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DIGITALIZATION OF CULTURAL AND ARTISTIC DOMAINS - MUSICAL PROJECTS: A LITERATURE REVIEW

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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. This study 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. In summary, 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*

1. Introduction

Digitalization has brought transformative changes to the cultural and artistic sectors, particularly in the music industry. The existing literature explores how digital tools have reshaped music creation, distribution and consumption, offering new opportunities and presenting unique challenges. This literature review aims to synthesize key themes from the academic and professional discourse on the topic, providing a comprehensive understanding of the state of knowledge. Our work focuses on historical developments, challenges in digital adoption, successful case studies, and the role of emerging technologies. By identifying gaps and opportunities, it highlights areas for future research and practical implementation.

The challenges this field brings to project management are numerous, ranging from financial and infrastructure-related issues to planning. Even so, attempts to manage the entire subset of industries as a whole have proven destined to fail. Therefore, it is necessary to determine the best segmented approach and create a model that maximizes centralization while minimizing decentralization (Walcott, 2004).

The music industry has always been shaped by technological advancements, from the invention of the phonograph to the advent of digital streaming platforms. Each innovation has redefined how music is created, shared, and consumed, paving the way for global connectivity and collaboration. In the current digital age, tools like Artificial Intelligence (AI), Virtual Reality (VR), and Augmented Reality (AR) are not only enhancing artistic expression but also reshaping project management.

Since 2020, digital platforms have become highly sought after, with YouTube leading in terms of streaming for all things art-related. While there will always be a debate between traditional means of promoting and listening to music, cultural boundaries can indeed be overcome in the online environment. Many of the analyzed articles highlight the understudied role of algorithmic systems in classifying cultural goods (Arioldi, 2021).

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However, the integration of digital tools in music management faces significant challenges. Traditionalists fear that digitalization may dilute artistic authenticity, while infrastructural and economic disparities limit the adoption of cutting-edge tools in developing regions. This study examines how digital tools can transform the management of musical projects, highlighting how digitalization can enhance the musical projects management processes, offering first-hand solutions to bridge gaps between the artistic and business worlds.

2. Literature Review

The shift from analog to digital music marked a turning point in the industry. Early innovations such as compact discs and MP3 files revolutionized how music was consumed, while streaming platforms like Napster, and later Spotify, democratized access to music. Literature from the early 2000s discusses how these shifts disrupted traditional business models, forcing artists and producers to adapt. At the same time, recent studies highlight how streaming services have both empowered independent artists by offering global reach and introduced challenges like algorithmic favoritism. This historical context provides a foundation for understanding the current dynamics of digital music.

The cultural boundaries of art will always face questions of legitimacy, copyright, and the massive issue of piracy, particularly in the audiovisual industry. Regarding music, innovation is being researched through the use of digital tools on major live music stages. Researchers analyze how live music venues with different types and levels of legitimacy conform to or differ from their counterparts in terms of the selection of choirs, orchestras, bands, and individual artists (soloists). In this way, the complex interaction between legitimacy and innovation in the context of cultural production is further understood (Tai, 2023).

Studies also explore how Artificial Intelligence (AI) aids in the music creation process through prototype applications that compose melodies by modifying specific algorithm parameters, such as ACO (Ant Conoly Optimization) – a technique inspired from the natural behaviour of ant colonies. The Ant System was the first algorithm of this kind, introduced in 1991 by Marco Dorigo (Dorigo, Maniezzo, & Colorni, 1991). The whole principle of ACO is to observe the movement of the ants from their nests on the way they take in search for food, in the shortest and fastest possible path. The analyzed studies are experimenting on different composition methods, while applying the ACO algorithm. These studies present the entire process, from the analysis of theoretical knowledge and system design to implementation, research, and drawing conclusions (Boryczka, Boryczka, & Chmielarski, 2023).

