Metaverse as a concept involving the coexistence of many virtual 3D worlds

Metaversum jako koncepcja obejmującą współistnienie wielu wirtualnych światów 3D

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Abstract. The article presents interesting new concept called Metaverse as a concept involving the coexistence of many virtual 3D worlds. The first part presents definition and history of the concept and moving forward some challenges related to MV. In next part some example of MV literature and main dimension has been developed by author of article. Next to summary and future of MV some opportunities has been presented. The main goal is to present new modern of concept in coexistence between the virtual world and human beings. The article brings:
- overview of concept;
- facts, statistic, numbers related to the topic;
- opportunities and challenges;
- future of Metaversum.

Keywords: Metaverse, concept, coexistence, virtual, world, 3D

Abstrakt. W artykule przedstawiono interesującą nową koncepcję o nazwie Metaverse jako koncepcję polegającą na współistnieniu wielu wirtualnych światów 3D. W pierwszej części przedstawiono definicję i historię pojęcia oraz, posuwając się naprzód, niektóre wyzwania związane z MV. W dalszej części autor opracowania rozwinął przykład literatury MV i jej główny wymiar. Oprócz podsumowania i przyszłości MV zaproponowano kilka możliwości. Głównym celem jest przedstawienie nowej i nowoczesnej koncepcji współistnienia świata wirtualnego i człowieka. Artykuł zawiera:
- przegląd koncepcji;
- fakty, statystyki, liczby związane z tematem;
- szanse i wyzwania;
- przyszłość Metaversum.

Słowa kluczowe: Metaversum, koncepcja, współistnienie, wirtualny, świat, 3D

Introduction

Metaverse in Polish is sometimes called metaversum or metaworld. It is a concept involving the coexistence of many virtual 3D worlds in which people function. In the metaverse of the living, people are represented by their avatars, who spend their time just like human beings: working, playing, meeting friends and shopping (WIX Blog, 2022).

In order to enter the metaworld and function there, special sets in VR (virtual reality) or AR (augmented reality) technology are needed. Currently, there are several separate platforms offering virtual worlds called "metaverses". However, it is still not one universal platform, although optimists assume that the development of the metaverse is heading in this direction thanks to blockchain technology and the new generation of the Internet, web3 (WIX Blog, 2022).

"Metaverse" is a term coined by Neal Stephenson in the 1992 science fiction novel Snow Crash. In Stephenson's book, the metaverse is a virtual world that exists parallel to the real world. The term "metaverse" combines two words:
– "meta" – according to According to the *PWN Dictionary of the Polish Language*, this term indicates "a higher degree, succession or variability of something";
– "verse" – "universe".

Metaverse literary precursor is William Gibson who created Virtual Reality cyberspace called *Matrix* in the science fiction novel *Neuromancer* in 1984 (Dionision, Burns, Gilbert, 2013, pp. 1-38).

Facebook laid the foundations for the metaverse back in 2019 by launching a social VR world called Facebook Horizon Worlds. In the following years, the company combined various applications and technologies to officially change its name to Meta Platforms, Inc. in 2021. Mark Zuckerberg officially confirms that he sees the future of the company in the development of the metaverse. In a Founder's Letter published in 2021, Zuckerberg wrote how he sees the future: "In the metaverse, you will be able to do almost everything imaginable: meet friends and family, work, study, play, shop, create, and have completely new experiences that are different from what we see today. computers or phones" (WIX Blog, 2022).

Zuckerberg announced to shareholders that the company's ambitions will require significant amounts of money to be spent on developing the metaverse over the next few years, with as much as 15 years of investment required to create some products. Of course, everything serves to increase the company's income – Mark Zuckerberg predicts that e-commerce activities in the metaworld will generate huge revenues, e.g. from the sale of virtual services and products, and that over a billion people will benefit from the commercial opportunities of the metaworld. Critics of this concept point out that instead of allocating huge resources to building virtual worlds, the company could deal with real problems and focus on security in its social networks (WIX Blog, 2022).

