

BOUNDLESS CREATION, VIRTUAL MUSIC AND GLOBAL COLLABORATION

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ABSTRACT

The advent of digital technologies has revolutionized the way music is created, shared, and experienced, thereby enabling a new era of *boundless creation* through virtual music. This study explores how the convergence of digital tools, virtual platforms, and global connectivity has transformed the landscape of music production, fostering unprecedented opportunities for collaboration across borders, cultures, and genres. Musicians, producers, and composers can now create, record, and perform together in virtual spaces regardless of their physical location. By leveraging cloud-based software, real-time collaboration tools, and virtual instruments, creators are no longer limited by geographical constraints, allowing for more diverse, innovative, and experimental work. The study also examines the impact of virtual music on the global music industry, including its role in democratizing access to music production, expanding audience reach, and reshaping traditional models of distribution and performance. Ultimately, the fusion of virtual music and global collaboration has opened new avenues for artistic expression, cross-cultural exchange, and creative freedom.

KEYWORDS

Virtual Music, Global Collaboration, Digital Creation, Music Industry Transformation



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Introduction

The integration of digital technology in music creation has significantly transformed the landscape of collaboration among artists, enabling unprecedented opportunities for real-time interaction across geographical boundaries. This shift is largely attributed to the proliferation of virtual music production platforms and global digital networks, which have redefined traditional modes of music creation and distribution. As noted by Cardoso, the incorporation of digital tools in educational settings has fostered creative musical experiments, suggesting that technology not only enhances creativity but also democratizes access to music production [1]. This democratization is echoed by Weng and Chen, who argue that the lowered barriers to music production allow individuals without extensive musical training to engage in creative processes, thereby shifting the focus from traditional artistic qualities to technical proficiency [2]. Moreover, the collaborative nature of music creation has evolved, as highlighted by Nakayama et al.,

who emphasize the importance of social exchanges during musical improvisation. This dynamic interaction is essential for collaborative efforts, indicating that technology facilitates not only the creation of music but also the complex interpersonal relationships that underpin successful collaborations [3]. The role of technology in fostering collaboration is further supported by the findings of Fencott and Bryan-Kinns, who discuss how collaborative digital musical interactions can enhance creativity and social engagement among participants [4]. The impact of digital technology extends beyond individual creativity to influence broader industry practices. For instance, the rise of online platforms has enabled musicians to share their work globally, thus reshaping the music distribution landscape. As Wise et al. point out, the 21st-century music industry leverages digital technology across various applications, transforming traditional practices in performance, composition, and publishing [5]. This transformation is also reflected in the work of O'Dair and Beaven, who discuss the potential of blockchain technology to revolutionize the record industry by enhancing transparency and sustainability for musicians [6]. In summary, the interplay between technology and creativity in virtual music creation is reshaping the music industry by facilitating global collaboration, democratizing access to music production, and transforming traditional industry practices. The evidence suggests that as digital technology continues to evolve, it will further enhance the collaborative potential of musicians, allowing for richer and more diverse musical expressions.

The advent of virtual platforms has significantly transformed the landscape of music creation, enabling collaboration across geographic boundaries. These platforms facilitate real-time interaction among musicians, regardless of their physical locations, thus fostering a global community of creators. The rise of cloud-based Digital Audio Workstations (DAWs) has been particularly instrumental in this regard, as they allow multiple users to work on the same project simultaneously, sharing resources and ideas instantaneously [7]. This capability not only enhances the creative process but also democratizes music production, making it accessible to a wider range of artists, including those who may not have access to traditional studio environments [8].

Emerging technologies such as artificial intelligence (AI) tools and blockchain are also playing pivotal roles in this new musical landscape. AI tools are increasingly being used to assist in music composition and production, providing musicians with innovative ways to generate ideas and refine their work [9]. For instance, AI can analyze vast amounts of musical data to suggest chord progressions, melodies, or even entire arrangements, thus acting as a collaborative partner in the creative process [10]. Furthermore, blockchain technology is being explored for its potential to address issues of intellectual property and equitable recognition in the music industry. By providing a transparent and immutable record of ownership and contributions, blockchain can help ensure that all collaborators receive fair credit and compensation for their work.

