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METAVERSE – a powerful new instrument for urban planning or yet another unfulfilled tech-promise?

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Abstract: Pandemic and post-pandemic conditions left significant impacts not only on human life, but also in all of the aspects of human behavior, which consequently led to serious change in human communication. Often overlapping and interference of "real life", and virtual, contactless communication influenced accelerated adaptation of people to rapid and immediate change of perspectives. This affected regular interaction among people, but also had consequences in different performance of duties such as scientific development in different fields, or any other development-oriented activities.

From that new adaptation, METAVERSE was born, as immersive 3D environment in which people synchronously interact with others, and with representations of objects from the physical world. METAVERSE enables interactions with digital environments and physical objects located in different places and enables individuals to interact with other people in remote locations.

Within the realm of urban planning, the emergence of the METAVERSE has sparked both excitement and skepticism. Proponents argue that it possesses the transformative power to revolutionize the way cities are designed, managed, and experienced, while skeptics remain cautious, questioning its viability and potential to deliver tangible benefits.

This paper aims to critically examine the METAVERSE as a potent instrument for urban planning or yet another instance of unfulfilled technological promises. By analyzing the concept of the METAVERSE and its fundamental principles, this study seeks to uncover its potential applications in urban planning, especially in the field of participation. It explores the integration of virtual and augmented realities, immersive technologies, and advanced data analytics to create interactive and participatory urban design experiences.

Ethical concerns regarding privacy, accessibility, and digital equity are addressed, acknowledging the potential for exacerbating existing social disparities. Additionally, technical constraints, economic feasibility, and the need for robust infrastructure are examined to assess the practicality of widespread METAVERSE adoption in urban planning practices.

Through a comprehensive analysis, this paper aims to contribute to a deeper understanding of whether the METAVERSE represents a truly powerful and transformative tool or merely another fleeting technological mirage in the landscape of urban development.

Keywords: METAVERSE, urban planning, public participation, 3D environment

1 Introduction

The term "metaverse" in urban planning is relatively new and emerging, but it can be understood as a digital or virtual representation of a city or urban environment, where users can interact with a computer-generated environment and with each other, in real time. It has improved urban planning by providing immersive digital environments that enable dynamic simulations, stakeholder collaboration and participation and visualization of city projects and infrastructure (Dorostkar, Najarsadeghi ,2023) (Allam et al., 2022). Also, it refers to a complex and interconnected virtual world that mirrors elements of the real-world urban environment and offers various interactive experiences and services to users. It's important to note that the concept of the METAVERSE in urban planning is still evolving, and its practical implementation may vary widely from one city or region to another. Additionally, ethical and privacy considerations, as well as the equitable access to and governance of the METAVERSE, will be important factors to address as this technology develops further in the field of urban planning.

History of METAVERSE development is long with the first mentioning in 1938 by the French poet and playwright Antonin Artaud who used the term virtual reality in his collection of essays, The Theater and its Double (Artaud, 1938).

First time the term "metaverse" was used in the science-fiction novel by Neal Stephenson (Stephenson, 1992) as a virtual reality (VR) space that utilizes internet and augmented reality (AR) (Joshua, 2017), but it was adopted worldwide in the beginning of the 21st century with the development of the smart city concept in the virtual reality and augmented reality surroundings. Smart cities are urban areas that utilize digital technologies and cutting-edge solutions to provide better infrastructure, modernize government services, improve accessibility, accelerate economic growth, and improve sustainability (Yaqoob et al., 2023). These concepts were firstly tried and tested within the video games and multimedia platforms (Gent, 2022), (Ludlow and Wallace, 2007), and

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lately they made their pioneer steps in the area of urban planning (Petkov, 2023). As a support for development of sustainable and resilient cities METAVERSE is using tools, such as augmented reality, geographic information systems, and machine learning algorithms.

As an opponent or extension of human reality, METAVERSE experiences blooming during the pandemic of COVID-19 in 2020 and 2021, mainly because it had potential to extend physical world using augmented and virtual reality technologies (Dwivedi et al, 2022). Also, it helped urban planners to enhance city services, administration and to give better overview of the pandemic circumstances in the cities worldwide.

Popularization of METAVERSE during pandemics also enhanced possibilities for public participation and direct communication between the experts (architects, planners, students and scholars) who were territorially separated due to the restrictions and curfews proposed by the local and national governments.

