Blockchain in Media and Entertainment

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ABSTRACT
Blockchain is a secure, encrypted, digital distributed ledger that is chronologically time-stamped with unalterable data. It is transforming the media and entertainment industry by offering solutions for copyright protection, royalty distribution, and content creation. Blockchain technology is making a significant impact across various sectors of the entertainment industry. It has become popular in the media, advertising, and entertainment industries. The integration of Blockchain for media and entertainment marks a significant step towards improved transparency, security, and efficiency. In this paper, we will understand the potential of blockchain for media and entertainment.

KEYWORDS: blockchain, distributed digital ledger, media and entertainment (M&E) industry, advertising

INTRODUCTION

Blockchain is a digital, decentralized method of chronologically recording transactions in real-time that was originally developed to enable the concept of cryptocurrency, specifically Bitcoin, over a decade ago. Blockchain technology is transforming media and entertainment by reducing piracy, increasing transparency, connecting artists directly with fans, and verifying scarcity of digital collectibles. It is now starting to impact numerous industries, with great potential to have a major effect on media and entertainment in the coming years [1].

The technology that was designed to be the foundation for Bitcoin is now available for use in a variety of new business applications and industries. A blockchain is essentially a digital distributed ledger. It records transactions in real time, chronologically, and immutably. From medicine to retail and economics, there is hardly any facet that blockchain has not pervaded. The television and media industry as a whole, can benefit from using blockchain technology in several ways — through advertising, distribution, and content creation and verification. Because the media and entertainment industry is vast, this technology has the potential to benefit the key stakeholders. Given its ability to store and share a unique and immutable set of records in a decentralized way, blockchain could transform content distribution, digital rights management, data storage, gaming, and advertising [2].

WHAT IS BLOCKCHAIN?

Blockchain, a type of distributed digital ledger technology (DLT), is a relatively new and exciting way of recording transactions in the digital age. It is a decentralized and distributed digital ledger technology that securely records and verifies transactions across multiple computers or nodes in a network. Basically, it is a chain of blocks in which each block contains a list of transactions. The symbol of a blockchain is depicted in Figure 1 [3].The blockchain technology was created as the foundational basis for Bitcoin – a digital currency in which secure peer-to-peer transactions occur over the Internet. It is expected that the spending on blockchain solutions worldwide would grow from 4.5 billion USD (2020) to an estimated value of 19 billion USD by 2024 [4].

Originally developed as the accounting method for the virtual currency Bitcoin, Blockchains are appearing in a variety of commercial applications today. Blockchain technology is a type of distributed digital ledger that uses encryption to make entries permanent and tamper-proof and can be programmed to record financial transactions. It is used for secure transfer of money, assets, and information via a computer network such as the Internet without requiring a third-party intermediary. It is now being adopted across financial and non-financial sectors. As a catalyst for change, the Blockchain technology is going to change the business world and financial matters in major ways.

The first Blockchain was conceived in 2008 by an anonymous person or group known as Satoshi Nakamoto, who published a white paper introducing the concept of a peer-to-peer electronic cash system he called Bitcoin [5,6]. Bitcoin and Ethereum are the first two mainstream blockchains. Other modern blockchains include Namecoin, Peercoin, Ether, and Litecoin. Figure 2 shows different components of blockchain [7].

Blockchain combines existing technologies such as distributed digital ledgers, encryption, immutable records management, asset tokenization and decentralized governance to capture and record information that participants in a network need to interact and transact. As illustrated in Figure 3, a complete blockchain incorporates all the following five elements [8]:

➢ *Distribution:* Digital assets are distributed, not copied or transferred. A protocol establishes a set of rules in the form of distributed mathematical computations that ensures the integrity of the data exchanged among a large number of computing devises without going though a trusted third party. A centralized architecture presents several issues including a single point of failure and problems of scalability.

➢ *Encryption:* BC uses technologies such as public and private keys to record data securely and semi-anonymously. Completed transactions are cryptographically signed, time-stamped, and sequentially added to the ledger.

