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Blockchain for Digital Brand Communications in Music Business

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Abstract:
This paper aims to provide a systematic analysis of the existing literature, focusing on the applications and hurdles encountered by blockchain technology in the music business. It aims to shed light on the potential benefits that can be realized through the integration of blockchain and the Internet of Musical Things (IoMust) in the music industry. It discusses the blockchain concept in detail & its role in the music industry supported by grey literature.
Blockchain 4.0 can benefit by providing huge data to understand the customer responses & which in turn can be used to put the data for better communications & understanding the fan base. It helps in micropayments through smart contract & ethical royalty disbursement. The study can be extended with individual level by surveys & can be studied utilizing companies offering music blockchain services as a case study or studying at the organisational level adoption. As music is mainly spread through online & events unlike offline in the past, understanding the fans is easily possible if the blockchain & IoMusT can be integrated.

Keywords: Blockchain Technology (BCT); Internet of Musical Things (IoMusT); Royalty; Smart Contract; Micropayment; Direct to Fan.

Introduction

Music industry is susceptible to lot of threats, majorly the copyright issues, delays, and denial of payment of royalties. Music is a vital part of everyday life, but we do not focus much on the process of the art before it has been consumed by the audience. Music is now crossing the national boundaries and has an international approach. The internet has somewhat helped to eradicate the loopholes, but the areas of improvements cannot be overlooked. We have seen how the quality of music has dropped due to mediocre remixes hampering the artists associated with the original music. There are many instances of not giving the credit to the original artist and this need an immediate attention.

The initial explanation of Blockchain emerged in 1990 during the CRYPTO conference, with the intention of developing archival systems. Subsequently, Haber and Stornetta (1991) introduced the notion of Blockchain in the Journal of Cryptography. Satoshi Nakamoto popularized it in 2008. Nakamoto introduced Bitcoin, a new Peer-to-Peer (P2P) electronic cash system, which is described as an electronic payment system based on cryptographic proof. This system enables direct transactions between any two interested parties without the need for a third party.
Blockchain is a secure digital ledger that stores immutable records in a decentralized manner. Blockchain technology can be used to analyse newer forms of financial Infomediaries to music creators- recording artists, record labels, music composers, sound engineers, producers, & distributors. Blockchain has a role in developing new business models to monetize recorded music. The term ‘Infomediaries’ was coined by Hagel & Rayport in 1997 to imply the use of new digital technologies like Blockchain, to improve financing & payment alongside a range of associated support services.
World Economic Forum Survey (2015) suggests that 10 per cent of global gross domestic product will be stored on blockchain by 2027. According to a forecast by Gartner in 2017, it was projected that by the year 2030, approximately 30 percent of the worldwide customer base would consist of individuals utilizing blockchain technology for their business endeavors. The market for blockchain related products and services has been expanding rapidly over past several years and will be worth close to US $ 40 billion by 2025 (Statista Research). TechRepublic Research says that 70 per cent of working professionals have yet to use blockchain. Blockchain value to businesses is estimated to increase to US $ 3.1 trillion by 2020 from US $ 360 billion in 2026 (Gartner).

As per Globenewswire, by 2024, the global blockchain market is expected to reach over US $ 20 billion. The music industry has an estimated value of around US $45 billion, with approximately US $15 billion attributed to recorded music (BerkleeICE, 2015). A blockchain program was launched in March 2020 by World Health Organisation (WHO) based on distributed ledger technology (DLT) – 'MiPasa' to help transfer data & statistics related to COVID-19 outbreak.

Review of Literature

Blockchain serves as a digital ledger, maintaining immutable records of all transactions and operations within a database (Drescher, 2017). Chirls (2018) explained blockchain as a novel type of database which has emerged, enabling a decentralized community to authenticate transactions and data without relying on a central authority or having to place trust in each other. Among the emerging technologies such as blockchain, artificial intelligence (AI), Internet of Things (IoT), and Machine Learning (ML), blockchain technology is already making a noticeable impact on our everyday lives (Bayyou, 2019; Herian, 2018; Kant, 2020).

Since the beginning of the new millennium, the decline in global recorded music revenue has been halted by the growth in online music streaming (IFPI, 2018), a mere 10 percent of tracks receive a staggering 99 percent of the streaming income (Krukowski, 2018). Blockchain technology is revolutionary within the recorded music industry (Tapscott and Tapscott, 2018) in diminishing the involvement of external entities. Blockchain technology has the capability to safeguard the rights of artists, as well as streamline the processes of royalty payments and licensing by utilizing smart contracts (O'Dair, 2019). Music copyrights are typically categorized into songs, compositions, and recordings.

