted practical, effective strategies across various fields such as education, economics, and art. By analyzing keyword co-occurrence, researchers can uncover correlations that simplify hypothesis formulation and provide a deeper understanding of research themes. The use of keyword co-occurrence is crucial for advancing interdisciplinary studies and expanding intellectual boundaries in still-developing or underexplored fields. Following a carefully designed search strategy, as illustrated in Figure 1 (Fig. 1), the initial exploration identified a collection of 22,278 articles. Using the NVivo14 program, a keyword filtering method was applied. Upon discovering that many of these articles included professionals from the artistic field as co-authors, VOSviewer was employed with the co-authorship filtering method. The "Full Counting" approach was selected to ensure equal importance was given to all collaborations between authors. To maintain relevant connections between authors and their institutions, a maximum of six authors per article was set, along with a limit of three publications per author, aligning with the objective of focusing on the niche area of digital music.

Figure 1. The string of keywords used

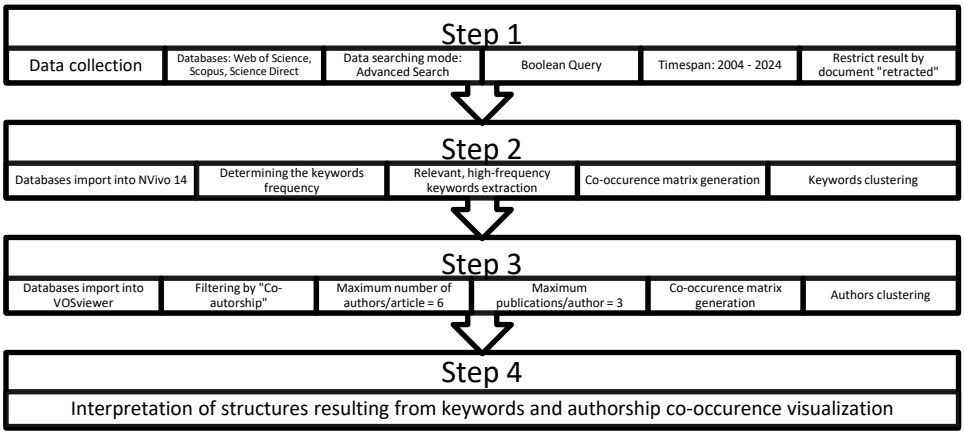


Source: Author's processing

The large number of generated papers highlights a significant interest in this field, particularly within the research community. Network graphs were created to visualize and reveal the complex relationships between keywords, authors, and institutions. In a total of 7426 authors, 400 met the specified criteria, although not all were directly connected (i.e., they had not work on the same articles). Out of these 400 authors, 168 were identified as having co-authored articles. In the final stage, following a thorough review of the articles

and analysis of the information to ensure alignment with the research topic, a total of 90 articles were selected for content analysis. Figure 2 (Fig. 2) provides a visual representation of the stages involved in the bibliometric analysis, outlining the methodology from data selection and filtering to the exclusion of open-access items and final dataset refinement. The diagram highlights the systematic approach taken to ensure accurate and reliable research results.

Figure 2. The bibliometric analysis process



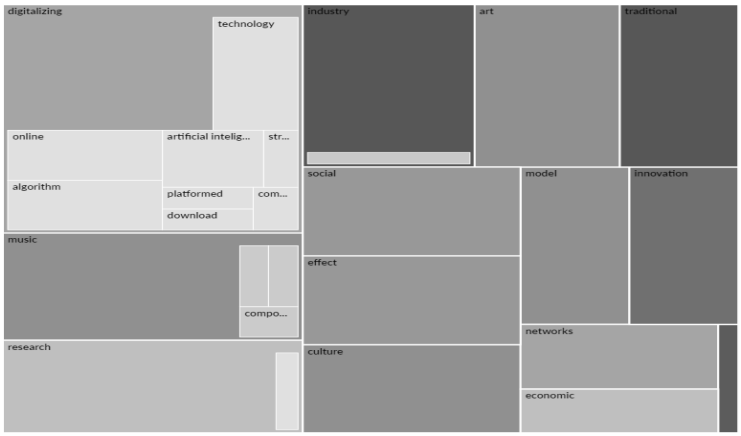
Source: Author's processing

The selection of these keywords and authorship links was of high importance as they effectively represent the research domains, bringing together not only economic and technical aspects but also artistic ones. Basing the data analysis and insights on these keywords and co-authorship connections enables a thorough and comprehensive exploration of the subject.

