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Review

Analysis of metaverse utilization from creative industry and social perspectives

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Abstract—The rapidly growing digital era has made the Metaverse concept a subject that must be developed within the creative industry and social activities. This article aims to examine how Metaverse is used from creative industry and social viewpoints. The method employed is a literature review, collecting information from a range of related sources. The Metaverse allows creators to produce and distribute their work in a safer, more transparent, and decentralized manner without third-party involvement, unlike earlier models that required many intermediaries. It grants them greater control over their output and fairer royalty distribution. On the social side, Metaverse also creates interactive spaces where people can meet, interact, and collaborate in real time in ways never experienced before. This shapes how we build social relationships, cooperate in project-based settings, and even attend events together virtually. Therefore, Metaverse can serve as a bridge between the physical and digital worlds that are becoming increasingly close, enabling individuals to merge within immersive virtual experiences.

Keywords—*blockchain, creative industry, metaverse, nft, social.*

1. Introduction

During the past few years, the metaverse has stood at the center of conversations about the future of technology and human interaction. This momentum arises from advances in virtual reality (VR), augmented reality (AR), and blockchain,

each of which strengthens metaverse development. The metaverse is an innovative interface projected to sustain various kinds of human-computer interaction (Prieto et al., 2022). It is a three-dimensional digital world where individuals can create avatars, meet other users, and join a wide range of activities, including gaming, virtual concerts, shopping, and even professional work (Bellalouna & Puljiz, 2023).

Inside this environment, users may possess unique digital assets such as fashion items, collectible objects, or virtual plots of land. By means of blockchain, authenticity and ownership of these assets can be verified easily and transparently (Scheiding, 2023). A metaverse participant who owns an expensive digital outfit, for example, can confirm that the garment is genuine and rare. Furthermore, blockchain lets users sell or exchange their assets with others, strengthening the virtual economy (Flick, 2022).

On the social side, the metaverse is influencing how people relate to one another, changing social dynamics from virtual gatherings to everyday activities performed through avatars (Ramadan, 2023). Greater inquiry is still required so that society may use the metaverse wisely. This article explains how the metaverse supports the creative industry and how it is applied in daily social life.

2. Method

This study adopts a literature review, which involves analyzing and synthesizing information from diverse sources. A literature review is a recognized research methodology carried out to collect and evaluate studies related to a specific focus (Triandini et al., 2019). The procedures are as follows (Fig. 1):

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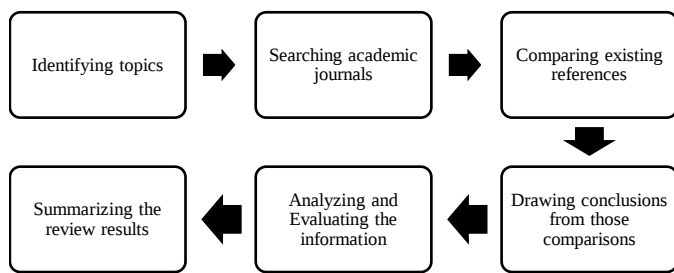


Fig. 1. Research method

1. Identifying topics concerning metaverse utilization in the creative industry and social activities.
2. Searching academic journals by keywords such as “blockchain,” “creative industry,” “metaverse,” “NFT,” and “social.”
3. Comparing existing reference journals with the conceptual frame of the present study, which emphasizes metaverse use in creative and social contexts, blockchain, and NFTs.
4. Drawing conclusions from those comparisons in line with the review goal: analyzing metaverse use from creative and social perspectives.
5. Evaluating the information, including significant findings and researchers’ opinions.
6. Summarizing the review results that explore metaverse adoption within creative and social domains.

3. Results and discussion

A science-fiction novel published in the 1990s, *Snow Crash*, introduced a virtual world whose idea resembles today’s metaverse (Dwivedi et al., 2022). By 2021, the word “metaverse” had become widespread. It is an immersive virtual space that allows users to appear as avatars and interact with digital surroundings wherever they are (Bellalouna & Puljiz, 2023). The metaverse blends the physical and digital realms into one visual universe (Zhao et al., 2022). Schumacher (2022) argues that it will expand the internet and become a primary arena for daily life.