In the "safe space" like METAVERSE, safe communication was enabled and basically became only way of human interaction, and the possibility to enjoy actual spaces and objects, but within the virtual realm.

Virtual copies of the actual working places such as offices, universities, and even public spaces provided users the real experience of attendance and provided them secure and familiar surrounding which was of the utmost importance in the pandemic hysteria. Psychological disbalance caused by the COVID 19 of the world population (including students, experts, ordinary people) had a direct impact on the communication, interaction and participation in all of the activities, which was partially overcome by use of the METAVERSE as a parallel universe.

2 METAVERSE in urban planning

As all of the other activities, urban planning has also gone through the major changes in the last 10 years, mainly due to rapid technological improvements in all aspects of human life. Use of computer programming, GIS systems and AI an VI reality for planning became a common practice in which urban planners serves as a coordinator of different activities and not only a designers and creators of new spaces (Yaqoob et al., 2023).

Over the past decade, technological advancements have significantly reshaped the landscape of urban planning, entering the new era of innovation and efficiency. The integration of smart technologies, data analytics, and digital tools has empowered urban planners to make more informed decisions and address pressing urban challenges. One of the most notable impacts has been the emergence of smart cities, where sensors and interconnected devices provide real-time data on traffic flow, air quality, energy consumption, and more. This wealth of information enables cities to optimize transportation systems, reduce energy consumption, and enhance public safety. Additionally, the rise of Geographic Information Systems (GIS) has revolutionized the way planners analyze spatial data, enabling them to visualize and model urban environments with greater accuracy. Moreover, collaborative urban planning platforms and public engagement apps have fostered greater citizen participation, making city development more inclusive and transparent. In the coming years, as technology continues to evolve, the influence on urban planning is likely to grow, paving the way for even more sustainable, resilient, and people-centric cities.

The METAVERSE technology works through interconnected, interactive, and immersive 3D worlds where urban planners can interact with each other, attend events, hold lectures, and scientific conferences. These typically involve using VR and AR technologies to create immersive 3D environments that can be accessed through various devices, including VR headsets, smartphones, and computers (Zallio, Clarckson, 2022) (Kye et al., 2021).

With all of these technological improvements, METAVERSE came like a logical sequence of events unifying all of the functions of the new smart city within one virtual realm. Havin that in mind, there are several potential key aspects of the use of METAVERSE in the urban planning:

a) Digital Twin: The METAVERSE often involves the creation of a digital twin of a physical city or urban area. This digital twin is a highly detailed, 3D virtual replica that includes information about buildings, infrastructure, transportation networks, and other urban features (Lv et al., 2022).

b) Virtual Collaboration: Urban planners, architects, policymakers, and residents can collaborate within the METAVERSE to visualize and simulate different urban planning scenarios. This enables stakeholders to better understand the potential impacts of various development projects and policy changes.

c) Public Engagement: The METAVERSE can serve as a platform for engaging the public in the urban planning process. Citizens can explore virtual versions of their city, provide feedback, and participate in discussions about proposed changes and developments.

d) Data Analysis: The METAVERSE can integrate real-time data from sensors and other sources to provide insights into urban dynamics, such as traffic flow, air quality, energy consumption, and more. This data-driven approach can inform decision-making in urban planning.

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e) Smart City Integration: As smart city technologies become more prevalent, the METAVERSE can serve as a central hub for managing and monitoring various urban systems, including transportation, energy, and public safety.

f) Augmented Reality (AR) and Virtual Reality (VR): AR and VR technologies can be integrated into the METAVERSE to provide immersive experiences for users. This can include virtual tours of proposed developments, interactive simulations, and augmented overlays on the real-world urban environment.

g) Accessibility and Inclusivity: The METAVERSE can potentially enhance accessibility and inclusivity in urban planning by allowing individuals with disabilities or those who cannot physically attend meetings to participate in the planning process.

On the other hand, in the current theory and practice some of the critical opinions and concerns can be found regarding the use of the METAVERSE in urban planning such as: (Greenfield, 2017) (Brooke, 2022) (Allam, et al. 2022)

1. **Inequality and Accessibility/ Digital Exclusivity**: The METAVERSE heavily relies on digital technology, which could deepen existing socio-economic disparities. Not everyone has equal access to the internet or the necessary devices to participate fully in the METAVERSE. This could lead to a situation where certain segments of the population are left behind or marginalized in urban planning processes.