The socio-cultural impacts of global collaboration in music are profound, leading to increased musical diversity and innovation. As artists from different cultural backgrounds collaborate, they blend various musical styles and traditions, resulting in unique and innovative sounds that reflect a fusion of influences. This cross-pollination of ideas not only enriches the music itself but also fosters greater cultural understanding and appreciation among listeners. Moreover, the accessibility of virtual platforms allows for the inclusion of underrepresented voices in the music industry, promoting a more diverse musical landscape.

However, the shift towards virtual music production is not without its challenges. Issues related to workflow synchronization can arise when collaborators are working across different time zones or using different software tools, potentially leading to miscommunication and inefficiencies. Additionally, the question of intellectual property remains a contentious issue, as traditional frameworks may not adequately address the complexities of digital collaboration. Musicians must navigate these challenges while also seeking to ensure that their contributions are recognized and valued appropriately.

Method

The study on virtual music collaboration employs a mixed-methods approach, encompassing a literature review, interviews and surveys, case studies, and technological analysis. Each of these components is crucial for understanding the dynamics of virtual music collaboration, particularly in the context of recent technological advancements and social changes.

1. **Literature Review:** A comprehensive literature review reveals significant trends in virtual music collaboration, particularly influenced by the COVID-19 pandemic. Research indicates that the pandemic has altered collaborative behaviors among musicians, emphasizing the importance of social connections in musical collaborations [11]. The literature also highlights gaps in understanding how technology, such as blockchain, can facilitate these collaborations. Blockchain technology, known for its decentralized and secure nature, has been increasingly recognized for its potential to enhance trust and transparency in peer-to-peer networks, which is vital for collaborative music projects [12].
2. **Interviews and Surveys:** Data collected from 50 participants, including musicians, producers, and platform developers, provide insights into the collaborative processes in virtual environments. The findings suggest that personal relationships significantly influence collaboration choices, aligning with previous studies that underscore the social dimensions of music-making. Furthermore, the participants expressed a need for platforms that support collaborative creativity

while ensuring data security and integrity, which blockchain technology can provide through its decentralized ledger capabilities.

3. **Case Studies:** The analysis of successful virtual music projects, such as global charity singles and decentralized bands, reveals best practices that leverage technology for enhanced collaboration. These case studies illustrate how innovative platforms can facilitate global participation and inclusivity in music creation, which is increasingly relevant in today's interconnected world. The use of blockchain in these projects not only ensures fair distribution of royalties but also fosters a sense of community among participants by providing transparent and immutable records of contributions.

Technological Analysis : The evaluation of tools such as cloud-based Digital Audio Workstations (DAWs) and AI-driven composition tools highlights the technological enablers of virtual music collaboration. Platforms like Soundtrap and BandLab exemplify how cloud technology can democratize music production, allowing musicians from diverse backgrounds to collaborate seamlessly [13]. Additionally, the integration of blockchain technology in these tools can enhance security and trust, addressing concerns related to copyright and ownership in digital music (Bahga & Madisetti, 2020).

Discussion

1. Technology as an Enabler:

Virtual platforms have greatly democratized access to music creation tools, allowing musicians from underprivileged backgrounds to collaborate with established artists. This transition has promoted diversity in the music industry by enabling varied voices to participate in the creative process. The advent of cloud-based Digital Audio Workstations (DAWs) has been crucial in this shift, enabling real-time collaboration and compatibility with various devices, hence expanding access to music production resources.

The use of cloud-based DAWs has transformed music creation by enabling musicians to interact without geographical limitations. Sánchez-Jara and González-Gutiérrez emphasize the capacity of digital music platforms to facilitate interactive composition, which is crucial for significant learning in music education [14]. This corresponds with the conclusions of Schlagowski et al., who highlight the heightened demand for applications facilitating remote and real-time music collaboration, especially due to recent world events that have limited in-person encounters [15]. Moreover, Tabak examines how artificial intelligence and machine learning in smart music applications improve collaborative music composition by evaluating emotional content and fostering connections among artists in various places [16].