3.1. Supporting technologies

According to Yaqoob et al. (2023), several technologies support the Metaverse.

3.1.1. AR, VR, MR, and XR

Augmented Reality projects real-time information—text, audio, video, or virtual objects—onto the physical world. Two main forms exist: marker-based and marker-less. Virtual Reality is a computer-generated 3D setting that simulates reality and invites user interaction; its main systems are non-immersive, semi-immersive, and fully immersive. Mixed Reality combines VR and AR, letting physical and digital items interact in real time. Microsoft HoloLens, for instance, enables game characters to engage with real objects. Its three key elements are

cloud-based computing, enhanced input methods, and environment recognition. Collectively, VR, AR, and MR experiences are often referred to as Extended Reality.

3.1.2. Artificial Intelligence (AI)

The metaverse relies on AI for creating most 3D imagery, animations, chatbots, smart contracts, and virtual transactions. AI improves presentation quality, object detection, and control of cybersickness effects. By working with game engines, AI produces immersive experiences, realistic avatars, and efficient asset creation. It learns from historical data, forecasts movement, and generates appropriate responses. AI also safeguards data against misuse. Overall, AI is integral for user interaction, data handling, security, and avatar generation, all of which enrich the user experience.

3.1.3. Blockchain, NFT, dan cryptocurrency

Blockchain is a decentralized digital record, capable of being tracked, transparent, secure, and trustworthy, used to protect digital assets in the metaverse. Blockchain is used to ensure the metaverse functions as a coordinated virtual world. Smart contracts enable effective management of economic, legal, and social relationships within the metaverse ecosystem. Metaverse users can socialize, find entertainment, and conduct trade in real time, and they use blockchain-based crypto assets for real and virtual purchases as a flexible payment choice. Blockchain, supported by NFTs (Non-Fungible Tokens) and cryptocurrencies, is central to securing digital assets in the metaverse. The use of NFTs, which are blockchain-based crypto tokens, in the metaverse can make trading digital products and creating unique avatars easier because they offer unchanging proof of ownership recorded on the blockchain. NFTs are traded using Ethereum (Bao et al., 2023). Blockchain has the ability to guard against attacks and malware and to remove centralized decision-making processes in metaverse operations, which can help build a virtual ecosystem that is safe, stable, dependable, and trustworthy.

3.1.4. 3D reconstruction

3D reconstruction technology plays a role in creating realistic virtual environments. The existence of the metaverse significantly relies on the ability of 3D reconstruction technology to transform real-world objects into 3D models so users can view and interact with these virtual surroundings. This technology finds use not only for entertainment and social purposes but also for matters related to land, allowing potential buyers to view land virtually.

Furthermore, 3D reconstruction technology is a key element in creating 3D human avatars that can enrich the experience within the metaverse. By employing this technology, the metaverse can become more realistic and feel like a genuine environment.

3.1.5. Internet of Things (IoT), 5G technology, dan edge computing

IoT enables the virtual world to interact with the real world, creating user-driven experiences in the metaverse. The combination of these technologies allows for data-driven

decision-making without requiring extensive training. IoT also functions to gather accurate, secure, and real-time data from the physical world and integrate it into the metaverse. Additionally, IoT facilitates connections between the real and digital worlds, which necessitates a sophisticated infrastructure. 5G networks provide the required reliability, throughput, and latency for the metaverse. Moreover, this technology reduces power consumption, increases data speed, and decreases latency considerably. These advantages support high-performance metaverse applications. Edge computing is also a technology that supports the metaverse. With edge computing, users can experience quick responses, providing an immersive experience within the metaverse.

3.2. Use of metaverse in the creative industry sector

The metaverse is a technology built on blockchain that enables individuals to connect with one another using digital avatars within a 3D virtual universe (Far et al., 2022). This metaverse, recently supported by Facebook, stands as a representation of the Web 3.0 movement, which utilizes blockchain as the foundation for a more decentralized internet (Chalmers et al., 2022). Blockchain itself is not a new technology; it emerged several years ago and was first introduced alongside the launch of Bitcoin in 2008 by an individual known by the pseudonym Satoshi Nakamoto. At its core, blockchain represents a technology for establishing a distributed ledger, which is employed to record digital assets and transactions securely and with openness. It is specifically designed to store data for every transaction in a way that ensures security, resistance to modification, and decentralization (Huynh-The et al., 2023). This particular function holds significant consequences within the field of marketing.