The secondary rights market has the potential to coexist with online activities like artist subscription services and the sale of music segments through micro-metering. (Takahashi, 2017). Sitonio and Nucciarelli (2018) Indicate the increase in digital service aggregators that connect digital music with customer-oriented streaming platforms. Blockchain has the capability to establish a direct link between specific end users, enabling both communication and subsequent actions (Antonopoulos, 2015).

Blockchain is an immutable distributed ledger technology that ensures security, anonymity, and data integrity without the need for any external entity to oversee transactions (Yli-Hummo et al., 2016).

Blockchain is an exemplary foundational technology that enables the utilization of decentralized databases and peer-to-peer networks for securely storing a registry of transactions that are cryptographically linked (Kokina et al., 2017). The concept of 'Blockchain' pertains to the utilization of a communal distributed database that facilitates the processing of digital transactions among a network of users, while simultaneously monitoring the tangible or intangible assets associated with it. (Iansiti and Lakhani, 2017).

The absence of a middleman or trusted third party eliminates the need for a centralized point for data transmission, removes any central vulnerability on the network that could be exploited, and prevents data manipulation, ensuring that transactions carried out through blockchain technology are secure and transparent (Nakamoto, 2008). Utilized in a business setting, numerous advantages emerge such as savings in costs and time, more efficient processes, enhanced system trust, heightened security, improved transparency, decreased tampering and fraud, minimized auditing requirements, decreased overhead and human error from manual tasks, reduced transaction expenses, and more (Torres de Oliveira, 2017).

Blockchain technology has the capability to lower transaction costs (Antonopoulos, 2017; Campbell-Verduyn, 2018; Davidson et al., 2018) & 'industrialize trust' (Berg et al., 2019) by reducing the occurrence of opportunistic behavior. Blockchain is a vast decentralized digital database that maintains records of transactions. (Pilkington, 2016); it is made up of an ever-expanding collection of records and data structures known as 'blocks' that are interconnected and protected through cryptography.

The blockchain is accessible to the public, allowing for the tracing of every transaction back to the initial block. (Bancroft and Reid, 2017). When a fresh user becomes a part of a particular blockchain network and triggers a transaction, the transaction is disseminated to the peer network, and each user in the network obtains a duplicate of all the information that was previously stored on the blockchain up until that point in time (Risius and Spohrer, 2017; Tapscott and Tapscott, 2017). Following validation by the peer network, the transaction is assigned a distinct identifier and incorporated into a fresh block located at the conclusion of the chain. Once executed, a bundle of transactions is sent to other users in the network within each blockchain. These interconnected blocks collectively create a chain, commonly known as a blockchain. (Crosby et al, 2016, 2017). After a transaction is added to the blockchain, it becomes immutable, transforming the blockchain into a permanent ledger of historical transactions, marking the completion of the transaction (Seebacher and Schüritz, 2017; Kshetri and Voas, 2019).

To alter blockchain, the hacker must have 51 per cent access to the nodes, which makes them to do mining monopoly and cause network disruption. This is called as 51 per cent attack.Each fresh batch of information, known as the block, needs to undergo encoding and encryption via a process known as mining. (Crosby et al., 2016; Zheng et al., 2018). The protocol ensures transparency, accountability, and verifiability for every data or record, as they cannot be overwritten and are accessible to all parties involved in the transaction. (Crosby et al., 2016).
Blockchain enables the exposure of vast quantities of data while preventing counterfeit activities using QR codes, the commonly utilized RFID technology that serves as unique identification markers for products, or through crypto anchors, which are microscopic markers with distinct codes (Tripoli and Schmidhuber, 2018).

Blockchain transactions are based on cryptography, which is a technique of writing and solving codes to securely communicate messages (Diffie & Hellman (1976).
The main features that are highlighted regarding blockchain systems is its security, because of the hashing programming and sophisticated encryption of its system architecture (Yang, 2019). Each block related to previous events, with increasing number of participants and blocks. It is extremely difficult to modify information without having authority from network consensus. (Corea, 2019; Crosby et al., 2015).
Blockchain technology can be used for business that require transparency and solving problems where there are many parties involved and do not have confidence in the distribution of some business resources (Manski, 2017). A new blockchain network called Ethereum was created by Buterin in 2016. It adds additional layer of functionality, allowing applications coded by users to run on top of it.
Etherium was the first blockchain protocol which allows users to create smart contracts through Solidity language. Python, JavaScript, and C++ are the backbone of solidity.
The objective was to understand blockchain concept and its applications, especially to the music industry and to study the use of smart contracts for the royalty payment for performers. The questions were to understand- What is Blockchain technology and its importance in music industry? How smart contract can help in removing the third party for the royalty and bring transparency?