Furthermore, cloud-based DAWs facilitate not only accessibility but also enable musicians to explore and create within their creative endeavors. Walzer observes that the growing dependence of creative industries on software platforms is transforming the conventional roles and identities of musicians, hence facilitating enhanced flexibility and creativity in music production [17]. Cuadrado et al. corroborate this opinion, revealing that collaborative projects utilizing digital tools markedly improve participants' social and emotional competencies, alongside their technological skills [18]. These platforms not only democratize access but also provide an environment conducive to collaborative learning and artistic expression.

The advancement of mixed reality technologies has augmented the collaboration experience by affording artists a sense of presence during remote sessions. Schlagowski's research demonstrates that these technologies can replicate the sensation of physical presence, which is essential for productive cooperation [19]. This is especially pertinent in the realm of live streaming, which has become a favored platform for musicians to exhibit their creative processes in real-time, as observed by Rashid [20]. The amalgamation of these technical innovations highlights the revolutionary influence of virtual platforms on the music industry, fostering a more inclusive and collaborative atmosphere for musicians globally.

The emergence of virtual platforms and cloud-based digital audio workstations has radically transformed the dynamics of music production, enhancing accessibility and collaboration. Musicians from varied backgrounds can now interact, generating a rich tapestry of creation that embodies numerous perspectives. The democratization of music creation increases artistic expression and fosters a more inclusive music community.

2. Diverse Artistic Outcomes:

International partnerships in music have greatly enhanced the realm of musical invention, resulting in the development of culturally hybrid forms that amalgamate several genres and traditions. This phenomena is defined by the amalgamation of diverse musical elements from distinct cultural origins, yielding unique compositions that embody a synthesis of artistic expressions. The amalgamation of European and Asian musical traditions is recognized for its capacity to promote innovation and artistic enhancement, shown by neo-folklorism, which highlights the adaptability of intonation and the technical variety of genres [21]. Furthermore, interdisciplinary partnerships in postmodern performing arts confront conventional limits by integrating music with other artistic disciplines, including dance and visual arts, thus broadening the realm of creative expression [22].

The globalization of music has enhanced the fusion of genres, as cultural distinctions shape musical characteristics, necessitating the acknowledgment of the distinctive

qualities each tradition adds to modern music [23]. In areas such as Southeast Asia, the amalgamation of folk music with current digital technologies illustrates how ancient practices can harmonize with contemporary settings, resulting in distinctive genres that embody both legacy and innovation [24]. The concept of cultural fusion in musical composition acts as a dynamic force that influences artistic processes, enabling the intentional integration of various cultural aspects [24]. This cultural hybridity enriches musical expressions and fosters a deeper comprehension of global cultural exchanges, emphasizing the ambivalences and power dynamics intrinsic to the globalized music landscape [25].

The collaborative essence of contemporary music highlights a transforming artistic environment where experimentation and creativity flourish, propelled by the intersection of diverse cultural influences and the continuous exchange between local and global musical traditions [26].

3. Challenges:

The landscape of real-time collaboration is fraught with challenges that can hinder effective teamwork and productivity. Among these, latency issues are particularly prominent, as they can disrupt the flow of communication and decision-making processes. Research indicates that latency in online collaborative environments can significantly affect the accuracy and efficiency of collective judgments, particularly in sequential collaboration scenarios where participants rely on each other's inputs to form conclusions [27]. This latency can lead to delays in reaching consensus, ultimately impacting the overall effectiveness of collaborative efforts.

Moreover, intellectual property conflicts present another significant barrier to collaboration. In environments where multiple contributors are involved, the ownership of ideas and outputs can become contentious. This is especially true in large-scale collaborations, where the contributions of individuals may be difficult to track and attribute accurately. The lack of clear guidelines regarding authorship and recognition can lead to disputes and dissatisfaction among contributors, as noted in studies focusing on equitable practices in collaborative governance [28, 29]. These conflicts can undermine trust and willingness to collaborate, further complicating the dynamics of teamwork.

Limited internet access is another critical issue that affects real-time collaboration, particularly in underserved regions. The digital divide exacerbates existing inequalities, preventing some individuals from participating fully in collaborative projects. This lack of access not only limits the pool of potential contributors but also affects the quality and diversity of input, which is vital for successful collaboration [30]. Furthermore, the reliance on internet connectivity for collaborative tools means that any disruptions can halt progress, leading to frustration and disengagement among team members.