➢ *Immutability:* The blockchain was designed so these transactions are immutable, i.e. they cannot be deleted. No entity can modify the transaction records. Thus, Blockchains are secure and meddle-free by design. Data can be distributed, but not copied.

➢ *Tokenization:* Value is exchanged in the form of tokens, which can represent a wide variety of asset types, including monetary assets, units of data or user identities.

➢ *Decentralization*: No single entity controls a majority of the nodes or dictates the rules. A consensus mechanism verifies and approves transactions, eliminating the need for a central intermediary to govern the network.

Bitcoin and its underlying blockchain technology increasingly impact all facets of society. Bitcoin's status as digital gold is merely the tip of this technology. Figure 4 shows Bitcoin [9], while Figure 5 shows how blockchain works [10]. Although blockchain technology will for all time be associated with Bitcoin due to their common genesis, it has broader applications. Cryptocurrency will increasingly become a factor in family law issues as well.

A blockchain is a tamper-proof, distributed database that stores blocks of information for cryptographically bound transactions via peer-to-peer networks. At the heart of blockchain's functionality is cryptographic hashing. Each block in a blockchain contains a cryptographic hash of the previous block, creating an immutable chain of blocks. If anyone attempts to tamper with the data in a block, it would alter the block's hash. This would disrupt the entire chain, making it virtually impossible to manipulate. The security feature ensures data integrity and prevents unauthorized changes [11].

In a nutshell, blockchain technology involves three basic concepts [12]: (1) It is a system for recording a series of data items (such as transactions between parties); (2) It uses cryptography to make it difficult to tamper with past entries; (3) It has an agreed process for storing copies of the ledger and adding new entries (also called a consensus protocol).

Blockchain is a novel decentralized infrastructure and distributed computing paradigm that uses a chained data structure for verification, storage, and distributed consensus algorithms to generate and update data. Decentralization is a key feature of blockchain technology, which refers to the distribution of power and decision-making across a network of nodes or participants rather than being controlled by a central authority or system. It provides robustness while eliminating many-to-one traffic flows to avoid delays and single points of failure. Figure 6 shows the decentralized property of blockchain [10]. The advantages of decentralized property of blockchain network include the following [10]:

➢ The decentralized property of blockchain makes it less prone to failure and more expensive for hackers to attack the network.

> There is no third-party involvement; therefore, there is no added risk.
> Every change made in the network is traceable and concrete.
> Users maintain full autonomy of their properties and are not dependent on third parties to maintain and manage their assets.
> It provides enhanced security.

BLOCKCHAIN IN MEDIA AND ENTERTAINMENT

The world has become a small, interconnected community. With it, demand for blockchain in media advertising and entertainment market is growing as traditional marketing quickly adopts online ad buying, web-based tagging, and other technologies. It is now employed in different areas and new business models, like buyer hardware, media and diversion, car, aviation, safeguard, material, energy, power, food and refreshments, etc. The media and entertainment sector is quickly adopting this technology as the market share for entertainment keeps expanding. Blockchain and other cutting-edge technologies are revolutionizing the media industry and the entertainment sector by enabling real-time consumption. Blockchain in media advertising and entertainment has become a key player in the advertising and entertainment market. Figure 7 shows a representation of the entertainment industry [13].

The blockchain in the media, advertising, and entertainment market is segmented by application (licensing and rights management, digital advertising, smart contracts, online gaming, and payments), type of blockchain (public, private), size of the enterprise (small and medium enterprises, large enterprises), and geography (North America, Europe, Asia-Pacific, Latin America, and the Middle East and Africa) [14]. The technology is promising in transforming how entertainment content, e.g., films, videos, music, etc., is provided, used, and paid for. It can generally change how the creators and consumers deliver, enjoy, and pay for types of entertainment.