Methodology

The primary sources utilized for the systematic literature review included SCOPUS, Emerald, and Elsevier. The keywords used were-blockchain, blockchain technology, blockchain adoption, blockchain based, blockchain applications, blockchain challenges, blockchain opportunities and blockchain in music. While selecting the papers a global perspective was taken by including papers from across the globe. The technical papers were not selected and the paper from the duration from 2018 to 2022 were taken. A total of 25 papers were selected. Also, considering blockchain novice nature, due to lack of quantitative papers, the focus was given to the grey literature from 'OpenSource' business magazine articles.

Discussions

The types of blockchains can be classified as public, private and consortium blockchains.

Public Blockchain

A public blockchain functions as a decentralized system in which every participant or node is responsible for documenting transactions on a shared ledger. These transactions are grouped together into blocks, which are then processed through an algorithm to produce a distinct hash code that corresponds to the data set at a specific moment. The initial hash code serves as the primary data element within the subsequent series of transactions that constitute the subsequent block. As additional transactions are made, the list expands while blocks are appended to form a chain. In a public blockchain, all individuals have the ability to join the network and are assigned a unique identification at random. No requirement exists for a central provider to admit new participants or oversee transactions. (Albrecht et al., 2018).
Public blockchains allow any individual with the role of a 'miner' to gain access to the blockchain, granting the ability for anyone to view its contents (Guo and Liang, 2016), a form frequently known as 'permissionless' (McGinnet al., 2018).Public blockchains often possess a substantial number of nodes, thereby enhancing security. This is due to the fact that any potential attacker would be required to gain access to a considerable number of nodes in order to modify data on the blockchain. Furthermore, they would need to obtain majority approval, in the form of 'votes', to validate such alterations

(Lin and Liao, 2017), although there exist various potential points of failure in numerous blockchain configurations (Gramoli, 2017).

Public blockchains utilize a 'proof of work' (PoW) mechanism, wherein a node that adds a block must demonstrate to other nodes, using a miner system's algorithm, that it is accountable for the creation of the new block. (Dinh et al., 2018). The energy needed to handle a single Bitcoin transaction is equivalent to the energy consumption of nine American households in a day. (Frizzo-Barker et al., 2020).

Private Blockchain

Private blockchains are managed by a sole entity, allowing restricted access to specific participants. (Wang et al., 2019). Transaction speeds are generally fast, while energy consumption and system costs remain minimal (Albrecht et al., 2018; Strüker et al., 2019). Private blockchains can be distributed, but they are not decentralized since their governance is restricted to a particular individual or entity, rather than being open to all (Preukschat, 2017).

Consortium Blockchain

Consortium blockchains share similarities with single owner blockchains, however, they have multiple owners instead of just one (Lin and Liao, 2017).

Public or permissionless blockchains allow anyone to participate while maintaining anonymity, whereas private or permissioned blockchains require users to disclose and verify their identities. Permission to access the latter is granted by either a single entity or a consortium that serves as a gatekeeper (Yeoh, 2017). Private and consortium blockchains, with a restricted number of nodes due to permissions given by the owners, limit transparency in exchange for a slight decrease in immutability (Kshetri, 2018) and an intrusion into the system would merely require compromising a handful of systems on the blockchain to manipulate the data. Additional blocks are accepted onto the blockchain through a consensus mechanism in these 'permissioned' blockchains. (Bergman et al., 2019).

Most of the blockchains in the market are currently operating independently. (Warkentin and Orgeron, 2020; Bumblauskas et al., 2020; Di Vaio and Varriale, 2019).

A blockchain is a collective, decentralized, and continuously growing digital ledger that records digital transactions in a sequential manner. (Andoni et al., 2019; Christidis and Devetsikiotis, 2016; Pilkington, 2016; White 2017). Each individual node possesses a duplicate of this database. Fresh blocks are incorporated through cryptographic methods. (Adhami et al., 2018; Cai and Zhu, 2016). If the majority of nodes verify its authenticity, it will be appended to the blockchain. (Nofer et al., 2017). Additional blocks are permanent and highly resistant to tampering, ensuring transparency and dependability. (Wu and Tran, 2018).

Digital timestamps help in making sure that the data is not tampered. The efficiency of public blockchains is compromised due to the higher number of nodes compared to private and consortium blockchains. This is because the consensus required to validate each new block is more demanding in public blockchains, whereas consortium or private blockchains can achieve consensus with fewer participants (Yermack, 2017).

Reconciliation between different databases is no longer needed in blockchain as a single ledger authoritative state is obtained by consensus without using an intermediary, which virtually eliminates the intermediary fee involved in the whole process (Biella and Zinetti, 2016). Firm that adopts blockchain & apply its opportunities are considered to achieve operational excellence (Cole et al., 2019; by Kamble et al., 2019).

Firms use initial coin offerings (ICO) to increase users and boost the transactions of their own applications by tokens distribution among the users. (Stallone et al., 2021). There are many open source blockchain platforms like Hyperledger, Etherium, BigchainDB, HydraChain, Corda, Tron etc.