Some of the analyzed works cover various aspects of musical performance and preferences, each contributing valuable insights into how music interacts with technology and influences its consumption. The technical and creative challenges of performing music in an online environment are explored in detail, emphasizing the impact of third-party digital mediation on musical synchronization and aesthetics through which music manifests itself (Wilson, 2020). Additionally, there are analyses of how social and demographic factors influence listeners' musical preferences, using advanced data analysis techniques to identify recurring patterns among web users' preferences (Shakhovska & Fedushko, 2021). The economic aspects of music streaming are also examined, with a focus on how platforms can encourage artists to bring their music to audiences and the impact of "multi-homing" strategies on artists' revenues (Bender, Gal-Or, & Geylani, 2021).

The economic and cultural impact of on-demand streaming services is strongly felt. The study of Wlömert & Papies examines platforms like Spotify and Apple Music, exploring how these platforms reshaped music industry revenues and distribution channels. It found that digital music is preferred by listeners over traditional music formats (Wlömert & Papies, 2016).

Research by Sinclair and Tinson delves into the concept of psychological ownership in the context of music streaming. Their study identifies how streaming services influence users' sense of ownership, loyalty, and emotional engagement with music, providing an intriguing comparison with traditional music formats regarding ownership rights and consumption at the 2017 level (Sinclair & Tinson, 2017).

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An article was also identified that presents a method for detecting instrumental activity in orchestral music using hierarchical classification. This work highlights technological advancements in music analysis and their applications in various fields (Krause & Müller, 2023).

Technology in music has also manifested in the educational domain, through a study on integrating creativity, music, and applied digital skills in education. The research explores the impact of technology integration on music teachers' competencies and their teaching approaches (Tejada, Murillo, & Mateu-Luján, 2023). Music serves as a bridge between multiple domains. As evidence, authors Born and Devine explored as early as 2015 the intersection of technology applied to music, gender, and the social class of music enthusiasts, as well as how digitalization affects educational and social changes in the United Kingdom (Born & Devine, 2015).

Nicholas Rougeux's work presents a practical application of digitalization in music: visualizing musical scores in innovative ways to create aesthetically appealing and informative representations. Complex musical data was transformed into simpler and more engaging visual formats, enhancing the understanding of music and offering enthusiasts a new way to interact with various musical pieces (Rougeux, 2020).

A current topic is how the concepts of Artificial Intelligence (AI), Augmented Reality (AR), and Virtual Reality (VR) are reflected in the music domain. In recent years, integrating these advanced technologies into music education has revolutionized traditional teaching methods. Han's study discusses the design of a VR-based music education system for vocal art. It highlights how VR can make lessons more interactive, significantly improving student engagement and outcomes (Han, 2022). Similarly, Yu and collaborators explore the evolution and applications of AI in music education, emphasizing better, personalized learning processes, the use of intelligent music software, and the assessment of teaching effectiveness. These advancements enable individualized teaching for each student and real-time feedback, effectively overcoming the limitations of traditional methods (Yu, Zheng, Wang, & Wang, 2023).

Another work on intelligent music applications presents innovative solutions for musicians and listeners alike, showcasing how AI can be used for music composition and performance. This expands creative possibilities in music education. Collectively, these studies demonstrate the transformative impact of VR and AI technologies in making music education more efficient, engaging, and accessible (Tabak, 2023).

A very interesting take on digital music is represented by the exploration of The Internet of Musical Things (IoMusT) in two significant studies. Luca Turchet et al. define IoMusT as networks of computing devices in musical objects enabling multidirectional communication. It could revolutionize areas like concert experiences, public participation, remote rehearsals, music education, and production. Challenges include network security, real-time audio processing, and sustaining public interest in music (Turchet, Fischione, Essl, Keller, & Barthet, 2018). Another study investigates how blockchain can enhance IoMusT by securely decentralizing music distribution and protecting copyrights. Applications include secure data exchanges and smart contracts for copyright management. Challenges involve scalability, integration with IoMusT systems, and the need for interdisciplinary research (Turchet & Nam Ngo, Blockchain-based Internet of Musical Things, 2022).