INDUSTRIAL EXAMPLES OF MEDIA AND ENTERTAINMENT

Many nations have gained various opportunities through advanced technologies and global media blockchain in advertising and entertainment. Large enterprises on various digital platforms highly use blockchain as an application in the advertising and entertainment market. Some implementations of blockchain in M&E industry include the following [15]:

> *Audius:* This is a blockchain-based music streaming platform that connects artists directly with their fans. It was founded in 2018 by Roneil Rumburg and Forrest Browning. The platform was launched in beta in 2019 and went live in 2020. The platform has over 250,000 artists and one million songs on its platform. Audius has raised over $50 million in funding from investors. Audius has a number of advantages over the traditional music streaming services. It eliminates intermediaries and is decentralized, which means that it is not controlled by a central authority. Listeners on Audius can earn rewards for listening to music, which gives them an incentive to support their favorite artists. Audius faces competition from major music streaming services such as Spotify and Apple Music.

> *SingularDTV:* SingularDTV uses blockchain to empower artists and content creators. It offers tools to manage intellectual property rights, royalties, and distribution in a transparent and decentralized manner. Creators can track their content's usage and receive fair compensation automatically through smart contracts.

> *Verasity:* Verasity uses blockchain to combat ad fraud and provide fair compensation to content creators. Through its Proof of View technology, it ensures that video views are genuine, preventing ad fraud, and ensuring that creators receive accurate revenue.

> *Flixxo:* This is a decentralized video sharing platform that combines blockchain and peer-to-peer technology. Content creators are rewarded with Flixx tokens based on the popularity of their content, and viewers can earn tokens by watching and sharing videos.

> *BlueSnap:* The preferred worldwide payment orchestration platform for major B2B and B2C companies announced a new collaboration with BitPay, the prominent provider of Bitcoin and cryptocurrency payment services. This product partnership helps BlueSnap reach its goal of helping businesses around the world make more money and cut costs by letting them accept and be paid in up to 15 different cryptocurrencies and seven fiat currencies.

> *Soney:* The Japanese media giant is dipping its foot into blockchain waters. Sony filed a patent for a blockchain solution to be used in user verification and storing digital rights. According to the company, current digital rights management solutions are insecure and unreliable.

APPLICATIONS OF BLOCKCHAIN IN MEDIA AND ENTERTAINMENT

Common applications of blockchain in media and entertainment include the following [16,17]:

➤ *Payments:* One of the most obvious applications of blockchain in the media is its ability to support micropayments that can be processed without the need for an intermediary payment network or its fees. Generally speaking, without blockchain, intermediary payment fees are too cost-prohibitive to enable micro-payments. Today, we are already seeing startups that are exploring new payment models through blockchain technology that are focused upon bringing more value to content creators. Pay-per-use consumption has become feasible due to blockchain-powered micropayments. Smart contracts, self-executing agreements powered by blockchain, play a pivotal role in automating royalty payments.

➤ *Tokenization of Assets:* Blockchain introduces the concept of tokenization, allowing content creators to tokenize their intellectual property. Blockchain platforms have recently announced capabilities allowing artists to tokenize their work, a process that divides a digital asset into multiple tokens. This fractional ownership model enables fans to invest in and own a share of their favorite content. The tokenization aspect of the blockchain platform heralds an era where digital assets, such as songs, movies, or art, can be tokenized as NFTs (non-fungible tokens). This not only allows artists to monetize their work in innovative ways but also provides consumers with unique, personalized ownership of digital media content.

➤ *Smart Contracts:* These automated, self-executing contracts handle the terms of the agreement between buyer and seller. It brings a new level of interactivity to content consumption. Blockchain-based smart contracts automate agreements and transactions, streamlining processes like content licensing and payment settlements. One major benefit of blockchain is enabling direct connections between artists and their fans or consumers, facilitated by smart contracts that can automatically enforce fair terms and facilitate micropayments. Smart contracts also empower artists with the ability to track every stream across the web and not miss out on potential royalties. Smart contracts play a pivotal role in the governance models of consortium blockchains in entertainment. These self-executing contracts are programmable agreements that automatically enforce predefined rules and conditions.