Results and discussions based on the bibliometric analysis

Bibliometric research is a systematic and quantitative approach to analyzing academic literature by examining networks of bibliographic references. Metrics such as citation frequency and volume are used as empirical indicators of a work's influence. This method is widely applied across disciplines to evaluate the scholarly impact of authors, publications and institutions, providing valuable insights into the evolving landscape of knowledge dissemination. Cluster analysis comes to complete the bibliometric research by identifying hidden patterns and thematic groupings within academic networks. These clusters reveal connections between researchers, institutions, and their contributions to scholarly discourse. Combining bibliometric and cluster analyses provides a deeper understanding of research impact, uncovering emerging trends, interdisciplinary connections and evolving paradigms. Figure 3 (Fig. 3) illustrates the codes and their associated sub-codes, providing clarity on the content analysis process conducted using the NVivo14 program.

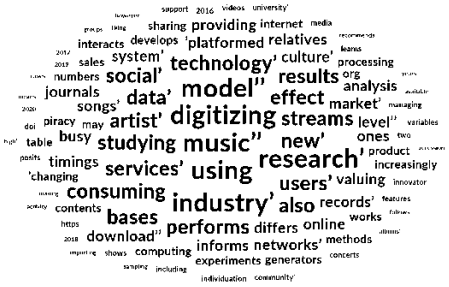
Figure 3. The hierarchical matrix of codes used for content analysis



Source: Author's processing

Figure 4 (Fig. 4) showcases the 100 most frequently used terms in the analyzed articles, offering insights that can help identify new correlations and uncover additional influential factors that are crucial to the adoption of digital tools in the cultural and artistic domain.

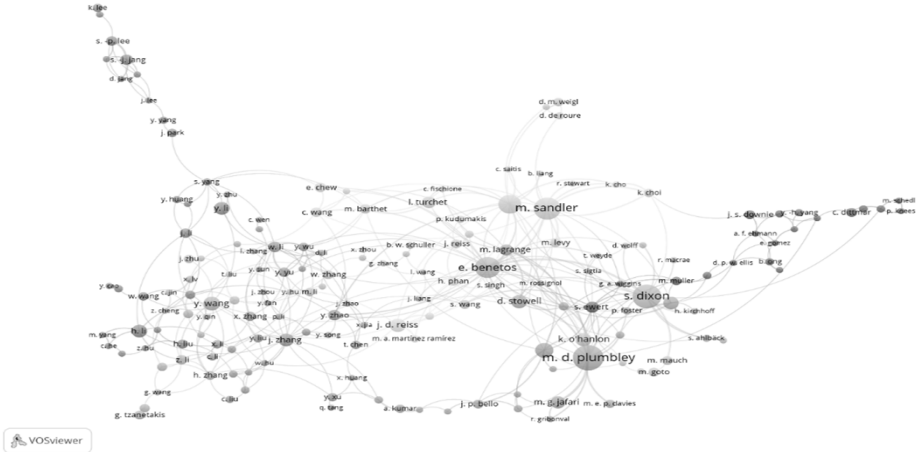
Figure 4. The 100 most frequently used terms in the analyzed articles



Source: Author's processing

Figure 5 (Fig. 5) displays the co-authorship map generated through data processing in VOSviewer. Out of the 400 authors who met the established criteria during the analysis, 168 were identified as collaborators in article writing.

Figure 5. The map of co-authorship. 168 authors connected to each other



Source: Author's processing

The majority of studies were conducted in countries such as the United States, Korea, China and India. Closer to Romania, research originates from France, Italy, Spain, Portugal, Turkey and the United Kingdom. Some of the analyzed works examine various aspects of musical performance and preferences, each one of them offering valuable insights into the interaction between music and technology and its impact on consumption. One study, conducted by a group of three researchers, applied the "text mining" method to analyze consumer reviews and online discussions about music streaming services. This technical paper identifies key factors driving consumer satisfaction and the popularity of these services, shedding light on common complaints and desired features for a better user experience (Chung, et al., 2022). To explore how listeners perceive the use of AI in music, Latikka et al. conducted a survey examining public attitudes toward AI integration in art. The results reveal mixed opinions on AI-generated art, though positive attitudes were noted regarding aspects such as perceived connection, autonomy, and technological competence. The study also offers valuable insights into the psychological factors that influence the acceptance of AI in creative industries (Latikka, et al., 2023).