In addition to Meta, several other companies are developing the metaverse using their own platforms and creating innovative virtual worlds. Epic Games is the company that created and made Fortnite a success. The company also has many other games based on virtual experiences. Epic Games announces the continuation of the development of the metaverse thanks to the investment announced earlier this year – Sony and KIRKBI will put $ 2 billion (article in English) into the future of digital entertainment. Microsoft's main entry into the metaverse is its Teams platform, which provides a solid foundation „for connecting the digital and physical worlds". Apple can make an impact in the development of the metaverse through its commitment to creating devices that combine virtual and augmented reality. Many potential customers are already waiting for Apple VR/AR goggles. there are already several platforms offering users a variety of experiences and opportunities for activities in the metaverse. Currently, platforms focus on game development or cryptocurrency exchange. Below we describe some of the most important creators of the metaverse market in its current form. Fortnite is a survival game where 100 players fight against each other at the same time. Epic Games released the game in 2017, it is currently the most popular battle royale game. It boasts over 80.4 million active users, with about 4 million players fighting in it at the same time every day. People log on to this powerful platform not only to play. Fortnite is where they meet and also spend money (e.g. on unique characters, skills, etc.). They have the opportunity to participate in unique events, e.g. in the summer of 2021, Ariana Grande's concert took place on the Fortnite platform. Roblox is a metaverse platform where users contribute to the game by creating new characters, items and places, etc. The game is free, but there is also a virtual currency in circulation. More than 100 million people play Roblox every month. Roblox allows you to go beyond the world of games, e.g. in the "Party Place" on Roblox, users can organize their own parties, and the fashion house Gucci has created an official space called Gucci Town, which can be visited freely and even purchase virtual goods there. Other major metaverse platforms include the blockchain-based game SANDBOX, the football hub Sorare and the virtual world of space exploration HyperVerse (WIX Blog, 2022).

Augmented reality (AR) and virtual reality (VR) technologies are crucial to the development of the metaverse as they enable access to immersive experiences on metaverse platforms. VR technology allows you to experience sensory experiences while moving around the world of the metaverse – you can, for example, hear a familiar jingle and receive stimuli when touching a virtual object. AR technology, on the other hand, takes elements from the virtual world of the metaverse and maps them to the real world. "Companies like Snap and Niantic are doing fascinating things with AR technology, and Meta has some very interesting VR hardware concepts," says Goldman. "While VR and AR are not themselves part of the metaworld, both technologies are likely to play a significant role in accessing it. Certainly, a new type of experience in the virtual world will require a change in the approach to

marketing activities and the creation of new forms of digital marketing, the area of content marketing will develop in new directions. Also, personal branding can gain a completely new face" (WIX Blog, 2022).

The metaverse has a lot of challenges in regards to Virtual Reality (VR) and Augmented Reality (AR). These are pointed out a per below (Mystakidis, 2022, pp. 486-497):

– two technologies are convincing and can have influence on users emotions, cognition and behaviors (Slater, Gonzales-Liencres, Haggard et. al., 2020, p. 1);
– a barrier to mass adoption is the high cost of equipment which is expected in the long run to be mitigated;
– can lead to harmful accidents;
– information overload needs to be prevented;
– the risk in regards to privacy by sharing with other parties and data collection;
– emerge a cybersecurity threat;
– privacy violation by volumetric capturing;
– temptation of metaverse actors to compile users of biometric psychography;
– unintended behavioral inferences;
– health concerns – nausea, dizziness, motion sickness;
– social isolation, addiction, abstinence from real;
– griefing, cyber-bullying, harassment;
– traumatic experiences;
– identify theft and VR deep fake avatars.

Overview of Metaverse science literature

Pioneering theorist and venture capitalist M Ball explains Metaverse as a persistent and interconnected network of 3D virtual worlds that will eventually serve as the gateway to most online experiences which also underpin much of the physical world. For decades, these ideas have been limited to science fiction and video games, but they are now poised to revolutionize every industry and function, from finance and healthcare to education, consumer products, city planning, dating, and well beyond (Bell, 2022, pp. 1-15). In the Metaverse, M. Ball explains, how it could operate in practice and explores how it might turn out to be a lot more exciting and beneficial invention than the miserabilists imagine, so long as we help shape its evolution in an informed and provocative style. It serves as a comprehensive guide to every aspect of the metaverse, from its technical underpinnings to its societal responsibilities.

In June 2022, McKinsey released Value creation in the metaverse, a new report based on surveys of more than 3,400 consumers and executives, as well as interviews with 13 senior leaders and metaverse experts. Based on this analysis, the metaverse is best characterized as an evolution of today's internet – something is deeply immersed in, rather than something to be primarily looked at. It represents a convergence of digital technology to combine and extend the reach and use of cryptocurrency, artificial intelligence (AI), augmented reality (AR) and virtual reality (VR), spatial computing, and more. And the "enterprise metaverse" may coalesce in a way that unlocks even more opportunity, beyond simply serving as a virtual place where people interact (McKinsey, 2022).

At its most basic, the metaverse will have three features:
– a sense of immersion;
– real-time interactivity;
– user agency.