➤ *Disintermediation:* Traditionally, the M&E industries have been dominated by intermediaries, creating inefficiencies in content monetization, rights management, and advertising targeting. Imagine a world where your favorite musicians and artists can directly share their masterpieces with you, without having to go through big companies. This is now possible thanks to the media and entertainment industries tapping into blockchain technology. The advertising and media industry is rife with intermediaries. On-demand streaming services like YouTube, Spotify, Apple Music, and Soundcloud are intermediaries as well as industry players like recorded music companies, music publishers, music managers, and music distributors. Smart contracts automate and streamline royalty payments, ensuring artists, musicians, and other content creators get their due without significant chunks of their profits being taken by intermediaries. By enabling direct creator-audience interaction, blockchain helps democratize participation, moving control away from centralized legacy platforms. Enthusiasts, gamers, and creators can interact without costly intermediaries, ensuring that more revenue streams back to the creators themselves.

➤ *Online Gaming:* The gaming and eSports sectors are experiencing a blockchain-driven transformation. Blockchain technology introduces secure ownership of in-game assets, transparent tournament systems, and decentralized gaming platforms. Gamers now have true ownership of virtual assets and can participate in fair competitions. Blockchain experts can write smart contracts and deal with blockchain-based online gaming. Neither can anyone change the public location where the in-game resources are put away, nor can anyone privately supplant the responsibility for resources. They will stay the property of the game player who claims them.

BENEFITS
The benefits of blockchain in media production are remarkable. It brings an exceptional level of transparency and traceability to financial transactions, protects against piracy, and promotes direct connections between content creators and consumers. Benefits of blockchain in media advertising and entertainment market are likely to expand. Blockchain eliminates the risk of digital fraud. Other benefits of blockchain in the media and entertainment industry include the following [18]:

➤ *Protection of IP*: Intellectual property issues and violations are pervasive in the media and entertainment industries. Musicians, artists, and other entertainers have long struggled to maintain ownership over their work. One of the most significant challenges faced by the media industry today is piracy. Blockchain allows for time-

stamping and verification of digital content, making it easier to prove ownership and combat piracy. Blockchain technology can track the lifecycle of any asset, and thereby reduce piracy of intellectual property (IP), protect digital content, and facilitate the distribution of authentic digital collectibles. Enterprise Ethereum allows artists and creators to digitize the metadata of their unique content, manage, and store IP rights on a time-stamped, immutable ledger. This means unauthorized use, distribution, or piracy of intellectual property, especially digital content, can be considerably reduced.

➢ *Royalty Distribution:* Blockchain can be used to track royalties for artists and creators. It can facilitate transparent and efficient royalty payments to artists, writers, and other contributors, ensuring fair compensation. Blockchain uses smart contracts to automate royalty payments based on predefined terms. This ensures content creators receive fair compensation without delays or disputes. Royalty payments can be programmed into a smart contract for every piece of content and can be automatically paid out to the creator upon usage.

➢ *Transparency:* Blockchain technology inherently promotes transparency. It offers noteworthy advertisement transparency and a better perspective on how media content gets consumers. Every transaction made on a blockchain platform is recorded and can be tracked in real-time. For artists, this means they can verify the usage of their digital assets and ensure they're receiving the correct royalty payments.

➢ *Traceability:* Blockchain enables the creation of a transparent and traceable supply chain for digital content. From the moment of creation to its distribution and consumption, every transaction is recorded on the blockchain. This ensures that content creators and rights holders can trace the journey of their intellectual property, identifying any unauthorized distribution or usage along the way.

➢ *New Revenue Streams:* Blockchain can boost revenue for creators since they provide value-added digital content for limited customers. Blockchain technology enables the creation of new revenue models, such as micropayments and NFTs, offering artists and creators more opportunities to connect with their audience. The rise of blockchain-based marketplaces means artists and creators can sell their work directly to consumers. This direct approach not only boosts

revenue streams but allows users to interact without costly intermediaries.