Generations of Blockchain Technology Development

The progress of blockchain technology can be classified into four generations.

- ***Blockchain 1.0*** was widely used cryptocurrency for payment of FOREX, low value payments, and direct cash payments.
- ***Blockchain 2.0*** deal with smart contracts, security trading, smart properties, clearing payments, banking instruments and associated areas of finance.
- ***Blockchain 3.0*** manages the regulatory governance of blockchain applications in government sector, science & technology, healthcare, art, &culture (Swan, 2015).

- ***Blockchain 4.0*** is a decentralized mechanism which allow IT system to do business integrations, operate on cross blockchain business processes to support supply chain, workflow and asset management and financial management systems. (Alladi, 2019; Srivastava, 2018).

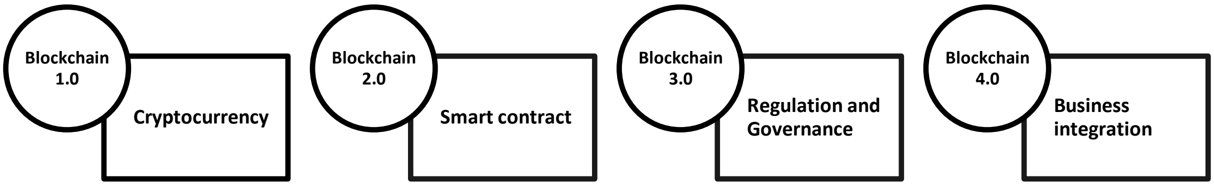

Figure 1: Generations of Blockchain

Smart contracts: Smart contract was coined by Nick Szabo in 1997. Smart contracts are digital protocols to execute, verify and enforce contracts automatically when contract conditions are fulfilled (Cong and He, 2019). Smart contracts autonomously negotiate and executes transactions between parties (Albrecht et al., 2018; Li et al., 2019; Troncia et al., 2019; Wu and Tran, 2018). The transaction is completed or declined depending on the check results. Post completion, the transaction moves to the ledger (Yuan and Wang, 2016).

Blockchain and Governance

One of the roles of governance is to ensure that monopolistic power is prevented (Williamson, 1979). The permanence of data on a blockchain contradicts the legal entitlement to erasure (Politou et al., 2019). On a public blockchain, governance can pose challenges as the blockchain lacks a designated 'owner', whereas on a private blockchain, the governor assumes the role of the owner (Wu et al., 2017). There may exist trade-offs on a consortium blockchain regarding the level of access granted to entities and the sensitivity of certain data (O'Leary, 2017). Smart contracts have the potential to disrupt traditional governance models (Shermin, 2017), offering cost efficiency, enhanced security, and improved visibility.

Features of Blockchain*:*

The blockchain possesses the following key characteristics

A. ***Decentralisation*****:** It is maintained by a network. The validation of the transactions, jurisdiction is performed by central entity.

B. ***Immutability***: Each connection between blocks in the chain represents a reverse hash value of the preceding block; any alteration made to a block results in the disqualification of all subsequently created blocks.

C. ***Traceability*****:** The user has the ability to authenticate and track the source of past data.

D. ***Non-repudiation*****:** The initiator of a transaction cannot deny a transaction that has been cryptographically signed.

E. ***Transparency*****:** Each individual has the privilege to access and engage with the blockchain network on an equal footing.

F. ***Anonymity*****:** Enhanced cryptographic methods like Zero-knowledge proof or commitment schemes are essential to achieve complete anonymity (Ateniese et al., 2017).

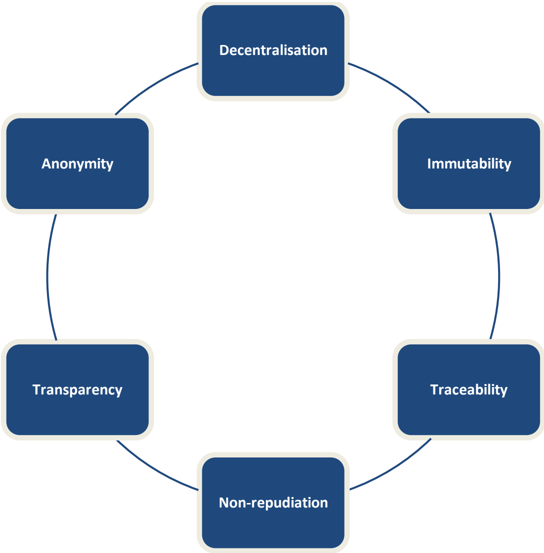

Figure 2: Features of Blockchain Technology

Internet of Musical Things (IoMusT)*:* The IoMusT is a new domain and is an application of IoT in music industry. IoMusT requires decentralisation, authentication, data integration, transparency, and privacy. It also includes managing copyrights & ease of royalty payment. IoMusT encompasses ecosystems, networks, Musical Things, protocols, and music-related information representations that facilitate services and applications pertaining to musical content and activities, within physical and/or digital settings.

