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Journal of Applied Technical and Educational Sciences jATES

ISSN 2560-5429



Meaning, concept and taxonomy of metaverse

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Abstract: *The article examines the meaning, concept and taxonomy of metaverse in detail. The metaverse is a complex digital environment that exists by blurring the boundary between the physical and virtual worlds. The paper overview the different aspects of the metaverse, including its social, economic, educational and technological dimensions, and explains the origins of the term and the philosophy behind it. By presenting a taxonomy of metaverse, the article aims to provide the reader with a clear framework for understanding the structure and categories of metaverse. Touching on the role of cryptocurrencies and blockchain technology, the article also provides a comprehensive picture of the current state and future prospects of the metaverse.*

Keywords: *metaverse; concept; taxonomy; VR; AR; society; economy; cryptocurrency;*

1. Introduction

The metaverse is an online, three-dimensional world that encompasses multiple virtual spaces. It could be a next level, a future version of the Internet. In this 3D environment, people can work together, meet, chat or even play games. Although the metaverse is not yet fully available, there are platforms that already include similar features. Current video games offer the most authentic metaverse experience, where developers bring the gaming experience ever closer to the metaverse by staging in-game events or creating virtual economies.

The metaverse does not yet exist, but the metaverse will be driven primarily by augmented reality, with each user embodied as a character or avatar in the system. There are some games that are somewhat similar to the metaverse, such as Second Life, Fortnite or Roblox, but they do not yet implement the metaverse. Players are now using it not only as a game, but for different activities and experiences in the digital space. The gaming platform Roblox not only

offers traditional gaming experiences, but also provides a space for virtual concerts and gatherings. In Fortnite, a popular multiplayer game, 12 million users participated in Travis Scott's virtual concert in the game world (Tidy, 2020).

The financial, digital and real worlds are increasingly intertwined. With the tools we use in our everyday lives, we can access virtually anything with a single click. The crypto world is following this trend. NFTs, blockchain-based games and cryptocurrency transactions are already easily accessible within an evolving metaverse.

This article presents and summarizes the meaning, concept and taxonomy of metaverse, taking into account several aspects. Readers can gain a deeper understanding of what metaverse is and what role it plays in the digital world, what are the different aspects of metaverse such as society, economy, education and culture, privacy, technology and infrastructure. The article also briefly discusses the economic and technological opportunities that the metaverse creates.

The article was prepared based on the synthesis and summary of several previous publications: (Dwivedi et al, 2023) (Han et al 2022) (Hollensen et al 2022) (Kim, 2021) (Kraus et al, 2022) (Park & Kim, 2022) (Wang et al., 2022).

2. Meaning of metaverse

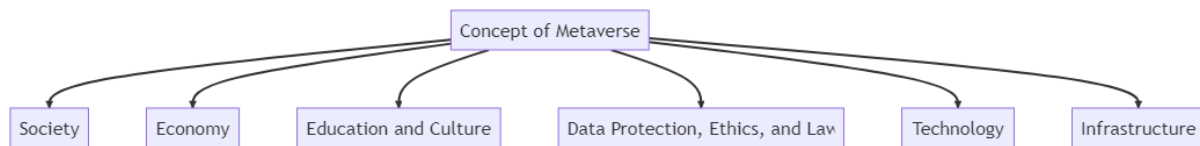
The term metaverse is derived from the words "meta-" (beyond, beyond) and "universe" and can be understood as a collective virtual space that combines physical reality, augmented reality, virtual reality and the internet. The term metaverse is often used to describe virtual worlds in which people exist as avatars and interact with each other and their environment. The meaning of metaverse:

A metaverse is an interconnected, immersive virtual world or universe in which people exist as avatars and interact with each other, their environment, and digital devices.

3. Concept of metaverse

The metaverse is the concept of a digital, three-dimensional virtual world that connects people in many aspects of their daily lives. The metaverse will bring together the economy, digital identity, decentralised governance and other applications. It can also be thought of as a connected platform system that, like the internet, brings together different websites under a single browser.

The concept is significant in several aspects, as illustrated in Figure 1.



- **Society:** the metaverse is a virtual social space where people can connect, communicate, work, play and learn. The metaverse has the potential to create new social dynamics and interactions. People can form new communities, communities, groups and circles of friends in virtual space, building new relationships and new experiences. Avatars and environments can be customised according to users' individual tastes, thus providing a means of personal expression.
- **Economy:** the Virtual Economy is the financial foundation of the metaverse, where digital assets such as NFTs (non-fungible tokens) and cryptocurrencies create new economic opportunities and enable transactions and value exchange. In addition, the metaverse offers new job and career opportunities, where people can pursue different professional activities and learn new skills in the digital space. In addition, commerce and business play an important role: virtual shops, marketplaces and services can be created within the metaverse, where users can buy, sell or exchange goods and services. People can buy, sell and trade these assets in the virtual world.
- **Education and culture:** in the field of entertainment, metaverse offers the possibility to virtually display concerts, performances, films and other artistic events, so people from all over the world can attend these events. In education, metaverse offers new platforms and tools for learning and education, where users can participate in courses, lectures and workshops. Last but not least, creativity is at the heart of the metaverse, where people can create and share artworks, designs and other creative projects, enriching the digital community and culture.
- **Privacy, ethics and law.** It is therefore essential that user data is properly protected and managed to preserve people's privacy and security. The issue of ownership also comes to the fore, especially of digital devices and content. It is important to define who owns the rights to a digital device or content and how these rights can be transferred or shared. Finally, ethical standards set out the basic principles for behaviour and interaction within the metaverse. These guidelines help ensure that communities in the digital space interact harmoniously and respectfully.
- **Technology:** Virtual Reality (VR) allows people to fully immerse themselves in a digital environment where experiences and interactions feel as if they are real. Augmented