➢ *Decentralization:* Blockchain facilitates the development of decentralized content distribution platforms that operate on a peer-to-peer network. Think of decentralizing as breaking up a big group into smaller teams. So instead of one big company controlling everything, many small groups or people share the power. This means artists do not have to share their earnings with big companies, called intermediaries. Instead, they get to keep more of what they earn. Through a myriad of blockchain use cases, artists and businesses alike are harnessing decentralized platforms to introduce transparency, eliminate intermediaries, and foster genuine connections between creators and their audience.

➢ *Global Collaboration*: Blockchain's global reach fosters collaboration and standardization in the content licensing space. The use of common standards and protocols on blockchain networks allows for interoperability between different platforms and ecosystems. Blockchain's decentralized system breaks down geographical barriers, enabling creators from around the world to work together easily. This global collaboration promotes diversity and sparks innovative content creation.

➢ *Competitive Landscape:* The competitive landscape of the global blockchain in the media, advertising, and entertainment industries is moderately concentrated, as only a few players offer blockchain solutions, especially in the media and entertainment industries.

➢ *Data Privacy:* Blockchain's decentralized nature contributes to enhanced data privacy in ticketing systems. Instead of storing sensitive information in a central database, personal data related to ticket transactions can be encrypted and stored in a decentralized manner. This minimizes the risk of data breaches and unauthorized access to attendees' personal information.

Some of these benefits are shown in Figure 8 [16].

CHALLENGES
While blockchain technology offers exciting possibilities for the entertainment industry, it also faces certain challenges and limitations. Despite the promising potential, issues such as complexity, cost, and regulation limit the evolution of this technology. Piracy is the worst challenge since it is hard to control the ownership, distribution, and identity. One major challenge is scalability. Another limitation is the lack of mainstream adoption. While blockchain-based

platforms have gained traction within niche communities, they have yet to reach mainstream audiences. Blockchain is now unregulated, and normal principles for using innovation to make esteem should be made. Other challenges of blockchain in the media and entertainment industry include the following [19,20]:

➢ *Scalability:* One of the main challenges is the ability of blockchain networks to handle a large number of transactions, especially as the entertainment industry continues to expand rapidly. It is important to find flexible solutions to meet the increasing demands. The key challenges of scalability that once held blockchain back are now being addressed.

➢ *Regulatory Landscape:* Blockchain's decentralized nature can sometimes clash with existing legal frameworks and industry regulations. It is crucial to effectively address these regulatory issues and ensure compliance. The regulatory landscape surrounding blockchain in the entertainment industry is still evolving. Different jurisdictions have varying regulations and laws concerning the use of blockchain technology, which can present legal challenges for artists and creators looking to leverage blockchain platforms.

➢ *Technical Difficulties:* Implementing blockchain media production requires overcoming technical challenges. This includes seamlessly integrating blockchain into current systems and creating user-friendly interfaces.

➢ *Transparency:* Transactions on the blockchain are visible to its participants, increasing auditability and trust. IP issues in the music industry are fueled by a lack of transparency. Artists often do not fully understand the terms of contracts and copyrights, which limits their ability to ensure they are fairly compensated. All blockchain transactions are transparent and traceable. This builds trust among everyone involved in content creation and distribution, reducing disputes and improving collaboration.

➢ *Trust:* Trust in the media has reached all-time lows. This has been fueled by fake news, which has undermined the public's confidence in the media and left many consumers misinformed. At its core, blockchain's strength lies in its immutable and transparent characteristics. This not only enhances security, fostering more trust in the media but also catalyzes a more direct interaction between creators and consumers. Because blockchain precludes the need for a

middleman, the technology creates new opportunities for large corporations to get closer to their customers and consumers.