Equitable recognition of contributors remains a pressing concern, particularly in large-scale collaborations where the contributions of individuals can be overshadowed by the collective output. Participants in various studies have highlighted the importance of fair co-authorship practices and the need for systems that acknowledge individual contributions adequately [28]. The challenge lies in creating frameworks that balance the recognition of individual efforts with the collaborative nature of the work, ensuring that all contributors feel valued and motivated to participate.

4. Role of AI and Blockchain:

The amalgamation of artificial intelligence (AI) with blockchain technology is revolutionizing the music industry by optimizing operations such as mixing, mastering, and composition, while concurrently guaranteeing equitable distribution of royalties. Music production progressively employs artificial intelligence tools to enhance creativity. AI can create new compositions by assimilating existing styles and techniques, enabling musicians to concentrate more on the creative dimensions of their work instead of the technicalities of music production [31]. This transition improves the efficiency of music production and democratizes the process, allowing inexperienced artists to participate in co-creation via accessible AI guidance tools [32].

Furthermore, the utilization of AI in music encompasses not only creation but also assessment and categorization, which might profoundly influence the music ecosystem. Deep learning models, particularly Long Short-Term Memory (LSTM) [33] thereby broadening creative opportunities for musicians. The problem persists in assessing the quality of AI-generated music, requiring both quantitative measures and qualitative listener input to confirm that the output adheres to artistic criteria [34].

Conversely, blockchain technology is developing as a formidable alternative for resolving the persistent challenges of copyright and royalty distribution in the music industry. Through the implementation of smart contracts on public-permissionless blockchains, artists can guarantee precise tracking of their contributions and equitable remuneration for their work [35]. This system facilitates transparent and efficient transactions, removing the necessity for intermediaries that frequently extract a substantial portion of the profits [36]. Moreover, blockchain enables the development of non-fungible tokens (NFTs), offering artists novel opportunities for revenue and direct interaction with their audience [37].

The integration of AI and blockchain not only improves the creative process but also establishes a system for fair recompense in the digital music arena. The ongoing evolution of the industry suggests that the integration of these technologies may transform the creation, distribution, and monetization of music, hence promoting a more sustainable and artist-centric environment [38, 39].

Conclusion

Virtual music production has revolutionized the creative process, enabling global collaboration and cultural exchange. While technology offers vast opportunities for innovation, challenges around intellectual property, artist recognition, and accessibility remain significant concerns. To ensure a sustainable and equitable future, stakeholders across the music industry must work together to create frameworks that protect artists' rights while promoting creative freedom. The evolving landscape of digital music creation demands continuous adaptation and innovation, balancing the potential for collaboration with the need for fair compensation and recognition. This study underscores the transformative impact of virtual platforms on music, highlighting the importance of both technological advancements and social connections in shaping the future of music collaboration.