MetaMandrill defines the metaverse as a collaboration, or merger, between the physical and digital worlds through the application of different technologies and programs. This definition emphasizes that the metaverse is a living universe that exists parallel to and concurrently with the physical one. The metaverse is never turned off since it's a persistent system. It's a collection of virtual worlds with their unique properties, ecosystems, and social environments. The metaverse is the result of over 30 years of technological progress. It required ubiquitous high-speed internet access. The larger culture needed to be familiar with concepts popularized by video games, such as moving in virtual environments. And, of course, both standard and graphical processing units are required to evolve to their current impressive state. Finally, display technologies used in virtual and augmented reality needed to become lightweight enough to feel natural when worn. The metaverse meaning is impossible to grasp without understanding its separate components. But once they were in place, people could fully conceptualize the metaverse. And most tech companies who've worked with one of the previously mentioned pieces quickly made the metaverse into their macro-goal. Epic Games, Facebook, Nvidia, and more are all bringing their expertise to the metaverse. And in this sense, the metaverse meaning can be seen as technological convergence (MetaMandrill, 2022).

XRToday describes the metaverse by stating, "Think social media as it exists today, but more integrated and immersive". It's a new world where content creators and designers can work on an innovative economy using metaverse krypto. All while moving technology forward (XRToday, 2023).

Merriam-Webster offers a metaverse meaning which focuses on its place in history. They look at the metaverse as something which has moved from fiction to fact over time. Merriam-Webster offers a succinct definition by stating it's "A real word for a virtual world". They also stress that the metaverse's unfamiliar and often mercurial nature makes it hard to strictly define. However, Merriam-Webster (2022) points out that it can be seen as somewhat analogous to a digital multiverse.

The New York Post sees the metaverse as a shared digital world that can often substitute itself for the physical one. They note that "The idea of the metaverse is that it will create new online spaces in which people's interactions can be more multi-dimensional, where users can immerse themselves in digital content rather than simply viewing it". To interact with the metaverse is to be a part of the metaverse (The New York Post, 2023).

Seeking Alpha's definition of the metaverse stresses its diversity. They note that "The metaverse, therefore, isn't one digital space but several digital spaces and experiences currently being created by companies to offer more realistic and immersive digital experiences". They note that the metaverse consists of a vast array of wildly different experiences (Seeking Alpha, 2023).

Jon Radoff from Building the Metaverse derives his metaverse meaning from its dynamic nature. He notes that "The common theme is that the «player» is connected to an online framework that permits live content changes, live social connection or live monetization". In short, the metaverse is constantly changing similarly to the physical Word (Building the Metaverse, 2021). Author of the article has overviewed and is presenting some example of literature in subject of Metaverse (see table 1).

Table 1. Overview of literature in Metaverse

Author	Title
M. Zhou, M.A.A.M. Leenders, L.M. Cong	*Ownership in the virtual world and the implications for long-term user innovation success*
A. Asadnia, M. CheshmehSohrabi, A. Shabani, A. Asemi, M.T. Demneh	*Identifying key factors affecting on future of text information retrieval: A cross-impact analysis method*
J.M. Pharr	*A research agenda for investigating the effectiveness of branding in virtual reality*
Y. Chandra, M.A.A.M. Leenders	*User innovation and entrepreneurship in the virtual world: A study of Second Life residents*
P. Alahuhta, A. Sivunen, T. Surakka	*Virtual Worlds Supporting Collaborative Creativity*
S. Nambisan, K. lyytinen, A. Majchrzak, M. Song	*Digital Innovation Management: Reinventing Innovation Management Research in a Digital World*
V. Chandna, M.S. Salimath	*Peer-to-peer selling in online platforms: A salient business model for virtual entrepreneurship*
B. Goertzel, T. Goertzel, Z. Goertzel	*The global brain and the emerging economy of abundance: Mutualism, open collaboration, exchange networks and the automated commons*
B. Roßmann, A. Canzaniello, H. von der Gracht, E. Hartmann	*The future and social impact of Big Data Analytics in Supply Chain Management: Results from a Delphi study*
B. Ryskeldiev, Y. Ochiai, M. Cohen, J. Herder	*Distributed Metaverse: Creating Decentralized Blockchain-based Model for Peer-to-peer Sharing of Virtual Spaces for Mixed Reality Applications*

table continued 1

H. Duan, J. Li, S. Fan, Z. Lin, X. Wu, W. Cai	*Metaverse for Social Good: A University Campus Prototype*
A. Siyaev, G.-S. Jo	*Towards Aircraft Maintenance Metaverse Using Speech Interactions with Virtual Objects in Mixed Reality*
C. Jaynes, W.B. Seales, K. Calvert, Z. Fei, J. Griffioen	*The Metaverse – A networked collection of inexpensive, self-configuring, immersive environments*