➢ *Scarcity:* Generally digital objects can lose value because they are easily copied. We see this especially in the area of pirated music, movies, and TV. But because blockchain makes it possible for creators to register origin of work and set sharing permissions, structure the means of exchange that they are willing to accept, it is possible create conditions for "digital scarcity."

➢ *Security:* The idea of blockchain innovation permits creators to precisely and safely track the development of their blockchain-facilitated content by confirming, paying customers, and breaking down appropriation designs because of its straightforwardness. Blockchain is secure and it is near difficult to "hack" the information. Blockchain can counter piracy in several ways. It can create a secure and transparent record of digital content ownership, simplifying the process of tracking and prosecuting pirates.

➢ *Lack of Standardization:* Smart contracts, which automate various processes in the media supply chain, may lack standardization across different blockchain networks. This can result in compatibility issues, making it challenging to execute uniform agreements and transactions. Establishing universal standards and protocols for data representation and smart contracts is crucial for interoperability. Standardizing smart contracts or creating interoperable versions that can function seamlessly across various blockchain networks is essential.

➢ *Data Protection:* With the vast amounts of user data involved in media and entertainment, compliance with data protection and privacy regulations is paramount. Blockchain's transparency can be leveraged to enhance data security, but it must also adhere to stringent privacy laws such as the General Data Protection Regulation (GDPR) in Europe or similar regulations in other jurisdictions.

Some of these challenges are shown in Figure 9 [21].

CONCLUSION

As the entertainment and media industry continues its digital transformation, many are beginning to realize the potential of blockchain technology to reshape the way content is created, distributed, and consumed. The value of blockchain technology has the potential to redefine the very fabric of the entertainment world. The role of blockchain technology in the media and entertainment industries is rapidly evolving, making it

an exciting time to be a part of the change. Blockchain is emerging as a critical tool in combatting fraud and enhancing transparency in digital advertising. It is disrupting not only the existing business models but is also enabling the development of new business models, especially in the media industry [22].

Blockchain technology is revolutionizing the media, advertising, and entertainment industries by offering innovative solutions for issues related to transparency, content distribution, intellectual property management, and revenue sharing. As the digital revolution surges forward, the role of blockchain technology in the media and entertainment industries is becoming increasingly significant. More information on the integration of blockchain technology into the media and entertainment industry is available from the books in [23-27] and a related journal: *IEEE Blockchain.*

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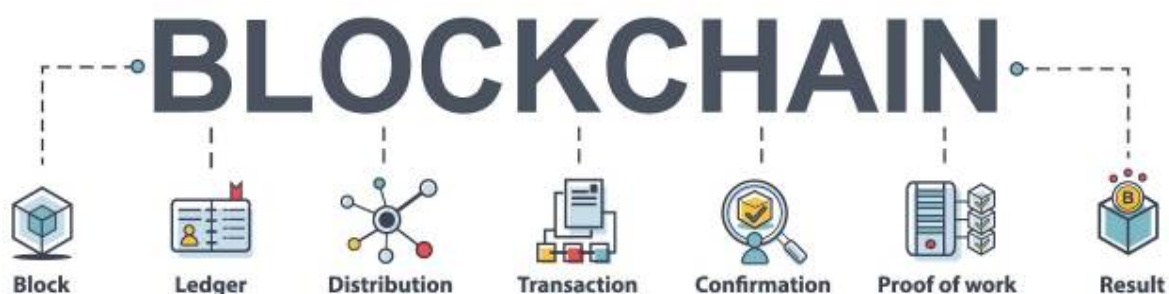

Figure 1 The symbol of blockchain [3].