Tabel 1. Top 5 terms used to describe the theme

No.	Term	Number of occurrences	Total link strength
1	Digitalizing music	18	134
2	Music industry	17	107
3	Innovation	14	84
4	Research	11	77
5	Culture	11	71

Source: Author's processing

The exploration of the Internet of Musical Things (IoMusT) provides intriguing insights, as highlighted in two significant studies. The first, led by Luca Turchet and collaborators, defines IoMusT as networks of computing devices embedded in musical objects, making possible the multidirectional communication. The study suggests that IoMusT has the potential to revolutionize various musical applications and services, such as enhancing concert experiences, promoting public participation, enabling remote rehearsals, advancing electronic music education, and optimizing studio production. However, it also identifies interdisciplinary challenges, including network security vulnerabilities, real-time audio processing, and the need for innovative strategies to sustain public engagement with music (Turchet, et al., 2018). The second study explores the integration of blockchain technology with IoMusT, highlighting its potential to transform the field by providing secure, decentralized music distribution and reliable copyright protection. The authors propose scenarios where blockchain-IoMusT applications can enable secure data exchange and implement smart contracts for managing copyrights. They also address challenges such as scalability, the technical integration of blockchain with IoMusT systems, and the importance of interdisciplinary collaboration to overcome these barriers (Turchet & Nam Ngo, 2022).

Conclusions

Knowing that the arts benefit from collaboration with other sectors, there is a pressing need to explore, analyze, and organize the factors that enable effective partnerships between representatives of the economic sector and the cultural-artistic domain. The expected

impact id bidirectional: internally, it seeks to strengthen collaboration between these groups and externally, it aims to enhance the success of joint projects. Digitalization is known to streamline the organizational and managerial processes of cultural-artistic projects, making them more efficient, less burdensome, and more engaging. This transformation will provide creativity, quality that is essential to both the Fine Arts and business sectors. This literature review affirms the importance of this topic, as similar themes have been investigated by other researchers addressing related challenges. A transformative journey driven by innovation, collaboration, and challenges is marked by the digitalization of cultural and artistic sectors, particularly in the music industry. This literature review brings together diverse research to illustrate how digital tools have revolutionized music creation, distribution, and consumption. Starting with the shift from physical albums to digital platforms, going to the incorporation of technologies like Artificial Intelligence (AI), Virtual Reality (VR) and blockchain, the study highlights the music industry's evolution in the digital era. Digitalization has evened up the access to music and expanded creative opportunities, but it also continuously brings challenges, including preserving artistic authenticity, overcoming infrastructural disparities, and addressing algorithmic biases. Emerging technologies like Artificial Intelligence (AI) and the Internet of Musical Things (IoMusT) present transformative possibilities for education, production, and performance, establishing a new paradigm of interaction between technology and art. The findings highlight the critical need for interdisciplinary collaboration to bridge gaps and maximize the effective use of these technologies. By integrating creativity with technological advancements, the music industry can adopt more innovative practices, ensuring its ongoing relevance and influence in a digital-driven world. Rather than posing a threat to artistic integrity, the evolution of digital tools offers ways to redefine the boundaries of creativity. As this digital transformation stays in progress, it tells an inspiring story of adaptability, resilience, and the timeless ability of music to connect and transform lives worldwide. The story of digitalization in music is an ongoing journey of innovation, adaptation, and resilience. As digital tools evolve, they present a valuable opportunity to blend creativity with technology. By confronting challenges directly and working for an enduring interdisciplinary collaboration, the music industry can shape a harmonious, dynamic future. In this ever-changing landscape, something stays the same: music will continue to connect, inspire, and transform lives, regardless of the environment. The digital age does not mark the end of authenticity but instead, signals a new beginning.

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