Some characteristics of blockchain according to Huynh-The et al. (2023) are:

1. **Security:** Blockchain uses cryptography to safeguard data. Each data block is locked and linked together in a chain, connecting to the preceding block. This structure makes altering the data quite difficult.
2. **Cryptography:** The record of transactions cannot be changed because it is encrypted. This quality helps to reduce fraudulent activities.
3. **Transparency:** Information contained within the blockchain (the ledger) is accessible to all parties involved in the network. This fosters a high level of openness and serves to diminish inaccuracies, fraud, and misuse.
4. **Decentralization:** A blockchain system operates without needing a third party or intermediary during transaction activities. This enables transactions and data processing to be efficient, potentially resulting in cost savings, and permits transactions to be completed quickly.
5. **Smart Contracts:** These are pieces of code capable of automating, overseeing, and executing agreements without requiring an intermediary party.
6. **Immutability:** Each transaction recorded on the blockchain is permanent; thus, it cannot be deleted or changed. This feature allows users to easily trace the history of their assets and transactions. Data present on the blockchain is also resistant to manipulation.

Two blockchain-based technologies hold particular significance for the creative sector: smart contracts and non-fungible tokens (NFTs) (Malik et al., 2023). As described by Píñero-Chousa et al. (2023), a smart contract is a computer program that runs automatically on a blockchain. It can be applied for various aims, such as creating decentralized applications, managing crypto tokens, organizing self-sovereign identity, funding projects through ICOs, forming decentralized autonomous organizations (DAOs), and recording and trading ownership within NFTs. An NFT, in simple terms, is a digital file, image, artwork, or similar item referred to as a "token." Its ownership is tracked and recorded through the application of blockchain technology (Scheiding, 2023).

It is highly likely that managing the metaverse will require a substantial quantity of NFTs, cryptocurrencies, and goods related to NFTs for use within that virtual realm (Liu et al., 2022). NFTs are rapidly becoming an important element of the blockchain economy. They theoretically represent the ownership of digital assets listed on public blockchains, such as Ethereum (Flick, 2022). NFTs identify unique pieces of art and log ownership on the blockchain. Smart contracts are programs kept on the blockchain that automatically carry out an agreement when certain predetermined conditions are met. Both of these technologies can be used to establish the rules for selling, using, and licensing NFTs. According to Malik et al. (2023), NFTs and smart contracts can be applied to creative content because more than 80% of all NFTs are generated on the Ethereum Blockchain network. This network permits the creation of diverse types of tokens, including cryptocurrencies and utility tokens. A majority of tokens can be exchanged using a smart contract known as ERC20. However, for NFTs, a smart contract called ERC721 is employed, which provides each NFT with a unique identifier. This ensures that NFTs are non-fungible, meaning each digital artwork or creative asset possesses a unique identity recorded on the blockchain. These smart contracts ensure that the rules and their execution are recorded in a decentralized manner on the blockchain, preventing anyone from altering the rules unilaterally. Furthermore, NFTs are not limited to digital art; they can also be applied to various forms of digital creative content, such as text messages, video clips, event tickets, sports cards, and items within games. NFTs can even be used to record ownership of physical artwork with assistance from IoT devices.

Within the creative sector, blockchain gives artists greater supervision over their work and a larger portion of the income generated. Artists can decrease their reliance on traditional intermediaries, which has the potential to increase their earnings and provide them with more say over the pricing and distribution of their creations. Blockchain also assists buyers in confirming the genuineness of creative items.

With blockchain-based smart contracts, every transaction undergoes verification and approval through consensus among network users. The complete record of transactions is continuously monitored, allowing anyone on the network to trace or inspect past transactions. Consequently, using blockchain makes the sale of counterfeit items significantly more challenging. Developers of virtual worlds can easily look up a consumer's NFT ownership on the blockchain to determine their possessions. More broadly, as electronic commerce, marketing, and social connections become increasingly virtual (beyond just online presence), ownership that can be verified digitally will gain increased importance (Huynh-The et al.,

2023).