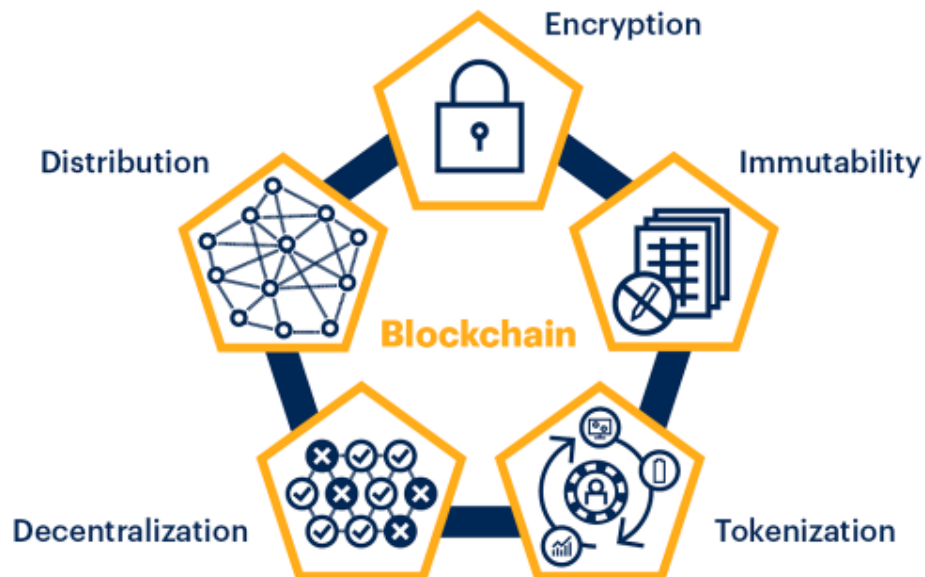**Figure 2 Different components of blockchain [7].**

Figure 3 Five key elements of Blockchain [8].
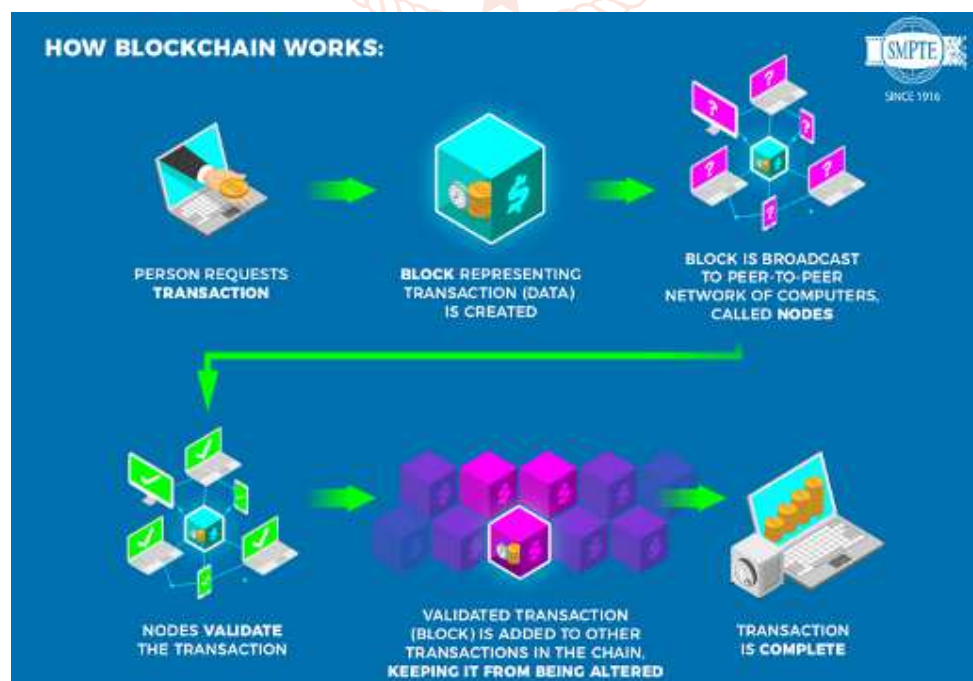

Figure 4 Bitcoin [9].