3. Methodology

While conducting the research for this article, the team accessed and analyzed the rich repository of scholarly articles within the Scopus, Science Direct, Web of Science, IEEE Xplore, CABI Digital Library, Springer, and Sage databases. Being recognized for its well known collection of peer-reviewed publications, Web of Science, Scopus and Science Direct served as the main sources for gathering relevant data. In order to fully understand the concerns of this study, there were used qualitative and quantitative analysis methods, including bibliometric analysis. These methods offer a better comprehension and highlight effective, applicable strategies in various domains like education, economy and of course, art.

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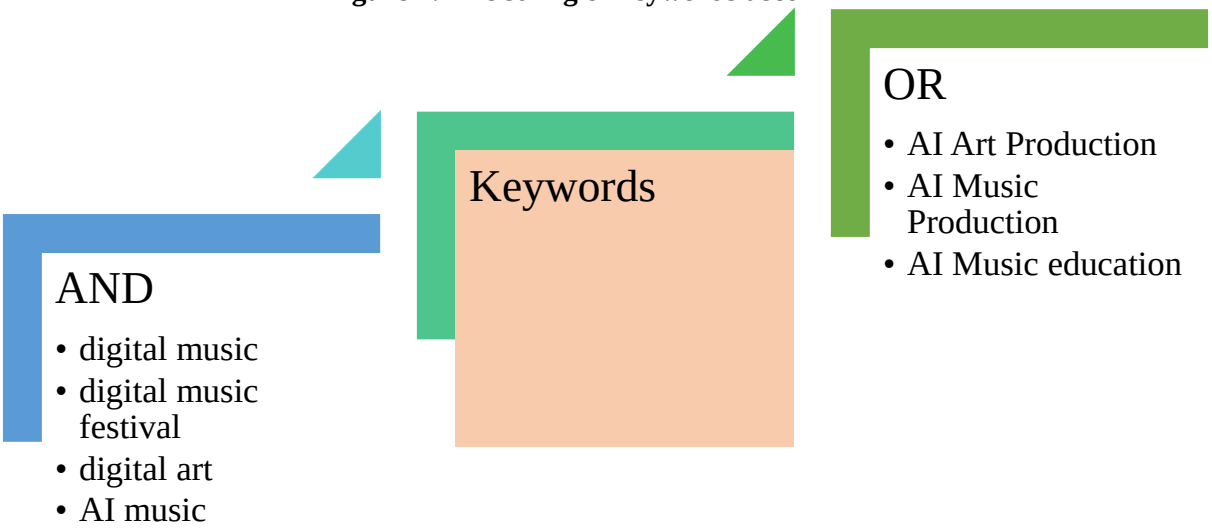
By examining keyword co-occurrence, researchers are able to discover correlations, making hypotheses formulation a lot easier, offering a in-depth understanding of research themes. The integration of keyword co-occurrence proves to be essential in the development of interdisciplinary studies and the broadening of intellectual boundaries in developing or less-explored fields. Applying a carefully designed search strategy, as outlined in Figure 1, the initial exploration got the team to a compilation of 22,278 articles. With the help of NVivo14, the keyword filtering method was used. After finding out that a lot of the articles have a professional in the artistic field as one of the authors, VOSviewer was used, with the co-authorship filtering method. The "Full Counting" method was selected, following the decision that each collaboration between authors on articles would have equal importance. The maximum number of authors for a single article was set at 6, in order to obtain a relevant connection between authors and the institution they represent and a maximum of 3 publications per author was chosen, due to the objective of staying true to the niche chosen, the one of digital music.

The substantial volume of generated papers underscores a great interest in this field, especially in the research area. Network graphs were developed, revealing intricate relationships between keywords, authors, and institutions.

Figure 1: The string of keywords used



Source: Author's processing

Out of 7426 authors, 400 met the established conditions, although not all of these authors were connected to one another (i.e., they did not work on the same articles). Subsequently, out of these 400 authors, 168 were identified as having collaborated in writing articles. In final stage, after reading the articles and analysing the information presented to align with the research's topic, a total of 90 articles was selected for content analysis.

Figure 2 visually represents the stages of the bibliometric analysis, illustrating the methodology from data selection to filtering, open-access exclusions, and final dataset curation. The diagram emphasizes the detailed approach for accurate and reliable research outcomes.