Reality (AR) represents the bridge between the digital and physical worlds, where digital information and objects are integrated into our real environment, enriching it. Artificial Intelligence (AI) represents the intelligent aspect of the metaverse, where avatars and the environment are able to respond autonomously and intelligently to user interactions. Last but not least, blockchain technology ensures the security and transparency of the metaverse, especially for transactions and digital assets such as NFTs.

- Infrastructure: Servers and networks are essential for the metaverse to function, as they ensure the storage, processing and transmission of data between users. Developer tools are critical for creating metaverse content and applications. These tools and platforms enable developers to create applications, games and other content that enrich the metaverse experience. Finally, the user interface is where users enter and interact with the metaverse. It includes the tools and technologies that allow users to access, navigate and interact with the metaverse.

These aspects together form the concept of the metaverse and must be balanced to make the metaverse successful, attractive and sustainable for users.

3.1. Cryptocurrencies in the metaverse

Cryptocurrencies are digital or virtual assets that are protected and controlled by cryptographic techniques. The metaverse, as an online, three-dimensional world, naturally accepts digital transactions, making cryptocurrencies ideal as the basis for a metaverse economy. In this way, cryptocurrencies, while not essential, can be perfectly integrated into a metaverse. They can be used to create digital economies with various unity tokens and virtual objects such as NFTs. Digital economies created in metaverse allow users to exchange real value for virtual assets. For example, a player can sell a rare item to another player for cryptocurrency. Utility tokens are a special type of cryptocurrency that can be used within a specific platform or application. These tokens give access to various services or products. NFTs (non-fungible tokens) are unique digital assets stored on a blockchain. As each NFT is unique, they are often used to represent works of art, collectors' items or other rare virtual assets.

Crypto wallets, such as Trust Wallet and MetaMask, allow users to store and manage their cryptocurrencies securely. These wallets can be integrated with the metaverse, allowing users to perform transactions and exchange assets in the metaverse.

A blockchain is a decentralised database that stores transactions in blocks. Since the transactions in the blockchain are transparent and immutable, this ensures transaction integrity and reliability. In the metaverse, blockchain technology can enable users to transact securely and transparently.

The integration of cryptocurrencies and blockchain technology into metaverse systems can help to create a new type of digital economy where users can exchange value securely and transparently.

4. Taxonomy of mataverse

The metaverse is a complex and dynamically evolving environment that blurs the boundary between the digital and physical worlds. As technology and the Internet evolve, understanding and categorising the metaverse becomes increasingly important. The following taxonomy is intended to provide a comprehensive overview of the different aspects of the metaverse and to help users, developers and researchers to gain a deeper understanding of the metaverse.

The taxonomy in Table 1 is structured according to the following aspects, which include:

- Types: different types of metaverse serve different purposes. Simulated worlds create reality or a whole new imaginary world, while social platforms allow people to meet and communicate. Games and educational platforms offer users a variety of activities and experiences.
- Modes of interaction: interactions within the metaverse can take many forms, from simple social interactions to complex work and leisure activities.
- User Experience (UX): the experience of the metaverse is highly dependent on the depth of immersion, interactivity and customisability.
- Communication Modes: Communication within the metaverse can take many forms, from avatars to gestures and motion capture to voice and speech communication.
- Content: metaverse content can be static or dynamic, and can come from a variety of sources, including user-generated content and content generated by algorithms.
- Technology: The hardware, software and network infrastructure required to make the metaverse work.
- Technology infrastructure: The way in which the platforms of the metaverse operate, whether centralised, decentralised or hybrid.
- Community and social structure: The different levels of communities and social structures within the metaverse.

- Social impacts: the social and cultural impacts of the metaverse, including community formation, forms of identity and expression, and ethical and normative issues.
- Economic environment: economic aspects of the metaverse, including transactions, digital tools and virtual marketplaces.
- Economic Model: the economic models of the metaverse that determine how revenues are generated and transactions take place.
- Security and Privacy: the metaverse's security and privacy protocols that guarantee the protection of users' data and the authenticity of their identity.
- Access: types of access to the metaverse, whether public, private or anonymous.