Several advantages offered by blockchain technology apply to both sellers and buyers. Smart contracts make transparent dynamic pricing possible. The level of demand for creative items (such as paintings, photographs, or songs) changes over time. In traditional market arrangements, creators, buyers, and intermediaries might need to negotiate to change prices as demand fluctuates. Using smart contracts, the owners of creative items can easily establish rules to adjust prices in accordance with market demand. A properly implemented dynamic pricing mechanism provides advantages not only for the seller but also for the buyer, making it possible for more buyers who are prepared to pay a lower price to gain access to the item. Therefore, a pricing mechanism that is transparent to buyers is given priority.

Managing the metaverse will most likely require many NFTs, cryptocurrencies, and related NFT products for use within that virtual world (Liu et al., 2022). NFTs are rapidly becoming a vital part of the blockchain economy, theoretically representing ownership of digital assets listed on a public blockchain like Ethereum (Flick, 2022). NFTs identify unique artworks and record ownership on the blockchain. Smart contracts are programs stored on the blockchain that automatically run an agreement when predetermined conditions are met. Both technologies can encode rules for the sale, use, and licensing of NFTs. According to Malik et al. (2023), NFTs and smart contracts can be utilized for creative content, as more than 80% of all NFTs are created on the Ethereum Blockchain network, which allows for the creation of various types of tokens, including cryptocurrencies and utility tokens. Most tokens can be exchanged using a smart contract called ERC20. However, for NFTs, a smart contract called ERC721 is used, allowing each NFT to have a unique identification. This makes NFTs non-fungible, so each digital artwork or creative asset has a unique identity recorded on the blockchain. This smart contract ensures that the rules and their execution are recorded decentrally on the blockchain, so no one can unilaterally edit the rules. NFTs are also not only used for digital art but can be applied to various types of digital creative content such as text messages, video clips, event tickets, sports cards, and in-game items. NFTs can even be used to record ownership of physical artwork with help from IoT devices.

In the creative industry, blockchain gives artists more control over their work and greater rights in the income generated. They can lessen reliance on traditional intermediaries, which can increase income and give them more say over the price and distribution of their work. Blockchain helps buyers verify the authenticity of creative products.

With blockchain-based smart contracts, every transaction is verified and approved by consensus among users in the network. The entire transaction history is continuously tracked, allowing anyone on the network to track or check previous transactions. Thus, using blockchain makes selling fake goods much more difficult. Virtual-world developers can easily check a consumer's NFT ownership on the blockchain to know their possessions. More broadly, as e-commerce, marketing, and social interactions become more virtual (not just online), digitally verifiable ownership will become more important (Huynh-The et al., 2023).

Several advantages of blockchain technology apply to both sellers and buyers. Smart contracts allow for transparent dynamic pricing. Demand for creative products (paintings,

photos, songs) changes over time. In traditional markets, creators, buyers, and intermediaries might need to negotiate to change prices as demand changes. With smart contracts, creative product owners can easily set rules to adjust prices to market demand. A well-implemented dynamic pricing method benefits not only sellers but also buyers, allowing more buyers willing to pay less to access the product. Therefore, a transparent pricing method for buyers is favored.

3.3. Metaverse in social settings

The metaverse is a three-dimensional virtual environment where users create their own avatars and interact with other users. The metaverse opens up great potential for various uses, including workspaces, meetings, social places, live events, and other communication activities (Ramadan, 2023).

3.3.1. Social interaction

Global Connectivity: The metaverse offers a space where individuals are able to connect with others from anywhere in the world within a three-dimensional virtual setting. This capacity also allows for the sharing of cultures, concepts, and lived experiences from a wide array of backgrounds. The connections formed can bridge geographical distances effectively, enabling a sense of presence with individuals who are physically far away. Furthermore, the exchange of ideas and cultural nuances within these virtual environments can foster greater understanding and appreciation among diverse groups.

Social Interaction: Within the metaverse, users have the ability to interact using their own digital representations, known as avatars, or engage with the avatars of other participants. This dynamic establishes opportunities for forming new acquaintances, gathering with friends or colleagues in a virtual space, or working together on projects in an environment designed to be engaging and pleasant. The flexibility of avatar-based interaction allows for various forms of social engagement, from casual conversations to structured meetings or collaborative endeavors.