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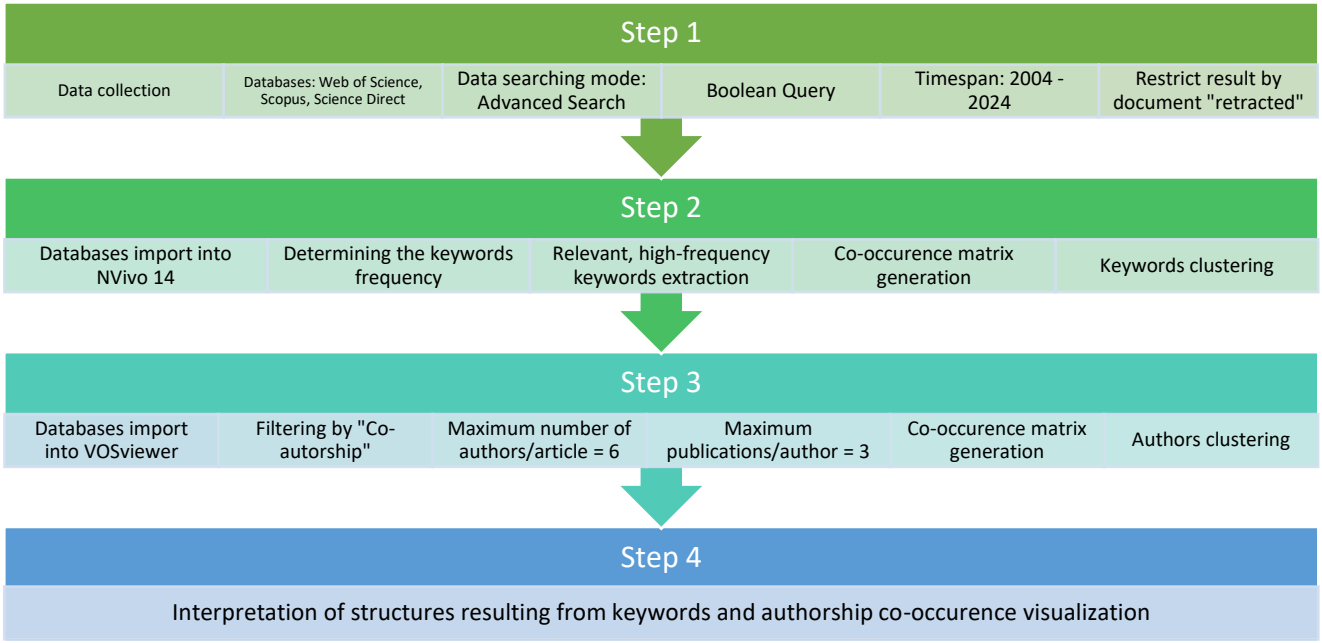
Figure 2: The bibliometric analysis process



Source: Author's processing

The importance of selecting these keywords and authorship links lies in their ability to accurately represent the research domains, which is not only economical or technical, but also artistic. Grounding the data analysis and insights on these keywords and co-authorship settings facilitates a comprehensive exploration of the topic.

4. Results and discussions based on the bibliometric analysis

Bibliometric research is a systematic and quantitative method that examines academic literature by analyzing networks of bibliographic references. Citation frequency and volume serve as empirical measures of a work's influence. This approach is widely used across various fields to evaluate the scholarly impact of authors, publications, and institutions, offering insights into the dynamic landscape of knowledge dissemination.

Cluster analysis complements bibliometric research by uncovering hidden patterns and thematic groupings within the scholarly network. These clusters highlight connections between researchers, institutions, and their contributions to academic discourse. The integration of bibliometric and cluster analyses enhances the assessment of research impact, revealing emerging trends, interdisciplinary linkages, and evolving paradigms.

Figure 3 presents the codes and their corresponding sub-codes for a better understanding of the content analysis process in the NVivo14 program.