Information related to music pertains to data that is detected and/or analyzed by a Musical Device, and then relayed to a person or another Musical Device for musical intentions. A Musical Thing is a tool that could detect, obtain, trigger, share, or manipulate information for musical use (Turchet et. Al, 2018). Smart Musical instruments, an emerging category of IoT devices, are characterized by sensors, actuators, wireless connectivity, and embedded intelligence, making them the most prominent instruments in the Musical Things collection (Turchet, 2019). Wearable devices, such as headsets designed for virtual or augmented reality, are another category of Musical Things that can be utilized in networked musical applications alongside other musical devices (Turchet et al., 2017, 2021; Loveridge, 2020). Musical Haptic wearables incorporate haptic stimulation, gesture tracking, physiological parameter monitoring, and wireless connectivity capabilities. These features facilitate improved communication among musicians and between musicians and audiences, utilizing the sense of touch in both remote and co-located environments (Turchet and Barthet, 2019).

The purpose of these devices is to enhance the musical experience for audience members during performances by incorporating haptic feedback and offering new opportunities for creative engagement through a user-friendly interface (Turchet et al., 2021). One key differentiator between IoMusT and IoT is the requirement for latency to remain consistently below 30 meters to enable genuine musical interactions among geographically separated musicians playing together. (Gabrielli and Squartini, 2016; Rottondi et al., 2016).

Record labels and publishers play a crucial role in managing databases of copyright ownership. In cases where a song is co-written by multiple individuals, each represented by a different publisher, discrepancies may arise within the database. This issue is further complicated by the fact that collection societies, which oversee blanket licensing, also maintain databases that may conflict with others. Additionally, aggregators introduce additional intermediary service costs for label artists, with minimal financial benefits for emerging independent artists. The implementation of blockchain technology is expected to diminish the role and expenses of these intermediaries.

The digitalization resulted in a broader decentralized platform for musicians to upload and more recently stream music either from their personal websites or via promotional channels. This creates possibilities for unauthorized file sharing and challenging to monitor usage, prompting the emergence of a fresh level of digital aggregation services to identify, gather, and distribute payments to publishers, record labels, and musicians.

There are numerous benefits to utilizing Blockchain technology for storing IoMusT data. Musicians can generate Musical Signals during music activities. Digital scores, created through specialized software for composing music, represent the intellectual property of composers, arrangers, or producers. Biometric signals, such as EEG, heart rate, galvanic skin response, eye tracking, muscle activities, and respiration, can be produced. These data can be collected during live music performances to gauge audience emotions or during rehearsals to monitor musician or band progress. Gestural data involves musicians interacting with sensors in a smart musical instrument interface, as well as signals captured by accelerometers in inertial sensors. Lastly, Error Signals track a music student's learning progress with a smart musical instrument, comparing the data to reference values to identify errors made during practice sessions.

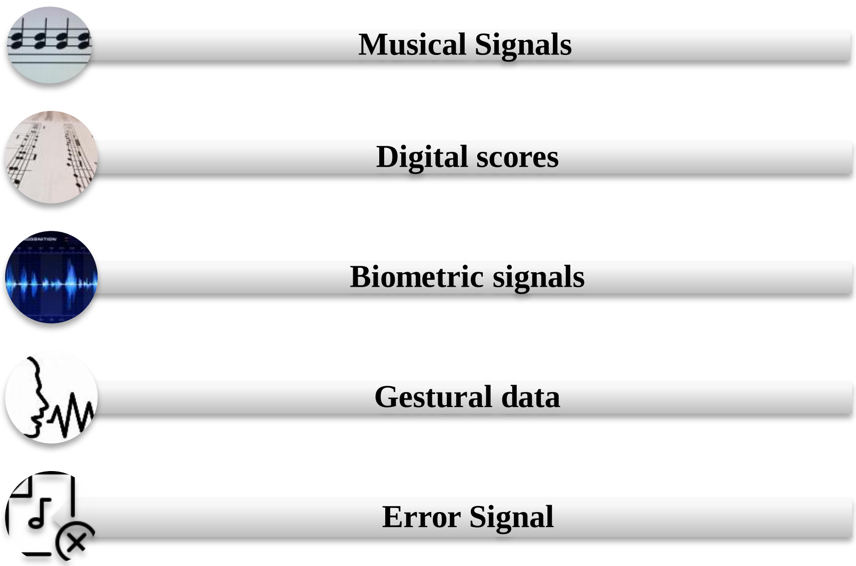

Figure 3: Advantages of using blockchain technology to store data produced by IoMusT applications

The need of Blockchain IoMust is due to the below reasons:

A. **Latency:** Blockchain is a technology that requires a significant amount of time, while IoMusT, on the other hand, do not have the ability to tolerate delays.