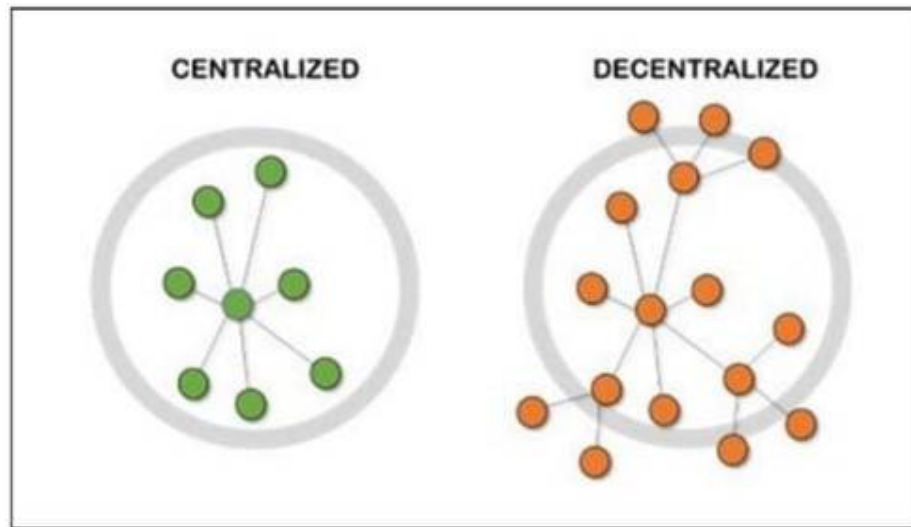**Figure 5 How blockchain works [10].**

Figure 6 The decentralized property of blockchain [10].

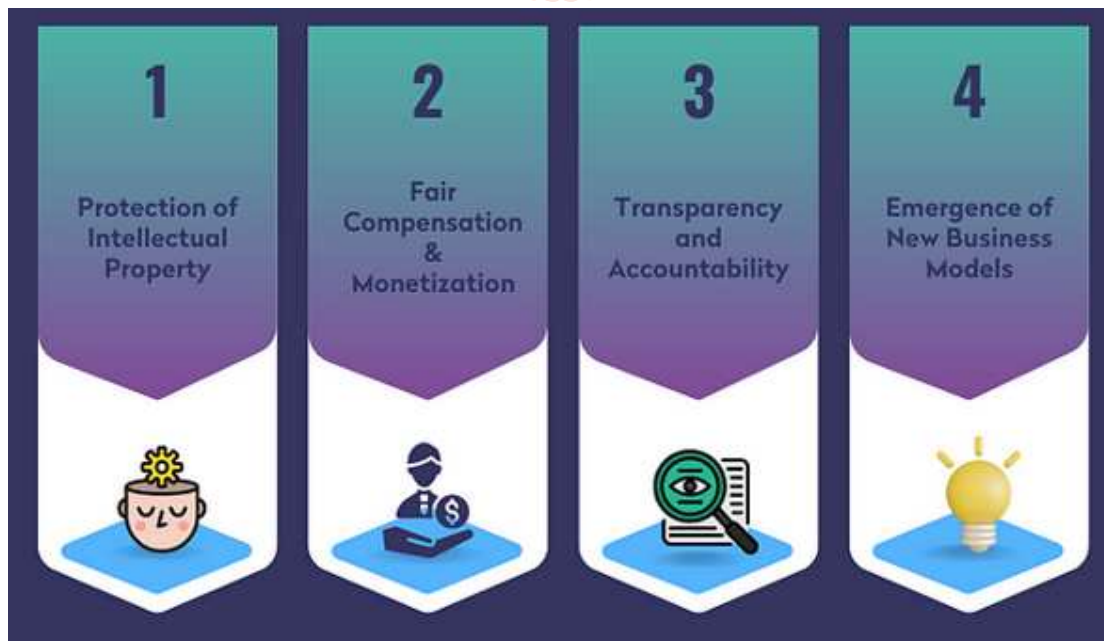**Figure 7 A representation of the entertainment industry [13].**

Figure 8 Some benefits of blockchain in media and entertainment [16].

Figure 9 Some challenges of blockchain in media and entertainment [21].