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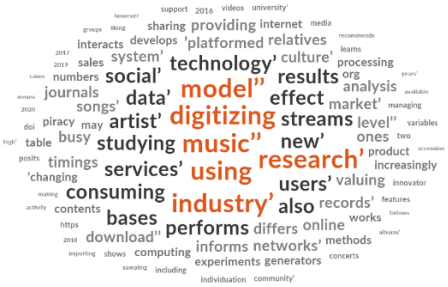
Figure 3: The hierarchical matrix of codes used for content analysis

Source: Author's processing

Figure 4 highlights the 100 most frequently used terms in the analyzed articles, which can help identify new correlations, leading to the identification of other influential factors that play an important role in the use of digital tools in the cultural-artistic domain.

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



Source: Author's processing

Figure 5 shows the co-authorship map, as a result of data processing in VOSviewer. Out of 400 authors that met the conditions that were set during the analysis, 168 were identified as collaborators in writing articles.

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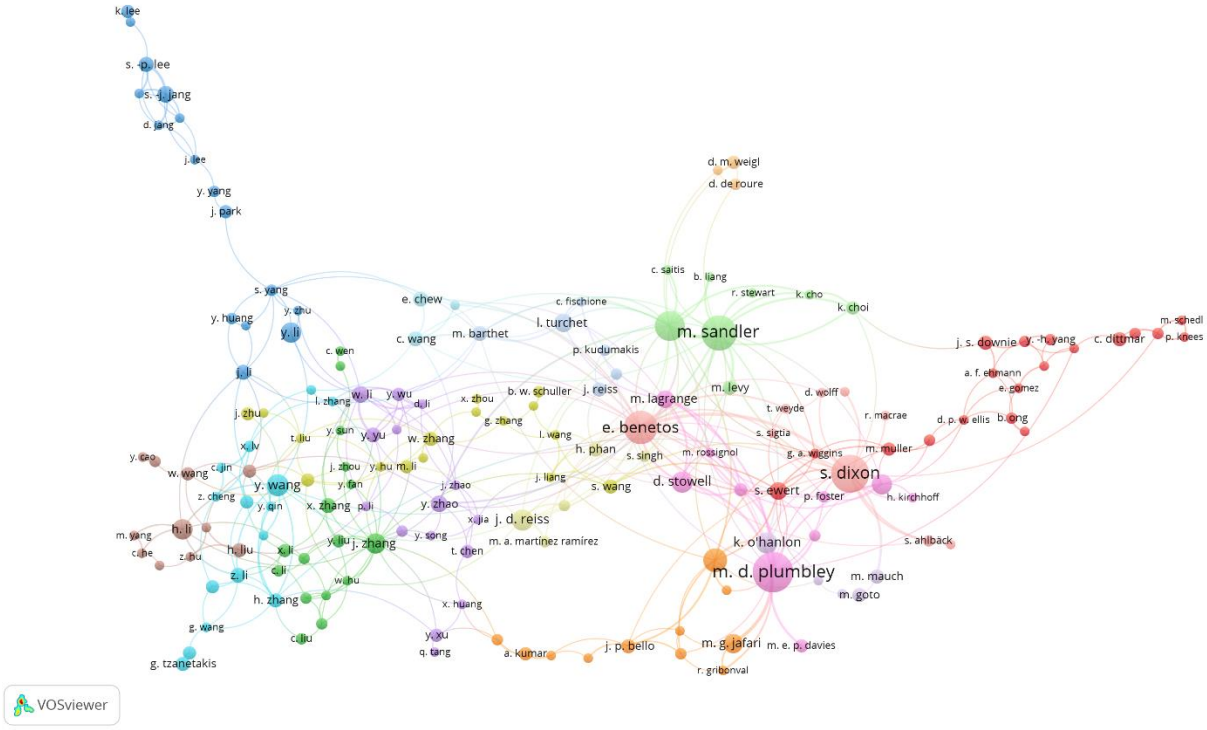
Figure 5: The map of co-authorship. 168 authors connected to each other



Source: Author's processing

Most studies were conducted in countries like the United States, China, Korea, and India. Closer to Romania, studies come from Italy, Spain, Portugal, France, Turkey, and the United Kingdom. Some of the analysed works cover various aspects of musical performance and preferences, each contributing valuable insights into how music interacts with technology and influences its consumption. A group of three researchers used the "text mining" method to analyze consumer reviews and online discussions about music streaming services. This technical paper identifies key factors influencing consumer satisfaction and the popularity of services, providing relevant insights into common consumer complaints and desired features for an improved experience (Chung, Lee, & Yoon, 2022).