B. **Decentralisation:** Several stakeholders of IoMusT may still have a preference for placing their trust in specific companies, organizations, or financial institutions.

C. **Robust distribution system:** It is imperative that there exists at least one node within the distributed system that does not have trust in another node.

D. **Peer-peer exchanges:** It commonly happens in scenarios like co-located or remote network music performances.

E. **Payment system:** Despite the presence of transaction fees and the need for a trusted bank, conventional payment systems still enable the completion of economic transactions.

F. **Micro-transactions:** Maintaining traceability is necessary for certain IoMusT applications as it involves keeping a record of every transaction.

Challenges in integration

Here are a few obstacles encountered when integrating Blockchain technology with the Internet of Musical Things (IoMusT):

- **Latency:** IoMusT need real time response and blockchain is time-consuming, can process few transactions per second.
- **Privacy**: Storing data in a secure manner is essential when it comes to safeguarding the musical item.
- **Security:** Musical devices have restricted computational capabilities and cannot meet the high resource demands of conventional security algorithms.

- **Processing:** The mining process in blockchain requires a substantial amount of energy.
- **Storage & Scalability:** The storage capacity of Blockchain is limited and cannot accommodate large volumes of data, unlike IoMusT. IoMusT has the capability to generate gigabytes of data in real-time.
- **Energy Efficiency:** Musical objects are embedded systems with limited resources, relying on batteries for power.
- **Traffic Overhead:** The blockchain nodes communicate in order to synchronize, resulting in an increase in network traffic. Musical devices have restricted bandwidth capacity.
- **Lack of standards:** There is a requirement for cross-platform solutions that can regulate the interactions among musical entities, IoMusT, and stakeholders of blockchain.
- **Programming abstractions:** It is necessary to create an abstraction layer that can hide complexities and offer developers interfaces and middleware to enable the implementation of a decentralized and secure music application using BloMusT.
- **Mobility:** The structure of blockchain remains constant, unlike the ever-changing topology of musical elements.
- **Legal Issues:** IoMusT is bound by the laws and regulations of the country in which it operates. It is responsible for managing and safeguarding information, including privacy considerations.

Comments

The recent rise of YouTube, Apple Music, Saavn, Spotify, Amazon Prime Music, Soundcloud provides an internet music streaming industry with a strong centralization. These models provide artists with opportunities to create new value by gaining global visibility, engaging in virtual or real-time performances, and connecting with fans. However, the potential for do-it-yourself success in the creative industry is challenging to achieve due to heightened competition resulting from reduced entry barriers. The landscape of centralized, potentially conflicting copyright databases could be revolutionized by blockchain technology, creating a decentralized network of databases that offer a unified source for royalty distribution of a specific song. Blockchain can be useful in many cases in the music industry.

A. **It can help in the identification of Cover Song**: During a live concert, an inspector from a National Rights Society utilizes a specialized musical device with microphones and intelligence to identify cover songs. The identified songs are then compared to the list provided by the musicians to ensure accurate reporting and payment of royalties to the composers. These musical devices can be strategically placed in music venues to monitor cover songs effectively, with blockchain technology aiding in their seamless operation. Once a match is confirmed, composers can receive instant rewards.

B. **Interactive online music repositories:** Each time a new download from a music repository is accomplished for a particular instrument, the instrument (e.g.: smart guitar) Composers are promptly informed of their royalties via the blockchain technology.

C. **Royalty via smart musical instruments:** During a music event at a concert hall, the individuals in charge compensate solely the artists and not the songwriters; the remuneration for the songwriters is guaranteed through advanced musical instruments used by the artists that are capable of recognizing the music being performed and subsequently facilitating the payment to the songwriters.

D. **Audience data Privacy:** The biometric data are captured in a live event. They are utilised both online and offline. It can be used to understand the emotional state of audience.

E. **Monetisation of musician's data**: The information generated by musicians is valuable to musical instrument manufacturers conducting extensive data analysis to comprehend product and service usage. Musicians have the ability to profit from this data with the appropriate parties. Blockchain technology enables the protection of user privacy.

F. **Benefit to Audio Engineers**: The sound technician has the ability to achieve complete autonomy from recording studios and provide services directly to musicians.

G. **Enhanced music pedagogy:** It facilitates remote communication between a student and an instructor. The wearable devices track the student's stress levels while practicing and activate an alert system if the limit is exceeded.

Practical Implications

The integration of blockchain and Internet of Musical Things presents numerous possibilities. However, the inherent characteristics of IoMusT also give rise to issues such as decentralization, limited interoperability, privacy concerns, and security vulnerabilities.