2. **Digital Divide**: The METAVERSE could create a digital divide, where those who are tech-savvy and can navigate virtual spaces effectively have more influence over urban planning decisions. This might exclude the voices of older generations

3. **Loss of Human Connection**: The METAVERSE is inherently digital, potentially reducing the value of physical, face-to-face interactions that are crucial for fostering a sense of community and social cohesion in urban spaces.

4. **Privacy and Data Security**: The METAVERSE involves the collection and sharing of vast amounts of personal data. This raises concerns about privacy, data security, and the potential for misuse or breaches of sensitive information.

5. **Monopolization**: Large tech companies could dominate the METAVERSE, controlling access, data, and infrastructure. This concentration of power may limit competition, innovation, and diverse perspectives in urban planning processes.

6. **Digital Addiction**: An overreliance on the METAVERSE could contribute to digital addiction and a detachment from the physical world, potentially leading to mental health issues and reduced physical activity.

7. **Environmental Impact**: Building and maintaining the digital infrastructure for the METAVERSE consumes significant energy and resources, which could contradict sustainability goals in urban planning.

8. **Loss of Authenticity**: Urban planning traditionally involves physical, tangible spaces. The METAVERSE, being virtual, may lack the authenticity and tangible qualities that make real urban environments unique.

9. **Security Risks**: Virtual environments are susceptible to hacking and cyberattacks, potentially disrupting essential urban services and infrastructure.

10. **Cultural Homogenization**: The METAVERSE could encourage cultural and social homogenization, as digital platforms often prioritize certain types of content and interactions, potentially eroding the cultural diversity that defines urban areas.

11. **Accountability Challenges**: In virtual spaces, individuals and entities can often remain anonymous or pseudonymous, making it challenging to hold them accountable for their actions. This may lead to issues like harassment or malicious activities without clear means of addressing them.

12. **Real-World Disconnect**: Overemphasis on virtual planning may lead to a disconnect between the digital representations of urban areas in the METAVERSE and the real-world physical environment, potentially causing planning decisions to be out of touch with practical realities.

13. **Accessibility Concerns**: Virtual environments might not be accessible to individuals with disabilities, creating barriers to participation in urban planning for this demographic.

Incorporating the METAVERSE into urban planning holds potential benefits but should be approached cautiously, taking into account these criticisms and addressing them to ensure that planning processes remain inclusive, equitable, and responsive to the needs of diverse communities.

Studies also have identified significant areas of concern relating to ethics, data security, regulation, safety as well as the potential detrimental psychological impact for vulnerable members of society (Lee & L.-H, 2021).

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The integration of the METAVERSE into urban planning presents a host of ethical dilemmas that demand careful consideration. One of the most pressing concerns is the potential for exacerbating existing inequalities within communities. As METAVERSE technologies offer novel ways to engage with urban spaces and infrastructure, there is a risk that these innovations may primarily benefit those with the means to access and navigate the digital realm. This could inadvertently exclude marginalized populations who lack the necessary resources or digital literacy to participate fully. In such a scenario, urban planners must grapple with the ethical quandary of whether to prioritize the interests of the digitally privileged or invest in strategies to bridge the digital divide, ensuring that the METAVERSE benefits all residents equitably.

Furthermore, the METAVERSE raises questions about privacy and surveillance in urban environments. As virtual and physical worlds become increasingly intertwined, the collection and utilization of vast amounts of personal data within the METAVERSE could raise significant privacy concerns (Yaqoob et al 2023).

Ethical dilemmas emerge regarding the balance between using data for urban planning and respecting individuals' right to privacy. Striking this balance requires careful deliberation to prevent the METAVERSE from becoming a surveillance tool that erodes personal freedoms. Urban planners face the challenge of implementing robust privacy safeguards and transparent data governance frameworks while harnessing the potential of the METAVERSE to enhance urban living. These ethical dilemmas underscore the critical importance of developing a METAVERSE that is not only technologically advanced but also ethically responsible and inclusive in its urban planning applications.

3 Social impact of METAVERSE in public participation

Ever since the first anti-utopian concept of the city has appeared (Stupple, 1974) (Eszeneyi, et al. 2023), the premises of the utopian city were demolished by dystopian ideas open, monitored cities which will have almost biological connection between residents and buildings.