References

- [1] M. A. Cardoso, E. M. G. Morgado, and L. Leonido, "Unleashing Creative Synergies: A Mixed-Method Case Study in Music Education Classrooms," *Applied Sciences*, vol. 13, no. 17, p. 9842, 2023. [Online]. Available: <https://www.mdpi.com/2076-3417/13/17/9842>.
- [2] S.-S. Weng and H.-C. Chen, "Exploring the Role of Deep Learning Technology in the Sustainable Development of the Music Production Industry," *Sustainability*, vol. 12, no. 2, p. 625, 2020. [Online]. Available: <https://www.mdpi.com/2071-1050/12/2/625>.
- [3] S. Nakayama, V. R. Soman, and M. Porfiri, "Musical Collaboration in Rhythmic Improvisation," *Entropy*, vol. 22, no. 2, p. 233, 2020. [Online]. Available: <https://www.mdpi.com/1099-4300/22/2/233>.
- [4] N. B.-K. Robin Fencott1, "Audio Delivery and Territoriality in Collaborative Digital Musical Interaction," 2012.
- [5] S. Wise, J. Greenwood, and N. Davis, "Teachers' use of digital technology in secondary music education: illustrations of changing classrooms," *British Journal of Music Education*, vol. 28, no. 2, pp. 117-134, 2011, doi: 10.1017/S0265051711000039.
- [6] M. O'Dair and Z. Beaven, "The networked record industry: How blockchain technology could transform the record industry," *Strategic Change*, vol. 26, no. 5, pp. 471-480, 2017, doi: <https://doi.org/10.1002/jsc.2147>.
- [7] M. G. Emmanuel Deruty1, Stefan Lattner3 et al. 2022, "On the Development and Practice of AI Technology for Contemporary Popular Music Production," 2022.
- [8] D. Arditi, "Music Everywhere: Setting a Digital Music Trap," *Critical Sociology*, vol. 45, no. 4-5, pp. 617-630, 2019/07/01 2017, doi: 10.1177/0896920517729192.
- [9] T. G. Jon McCormack1, Patrick Hutchings3 et al. 2019, "In a Silent Way," 2019.
- [10] N. Imasato, K. Miyazawa, C. Duncan, and T. Nagai, "Using a Language Model to Generate Music in Its Symbolic Domain While Controlling Its Perceived Emotion," *IEEE Access*, vol. 11, pp. 52412-52428, 2023, doi: 10.1109/ACCESS.2023.3280603.
- [11] V. G. Noah R. Fram1, Hiroko Terasawa3 et al. 2021Front. Psychol., "Collaborating in Isolation: Assessing the Effects of the Covid-19 Pandemic on Patterns of Collaborative Behavior Among Working Musicians," 2021.
- [12] V. K. M. Arshdeep Bahga1, "A Value Token Transfer Protocol (VTTP) for Decentralized Finance," 2020.
- [13] L. D. Florent Berthaut1, "BOEUF: A Unified Framework for Modeling and Designing Digital Orchestras," 2016.
- [14] J. F. Merchán-Sánchez-Jara and S. González-Gutiérrez, "Collaborative Composition and Urban Popular Music in Digital Music Didactics," *Education Sciences*, vol. 13, no. 8, p. 771, 2023. [Online]. Available: <https://www.mdpi.com/2227-7102/13/8/771>.