- **Copyright & faster of royalty payment:** The scope is not just restricted to revenue calculation, reward delay, revenue share between authors etc but also direct-to-fan models.
- **Enhanced interoperability:** Interoperability refers to the ability to communicate with Musical Things and share data among IoMusT systems using a universal language. Issues arise from isolated data, slow communication, and workflow interruptions caused by vendor-specific and incompatible IoMusT systems.
- **Decentralised bootstrapping:** Musical Things are authenticated by leveraging blockchain data such as device IDs and public keys. Subsequently, these musical items can establish connections through peer-to-peer networks. Decentralization serves as a safeguard against scenarios where a handful of dominant entities oversee the management and retention of data pertaining to numerous IoMusT participants.
- **Scalability:** The heavy computation is shifted from the smart devices in the IoMust to full nodes within the blockchain system.
- **Traceability:** The spatial and temporal information of a data block in the blockchain is discovered through the process. Timestamps play a crucial role in tracking data blocks.
- **Autonomy:** The interaction occurs directly between Musical entities and IoMusT systems, eliminating the need for a trusted third party.
- **Reliability & Accountability:** It is the reliability against fraudulences like unethical claiming of another musician copyrights.
- **Identity:** The information inputted into the blockchain remains unchangeable and possesses a distinct identification. The blockchain provides a reliable and decentralized system for verifying and granting access to musical entities.
- **Secure code deployment:** Securely uploading code in the Internet of Things is possible.
- **Security:** Messages exchanged between musical things act as a transaction which are validated by smart contracts.
- **Market of services:** Micropayments can be easily deployed in blockchain.

Conclusion

The music industry faces a significant challenge in terms of ownership rights and benefiting from royalty distribution. To address this, smart contracts offer a solution by creating a comprehensive and precise decentralized database of music rights. By utilizing blockchain technology, transparent information about artists' royalties and real-time distributions can be provided to all labels involved. Micropayments through smart contracts can help to lower transaction costs and faster payments.

The funding of new music ventures has traditionally shown a preference for established artists who have a proven track record of commercial success. Despite the empowerment that digital technologies bring to artists, the music industry continues to be centralized and hierarchical, with a majority of the income being directed towards a select few well-established artists. However, it is important to note that there are potential sources of revenue beyond recorded music, such as live performances and direct-to-fan opportunities. Blockchain technology along with internet of musical things can help to promote the performers event with personalisation (e-mail marketing), understand the pulse of the viewers and listeners and make changes in the performance for better audience expectations and increasing the fan base.

Due to the reliance on a substantial fanbase, these income sources are typically out of reach for up-and-coming artists. Emerging musicians find it challenging to attract attention without the support of established distribution channels and extensive marketing budgets; therefore, independent artists often turn to major label networks to release their music. Blockchain can help with the micropayments of the royalty which is not possible in the traditional royalty payments. It also can trace the exact and accurate artist for the royalty and combat with copyrights issues. BCT+ IoMusT can open new avenues for the digital transformation and a novel way of connecting with the consumers. This mechanism integrates the online and the offline campaigns and put the data influx into business continuity.

Limitations

Further studies can be done on the study of individual level adoption by online surveys and case studies on the companies offering music blockchain on their organisational adoption level. On the company level, brainstorming and interviews can be conducted with startup companies to get empirical results.