Table 1. Metaverse taxonomy

Category	Description
Types	
Simulated worlds	Virtual environments that try to imitate reality or create a completely new imagined world.
Social platforms	Virtual spaces where people can meet, communicate and interact with each other.
Games	Virtual environments where users compete or cooperate to achieve different goals.
Educational and workplace platforms	Virtual classrooms, meeting rooms and workspaces.
Interaction modes	
Social Relations	How people build and nurture relationships within the metaverse.
Work and Professional Activities	How the metaverse is used to work, negotiate or discuss projects.
Fun and Games	Games, concerts, movies and other entertainment activities within the metaverse .
User Experience (UX)	
Immersion depth	Depth of Immersion: How much the user feels "present" in the metaverse: <ul style="list-style-type: none"> - Full immersion (e.g. VR) - Partial immersion (e.g. AR) - Non-immersive (e.g. 2D browser-based platforms)
Interactivity	To what extent the user can interact with the environment and other users.
Customizability	How well the user can customize the environment, avatar or experience.
Communication methods	
Avatars	Virtual representations of users in the metaverse.
Gestures and motion detection	Detecting and transforming the physical movement of users into virtual interaction.

Sound and speech	Communication with voice-based interactions.
Content	
Static	Content that doesn't change or update frequently.
Dynamic	Constantly changing or updated contents.
User generated	Content created by the community.
Algorithm generated	Automatically generated content, such as by AI.
Technology	
Hardware	What tools do people use to access the metaverse (e.g. VR glasses, AR devices).
Software	The applications, platforms and systems that power the metaverse.
Network	How the servers of the metaverse are connected and how they ensure a fast and smooth user experience.
Technological infrastructure	
Centralized	Platforms controlled by a single organization or company.
Decentralized	blockchain or other peer-to-peer technologies.
Hybrid	A combination of centralized and decentralized elements.
Community and social structure	
Individual	Custom User Experiences and Activities.
Small group	Groups of friends, teams or smaller communities.
Large communities	Larger groups, clans or guilds.
Global	the entire metaverse.
Social influences	
Communities	Communities and cultures formed within the metaverse.
Identity and Expression	How people represent and express themselves within the metaverse.
Ethics and Norms	Codes and norms of behavior within the metaverse.
Economic environment	
Transactions	How purchases and sales are made within the metaverse
Digital Tools	cryptocurrencies, NFTs and other digital assets.
Virtual marketplaces	Where users can buy or sell virtual items and services.
Work and Wages	How they create value and get paid for working within the metaverse.
Economic Model	
Transaction based	Models based on individual purchases or transactions.
Subscription	Access for a monthly or annual fee.
Free (freemium)	Basic features are free, but premium features require payment.
Crypto economy	cryptocurrencies and tokens for economic transactions.
Security and Data Protection	
Data Protection Protocols	How they protect users' data and privacy.
Authentication and Identification	How to ensure the authenticity of users' identities.
Legal and Regulatory Issues	the metaverse: <ul style="list-style-type: none"> - User rights and data protection: Protection of users' data and activities.

	- Ownership Rights: Ownership rights of virtual objects and territories.
Access	
Public	Data and content accessible to everyone.
Private	Only available to specific users.
Anonymous	User data is anonymous and non-identifiable.

This taxonomy provides a comprehensive view of the metaverse and its various aspects. As technology and society evolve, so does the metaverse, so it's important to keep updating and refining this taxonomy.

5. Discussion

We have encountered many challenges and questions in the development of the metaverse taxonomy. One of the key questions was how best to categorise a complex and dynamically evolving environment such as the metaverse. The categories and descriptions chosen are not exclusive and may change and expand as technology and society evolve.

Another important aspect was to understand the social and cultural impact of the metaverse. The metaverse is not only a technological platform, but also a social space where people can communicate, connect and express themselves. In developing the category of community and social structure, we have sought to show the diversity of communities and social dynamics within the metaverse.

In developing the categories of economic environment and economic model, it was important to understand that the metaverse is not just an entertainment platform, but also an economic space where transactions take place, value is created and new economic models emerge. Given the growing popularity of cryptocurrencies and NFTs, it was particularly important to show how these technologies are integrated into the metaverse.

Last but not least, in developing the category of security and privacy, we have sought to illustrate the challenges and opportunities for the metaverse in this area. Protecting users' privacy and ensuring the authenticity of their identity are key issues for the future of the metaverse.

Overall, the development of the metaverse taxonomy is an evolving process, shaped by changes in technology, society and culture. As the metaverse continues to evolve and grow, there will be a need to further refine and expand the taxonomy.

6. Summary

The metaverse is a combination of the words "meta-" and "universe", and refers to a collective virtual space that combines physical reality, augmented reality, virtual reality and the internet. In this space, people exist as avatars and interact with each other and their environment. The concept of the metaverse is a digital, three-dimensional world that connects people in their daily lives, including the economy, digital identity and decentralised governance. Different aspects of the metaverse include society, economy, education, privacy, technology and infrastructure. Cryptocurrencies, such as NFTs and crypto wallets, play an important role in the metaverse economy, enabling digital transactions and value exchange. The taxonomy of the metaverse helps to understand and categorise this complex and dynamically evolving environment.

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