To understand how listeners respond to AI use in music, Latikka et al.'s study investigates public attitudes toward AI in art through a survey. The findings reveal divided opinions on AI-generated art. However, positive attitudes emerged concerning factors such as perceived relationship, autonomy, and competence in using the technology. The study also provides insights into the psychological factors influencing the acceptance of AI in creative fields (Latikka, Bergdahl, Savela, & Oksanen, 2023).

Table 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

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The exploration of the Internet of Musical Things (IoMusT) offers fascinating insights, as detailed in two comprehensive studies. The first one, led by Luca Turchet and colleagues, defines IoMusT as networks of computing devices embedded within musical objects, enabling multidirectional communication. The research suggests that IoMusT could revolutionize musical applications and services, including enhancing concert experiences, fostering public participation, facilitating remote rehearsals, advancing electronic music education, and streamlining studio production. However, it also highlights interdisciplinary challenges such as ultra-low security in network communication, real-time audio content processing, and the need for innovation to sustain public engagement with music (Turchet, Fischione, Essl, Keller, & Barthet, 2018). The second one examines the integration of blockchain technology with IoMusT, emphasizing its potential to transform the field by enabling secure, decentralized music distribution and robust copyright protection. The authors propose scenarios where blockchain-IoMusT applications can facilitate secure data exchange and implement smart contracts for copyright management. They also address challenges such as scalability, the technical integration of blockchain with IoMusT systems, and the necessity of interdisciplinary research to overcome these obstacles (Turchet & Nam Ngo, Blockchain-based Internet of Musical Things, 2022).

5. Conclusions

In a world where arts should be supported by other domains, there is a general need to explore, analyze, and systematize the factors that support effective collaboration between representatives from the economic sector and those from the cultural-artistic domain. The anticipated impact is twofold: internally, it aims to enhance the collaboration between these groups, and externally, it focuses on the success of joint projects. Through digitalization, the organizational and managerial processes involved in cultural-artistic projects are expected to become more efficient, less cumbersome, and more engaging. This transformation will create space for the creativity essential to both Fine Arts and business. This literature review confirms the relevance of this topic, as similar ideas have been explored by other researchers addressing comparable issues.

The digitalization of cultural and artistic domains, particularly within the music industry, underscores a transformative journey characterized by innovation, collaboration, and challenges. This literature review synthesizes diverse research to reveal how digital tools have reshaped music creation, distribution, and consumption. From the transition of physical albums to digital platforms, to the integration of Artificial Intelligence (AI), Virtual Reality (VR), and blockchain, the study highlights the evolution of the music industry in the digital age.

While digitalization has democratized access and enhanced creative possibilities, it also presents challenges such as maintaining artistic authenticity, addressing infrastructural disparities, and mitigating algorithmic biases. Emerging technologies like AI and the Internet of Musical Things (IoMusT) offer groundbreaking opportunities for education, production, and performance, creating a new paradigm of interaction between technology and artistry.

The findings emphasize the necessity of interdisciplinary collaboration to address gaps and leverage these technologies effectively. By adding creativity in the technological advancements, the music industry can establish more innovative practices, ensuring its continued relevance and impact in a digital-centric world. The evolution of digital tools is not a threat to artistic integrity but a pathway to reimagining the boundaries of creativity. As this digital transformation continues, it presents an inspiring narrative of adaptability, resilience, and the enduring power of music to connect and transform lives across the globe.

The narrative of digitalization in music is far from over. It is a story of innovation, adaptation, and resilience. As digital tools continue to evolve, they offer a unique opportunity to harmonize creativity with technology. By addressing challenges head-on and considering creating a durable collaboration across disciplines, the music industry can create an inspiring future.

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In this evolving landscape, one thing is certain: music will continue to connect, inspire, and transform lives, no matter the environment. The digital age is not the end of authenticity, but rather a new beginning.

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