Entertainment Activities: The metaverse provides a broad selection of activities intended for enjoyment and leisure. These include virtual attendance at music performances, visiting exhibitions of art, participating in various games, and watching theatrical showings. These options present forms of entertainment that can feel more realistic and allow for greater participation compared to traditional media. For instance, utilizing the metaverse for virtual concerts creates a simulated viewing environment that is notably more immersive. This is often achievable at a lower cost, provides easy access for many people, and offers considerable flexibility regarding the viewer's physical location (Rinaldi & Purnamasari, 2023). The virtual setting allows attendees to experience the event in ways not always possible in person, such as customizing their viewing perspective or interacting with others in attendance.

3.3.2. Education

Interest in the metaverse is seeing a significant increase within the academic community (Yang, 2023). In this virtual realm, students and educators can represent themselves using digital identities, referred to as avatars, which can be customized for attending educational sessions. The

environments for learning can also be reconstructed virtually to suit the specific needs of a lesson, or they can be entirely simulated to create new educational landscapes. Resources for learning can be made visible using augmented reality (AR) or virtual reality (VR) technologies. Additionally, learning materials are often managed in a decentralized manner, providing students with the capability to gain access to resources on a global scale and pursue independent study. The metaverse facilitates learning that occurs in real-time but in a virtual format, effectively removing the constraints of physical distance (Zhang et al., 2022). This allows for synchronous learning experiences where participants can interact as if they were in the same physical location, despite being geographically separated.

3.3.3. Business

Non-Fungible Tokens (NFTs) represent a concept that was introduced based on blockchain technology in 2017 (Far et al., 2022). NFTs can serve as a method to designate official ownership over digital items that could otherwise be easily copied by anyone. By acquiring an NFT, individuals can obtain verifiable proof of unique digital ownership that is recorded on the blockchain. This mechanism grants value to certain digital properties and establishes the idea of exclusive digital possession. Through the buying and selling of NFTs, some individuals have realized substantial financial gains, including those who have become millionaires and billionaires in the cryptocurrency space. This development opens up business possibilities within the metaverse, where the value of digital assets and creative works has the potential to grow considerably.

The metaverse holds the promise of altering the methods by which consumers, brands, and businesses interact with each other and conduct transactions within a seamless, interconnected virtual environment. This progress is being accelerated by the observable trend of increasing consumer involvement in virtual settings and the transactions taking place within them (Giang Barrera & Shah, 2023). The potential for new business models, marketing strategies, and methods of service delivery within the metaverse is vast, driven by the evolving ways people engage with digital spaces and digital goods.

3.3.4. Healthcare services

One primary challenge in providing remote healthcare services is managing communication between service providers and service recipients. The metaverse may offer conditions that allow for more effective and interactive communication, made possible by the ability to understand how people feel. According to Garavand & Aslani (2022), the metaverse holds significant promise for improving healthcare services. The use of the metaverse covers several areas, including medical education, medical imaging, and effective communication within remote healthcare services. By offering the ability to provide 3D digital images, this technology can serve as a foundation for enhancing the delivery of medical interventions for future requirements.

4. Conclusion

Within the context of the metaverse, blockchain acts as a

related "enabler" intended to uphold accountability within the digital ecosystem. Ownership of digital assets or virtual goods existing in the metaverse is represented by NFTs (Non-Fungible Tokens). NFTs can take the form of digital artwork, virtual clothing, virtual land, characters, and virtual pets. Digital artists and individuals generally working in the creative industry can create works and subsequently sell them within the metaverse as NFTs. With this blockchain technology, the authenticity of digital assets can be guaranteed, and the virtual economy within the metaverse can flourish, creating new opportunities for creators and users. Furthermore, within the metaverse, users are able to interact with their own avatars or even with the avatars of other individuals. This establishes possibilities for forming friendships, gathering together, or collaborating within an enjoyable environment.

Data availability

All data produced or examined during this study are present in this paper.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Authors' contributions

All authors participated in the study design, writing, and manuscript revision. NDA drafted and revised the manuscript, and AJ supervised the study. All authors have reviewed and approved the final manuscript.

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Photograph and biography of the authors (Najmi Dinda Ayuni dan Agus Juhana) were not available at the time of publication.