Source: own study

Stylianos Mystakidis (2022) presented main dimensions as illustrated in figure 1. It has been divided in in 4 main groups: affordances, challenges, technologies, principles. These four groups mentioned have elements which are part of whole Metaverse. There are in technologies Virtual Reality Mixed Reality and Augmented Reality. In Principles it has been pointed out Open, Hardware agnostic, Network and Interoperable. Challenges, which can be seen in Metaverse are: Psychical well-being, Ethics, Privacy, Psychology. The Subgroups in Affordances are Immersion, Embodiment, Presence, Identity Construction.
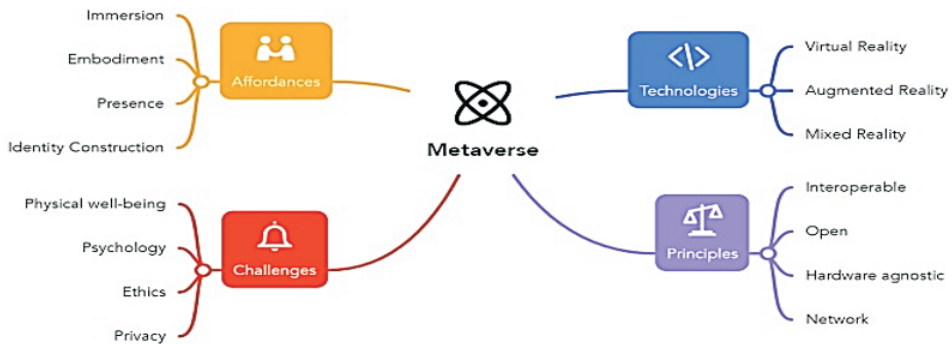

Fig. 1. Metaverse Affordances, Challenges, Technologies, Principles
Source: Mystakidis, 2022, p. 494

624 technology innovators, developers, business and policy leaders, researchers and activists provided open-ended responses to a question seeking their predictions about the trajectory and impact of the metaverse by 2040. The results of this nonscientific canvassing (PEW Research Center, 2022):
– **54%** of these experts said that they expect by 2040 the metaverse **WILL** be a much-more-refined and truly fully-immersive, well-functioning aspect of daily life for a half billion or more people globally;
– **46%** said that they expect by 2040 the metaverse **WILL NOT** be a much-more-refined and truly fully-immersive, well-functioning aspect of daily life for a half billion or more people globally.

John Pierpont Morgan has provided opportunities being in the Metaverse (Morgan, 2022):
–   54 dollars is spent every year on virtual goods, which is double amount than spending on buying music;
–   about 60 billion messages are sent on Roblox on daily basis;
–   Gross Domestic Product for Second Life in 2021 was 650 million dollars and out of this GDP almost 80 million dollars was paid to creators;
–   41 billion dollars are currently Non-fungible tokens (NFT's);
–   to lunch a music-themed virtual world 200 partnerships are involved including Warner Music Group;
–   in 2021 the average price from 6,000 in June to 12,000 dollars in December jumped to buy a virtual land;
–   by 2027 18,41 billion dollars will be spending in-game ad.
Metaverse should contain strategy with following elements:
–   learn;
–   access;
–   create;
–   connect;
–   establish.
Three verticals should be taken under consideration in gaming ecosystem (Morgan, 2022):
–   to helping content and game creators for more easily commercializing their creations;
–   ascending worldwide metaverse industry to multiply payment and currency methods;
–   by bank-grade product and digital access platform computerizing game platform creators.

Summary

The success of building and scaling in the metaverse is dependent on having a robust and flexible financial ecosystem that will allow users to seamlessly connect between the physical and virtual worlds (Morgan, 2022).
Metaverse has following advantages in use:
–   can bridge in social media connectivity with unusual affordances and immersive technologies;
–   transform lots of industry sectors including online education in distance;
–   allow hybrid, rich informal and formal learning experiences in online 3D virtual campuses;
–   break informal learning and final frontier in social connections;

– enable to be equally effective in virtual participation;
– foster lasting and deeper knowledge;
– become an important factor in education without geographical limitations and on equal footing world-wide participation.

The future for Metaverse as delivered by experts will be:

– two meta insights – Virtual Reality will be dominated by mixed-reality and augmented-reality applications, better serving people by networked--knowledge ecosystem;
– will be fully emerged (by profit motivating in investments in the type of technology, useful enough to access, available software will more available and creative by 2040, big boost given by XR development in technology, uses of XR will have any numbers of positives and delightfulness).

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