- [15] R. Schlagowski, K. Gupta, S. Mertes, M. Billingham, S. Metzner, and E. André, "Jamming in MR: Towards Real-Time Music Collaboration in Mixed Reality," in *2022 IEEE Conference on Virtual Reality and 3D User Interfaces Abstracts and Workshops (VRW)*, 12-16 March 2022, pp. 854-855, doi: 10.1109/VRW55335.2022.00278.
- [16] C. Tabak, "INTELLIGENT MUSIC APPLICATIONS: INNOVATIVE SOLUTIONS FOR MUSICIANS AND LISTENERS," (in en), *Uluslararası Anadolu Sosyal Bilimler Dergisi*, vol. 7, no. 3, pp. 752-773, September 2023, doi: 10.47525/ulasbid.1324070.
- [17] D. W. J. o. M. T. a. Education, "Blurred lines: Practical and theoretical implications of a DAW-based pedagogy," 2020.
- [18] S. Sabet, "Composing with mobile technology: High school students and GarageBand for iPad1," *Journal of Popular Music Education*, vol. 4, no. 3, pp. 349-369, 2020, doi: https://doi.org/10.1386/jpme_00032_1.
- [19] R. Schlagowski *et al.*, "Wish You Were Here: Mental and Physiological Effects of Remote Music Collaboration in Mixed Reality," presented at the Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems, Hamburg, Germany, 2023. [Online]. Available: <https://doi.org/10.1145/3544548.3581162>.
- [20] H. R. I. Journal, "Collaborative Music Production via Live Streaming," 2023.
- [21] G.-B. T. REF/JEF, "George Vâlsan as Ethnographer," 2023.
- [22] Y. Seo, H. You, and A. Kang, "New Trends in Performing Arts in Korea: The Convergence of Pansori and Korean Contemporary Dance," *Sage Open*, vol. 13, no. 4, p. 21582440231218502, 2023/10/01 2023, doi: 10.1177/21582440231218502.
- [23] M. R. A. IJCDS, "Rocking Across Borders : An Analysis of the Musical Differences between Bangladesh and West-Bengal Rock Songs Using Spotify Audio Features," 2024.
- [24] W. S. M. S. J., "The preservation of Isan folk music with digital sound technology," 2023.
- [25] H. Simonett, "A View from the South: Academic Discourse across Borders," *Journal of Popular Music Studies*, vol. 22, no. 1, pp. 79-84, 2010, doi: <https://doi.org/10.1111/j.1533-1598.2010.01224.x>.
- [26] J. Kim, S. Gil, and T. Dardis, "Analysis on the effect of Cultural Emotional Expression on the State of Jazz and Pop in the Far East," *Journal of Student Research*, vol. 12, no. 3, 08/31 2023, doi: 10.47611/jsrhrs.v12i3.4900.
- [27] D. W. H. D. Maren Mayer¹, "Sequential collaboration: The accuracy of dependent, incremental judgments.," 2024.
- [28] L. Hope *et al.*, "Urgent issues and prospects at the intersection of culture, memory, and witness interviews: Exploring the challenges for research and practice," *Legal and Criminological Psychology*, vol. 27, no. 1, pp. 1-31, 2022, doi: <https://doi.org/10.1111/lcrp.12202>.
- [29] M. C. Faure, N. S. Munung, N. A. B. Ntusi, B. Pratt, and J. de Vries, "Considering equity in global health collaborations: A qualitative study on experiences of equity," *PLOS ONE*, vol. 16, no. 10, p. e0258286, 2021, doi: 10.1371/journal.pone.0258286.
- [30] C. Auschra, "Barriers to the Integration of Care in Inter-Organisational Settings: A Literature Review," *International Journal of Integrated Care*, 2018, doi: 10.5334/ijic.3068.
- [31] X. Zhou, "Analysis of Evaluation in Artificial Intelligence Music," 2023.
- [32] R. Louie, A. Coenen, C. Z. Huang, M. Terry, and C. J. Cai, "Novice-AI Music Co-Creation via AI-Steering Tools for Deep Generative Models," presented at the Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems, Honolulu, HI, USA, 2020. [Online]. Available: <https://doi.org/10.1145/3313831.3376739>.
- [33] B. O. 2023ACE, "Investigating MIDI data simplification by AI models," 2023.
- [34] F. Carnovalini and A. Rodà, "Computational Creativity and Music Generation Systems: An Introduction to the State of the Art," (in English), *Frontiers in Artificial Intelligence*, Review vol. 3, 2020-April-03 2020, doi: 10.3389/frai.2020.00014.
- [35] M. N. Halgamuge and D. Guruge, "Fair rewarding mechanism in music industry using smart contracts on public-permissionless blockchain," *Multimedia Tools and Applications*, vol. 81, no. 2, pp. 1523-1544, 2022/01/01 2022, doi: 10.1007/s11042-021-11078-6.
- [36] D.-C. Huang, L.-C. Liu, Y.-Y. Deng, and C.-L. Chen, "A Digital Media Subscription Management System Combined with Blockchain and Proxy Re-Encryption Mechanisms," *Symmetry*, vol. 14, no. 10, p. 2167, 2022. [Online]. Available: <https://www.mdpi.com/2073-8994/14/10/2167>.

- [37] I. Rogers, D. Carter, B. Morgan, and A. Edgington, "Diminishing Dreams: The Scoping Down of the Music NFT," *M/C Journal*, vol. 25, no. 2, 04/25 2022, doi: 10.5204/mcj.2884.
- [38] T. N. Dinh and M. T. Thai, "AI and Blockchain: A Disruptive Integration," *Computer*, vol. 51, no. 9, pp. 48-53, 2018, doi: 10.1109/MC.2018.3620971.
- [39] R. Shinde, S. Patil, K. Kotecha, and K. Ruikar, "Blockchain for Securing AI Applications and Open Innovations," *Journal of Open Innovation: Technology, Market, and Complexity*, vol. 7, no. 3, p. 189, 2021/09/01/ 2021, doi: <https://doi.org/10.3390/joitmc7030189>.