References

1. Tiscini, R., Testarmata, S., Ciaburri, M., & Ferrari, E. (2020). The blockchain as a sustainable business model innovation. Management Decision, 58(8), 1621–1642. https://doi.org/10.1108/md-09-2019-1281
2. Bhaskar, P., Tiwari, C., & Joshi, A. (2020). Blockchain in education management: present and future applications. Interactive Technology and Smart Education, 18(1), 1–17. https://doi.org/10.1108/itse-07-2020-0102
3. Tsiulin, S., Reinau, K. H., Hilmola, O., Goryaev, N., & Mostafa, A. K. A. (2020). Blockchain-based applications in shipping and port management: a literature review towards defining key conceptual frameworks. Review of International Business and Strategy, 30(2), 201–224. https://doi.org/10.1108/ribs-04-2019-0051
4. Hew, J., Wong, L., Tan, G. W., Ooi, K., & Lin, B. (2020). The blockchain-based Halal traceability systems: a hype or reality? Supply Chain Management, 25(6), 863–879. https://doi.org/10.1108/scm-01-2020-0044
5. Bralić, V., Stančić, H., & Stengård, M. (2020). A blockchain approach to digital archiving: digital signature certification chain preservation. Records Management Journal, 30(3), 345–362. https://doi.org/10.1108/rmj-08-2019-0043
6. Höhne, S., & Tiberius, V. (2020). Powered by blockchain: forecasting blockchain use in the electricity market. International Journal of Energy Sector Management, 14(6), 1221–1238. https://doi.org/10.1108/ijesm-10-2019-0002
7. Rogerson, M., & Parry, G. (2020). Blockchain: case studies in food supply chain visibility. Supply Chain Management, 25(5), 601–614. https://doi.org/10.1108/scm-08-2019-0300
8. Queiroz, M. M., Telles, R., & Bonilla, S. H. (2019). Blockchain and supply chain management integration: a systematic review of the literature. Supply Chain Management, 25(2), 241–254. https://doi.org/10.1108/scm-03-2018-0143
9. Boukis, A. (2019). Exploring the implications of blockchain technology for brand–consumer relationships: a future research agenda. Journal of Product & Brand Management, 29(3), 307–320. https://doi.org/10.1108/jpbm-03-2018-1780
10. Gaur, N. (2019). Blockchain challenges in adoption. Managerial Finance, 46(6), 849–858. https://doi.org/10.1108/mf-07-2019-0328
11. Stallone, V., Wetzels, M., & Klaas, M. (2021). Applications of Blockchain Technology in marketing—A systematic review of marketing technology companies. Blockchain: Research and Applications, 2(3), 100023. https://doi.org/10.1016/j.bcra.2021.100023
12. Upadhyay, A., Ayodele, J. O., Kumar, A., & Garza-Reyes, J. A. (2020). A review of challenges and opportunities of blockchain adoption for operational excellence in the UK automotive industry. Journal of Global Operations and Strategic Sourcing, 14(1), 7–60. https://doi.org/10.1108/jgoss-05-2020-0024
13. Kant, N., & Anjali, K. (2020). Can blockchain be a strategic resource for ODL?: a study. AAOU Journal, 15(3), 395–410. https://doi.org/10.1108/aaouj-09-2020-0061

Shin, D., & Ibahrine, M. (2020). The socio-technical assemblages of blockchain system: how blockchains are framed and how the framing reflects societal contexts. Digital Policy, Regulation and Governance, 22(3), 245–263. https://doi.org/10.1108/dprg-11-2019-0095

14. Kizildag, M., Doğru, T., Zhang, T. C., Mody, M., Altin, M., Ozturk, A. B., & Özdemir, Ö. (2019). Blockchain: a paradigm shift in business practices. International Journal of Contemporary Hospitality Management, 32(3), 953–975. https://doi.org/10.1108/ijchm-12-2018-0958
15. Jain, G., Singh, H., Chaturvedi, K. R., & Rakesh, S. (2020). Blockchain in logistics industry: in fizz customer trust or not. Journal of Enterprise Information Management, 33(3), 541–558. https://doi.org/10.1108/jeim-06-2018-0142
16. Garcia-Teruel, R. M. (2020). Legal challenges and opportunities of blockchain technology in the real estate sector. Journal of Property, Planning and Environmental Law, 12(2), 129–145. https://doi.org/10.1108/jppel-07-2019-0039
17. Owen, R., & O'Dair, M. (2020b). How blockchain technology can monetize new music ventures: an examination of new business models. The Journal of Risk Finance, 21(4), 333–353. https://doi.org/10.1108/jrf-03-2020-0053
18. Hooper, A. J., & Holtbrügge, D. (2020). Blockchain technology in international business: changing the agenda for global governance. Review of International Business and Strategy, 30(2), 183–200. https://doi.org/10.1108/ribs-06-2019-0078

19. Rijanto, A. (2020). Business financing and blockchain technology adoption in agroindustry. Journal of Science & Technology Policy Management, 12(2), 215–235. https://doi.org/10.1108/jstpm-03-2020-0065
20. Turchet, L., & Ngo, C. N. (2022). Blockchain-based internet of musical things. Blockchain: Research and Applications, 3(3), 100083. https://doi.org/10.1016/j.bcra.2022.100083
21. Dewan, S., & Singh, L. (2020). Use of blockchain in designing smart city. Smart and Sustainable Built Environment, 9(4), 695–709. https://doi.org/10.1108/sasbe-06-2019-0078
22. PressReader.com - digital newspaper & magazine subscriptions. (n.d.). PressReader. https://www.pressreader.com/india/open-source-for-you/20221001/281986086429858
23. Behara, G. K. (2022, November 28). How Blockchains can Transform Enterprises. Open Source For You. https://www.opensourceforu.com/2022/11/how-blockchains-can-transform-enterprises/
24. Gaurav, K. (2023, January 2). Smart Contracts Programming in a Blockchain: An Overview. Open Source For You. https://www.opensourceforu.com/2022/12/smart-contracts-programming-in-a-blockchain-an-overview/
25. Centorrino, G., Naciti, V., & Rupo, D. (2022). A new era of the music industry? Blockchain and value co-creation: the Bitsong case study. European Journal of Innovation Management, 26(7), 65–85. https://doi.org/10.1108/ejim-07-2022-0362