METAVERSE concept enables all of that and goes even further in complete and accurate transformation of the actual cities in the virtual space, without giving a starting position to the residents to adapt and grow with the new born virtual city. The environment in which the 2020 COVID-19 pandemic developed only accelerated the adaptation processes and the residents were practically pushed to the new environment without knowing any advantages and disadvantages of such a system.

Some of the critics previously provided in the paper are giving an overview of potential problems of adaptation to the new METAVERSE cities, especially in terms of digital inequality generated by the lack of technical knowledge or access to the internet. Also, these circumstances could directly affect and public participation in the new born cities, which needs to be one of the basic postulates for its creation in VR (virtual reality) and AR (augmented reality).

One of the most important problems in the METAVERSE development in urban planning was lack of strategies and any guidance on the national/regional/local level which led to the rather confusion both in operational efficiency of the urban planners as well as in facilitation of communication in urban planning (Petkov 2023).

Also, public participation, as it was previously known went through serious transformation and new communication methods were starting to implement.

The practical use of METAVERSE in urban planning came in focus during the COVID-19 pandemic where new circumstances in the usual participative planning procedures demanded paradigm shift and new reconstruction of the participation process towards online spheres, instead of usual tete-a-tete cooperation. The basic principles for the adequate participation of all stakeholders in decision-making processes in pandemic conditions were the same, regardless of whether they are carried out live (offline) or on online platforms, and refer to the fact that the degree of harmonization of views is greatest if all interested parties are simultaneously engaged (Nenković-Riznić, Simonović Alfirević, 2022). Online engagements were initially met with many obstacles in the implementation, primarily related to the level of (un)familiarity with technology, psychological obstacles in active participation in decision-making in changed circumstances, as well as generalized problems arising from the impossibility of continuously holding the workshop due to technical obstacles (interruption of the Internet connection, image delay, etc.), enabling equality in time for expressing individual views, etc. All of this obstacles are the one noticed and acknowledged in the METAVERSE implementation- same problems were occured in the public participation processes organized in METAVERSE environment, but, due to the system complexity it was even more difficult and demanded all new set of behavioral patterns that must be learned for a long time, and not in a short period of time (which was the case in the COVID-19 surrounding).

The METAVERSE has helped maintain a semblance of normalcy during the pandemic and thus has become a powerful weapon for the continued collaboration of people of diverse backgrounds in urban planning.

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On the other hand, METAVERSE technology had a strong social impact on the continuity of urban planning processes during the pandemics, having in mind that it is a fully immersive digital space that allows users to interact and feel the presence of a computer-generated space as if they were physically present. The users can create avatars to represent themselves and interact with other users and objects within the virtual world. (Biswas,2023)

The creation of an avatar is one of the most significant problems in interaction. Even highly educated experts (in this example, urban planners) cannot remain immune to the improvement and beautification of reality, thus creating their fictional character that should represent it worthily in the virtual space.

Beautifying reality has become a global trend that bypasses processes such as participation. In virtual circumstances, all actors become an idealized vision of themselves, and the objectivity of their views, as well as their timely response to questions that require a direct answer, can be questioned.

Due to all of the above, the question of participation in the METAVERSE environment partially loses its objectivity, which can be one of the most serious criticisms of this concept.

4 Application of METAVERSE in urban planning participation processes and learning - advantages or unfulfilled tech promise?

During the COVID-19 pandemics, METAVERSE has involved from yet another internet tool to really useful platform for exchange of ideas, knowledge and opinions in the hostile world environment.

Although the majority of users were completely ignorant in using the METAVERSE, on the other hand, it was necessary to quickly become technologically literate, because the METAVERSE offered an almost faithful alternative to real life. The sense of safety in familiar spaces, generated for users, gave much-needed hope that life could go on despite prohibitions and obvious health threats.

On the other hand, the generators and creators of those spaces were faced with a serious challenge to create faithful replicas of objects that exist in the real world in a short period of time.

This stage represents breaking point where urban planners enter the scene, who are expected to faithfully recreate real spaces and place them in virtual reality in cooperation with technological experts and the IT sector.

As the final product of this work, a large number of METAVERSEs of different purposes were created that represent faithful replicas of the spaces that exist in the real world and as such enable communication most similar to one in the real world. In the METAVERSE, people can go into a virtual world and interact with their surroundings and other people (Morgan 2023). With the METAVERSE, users can access their virtual environments created for learning and participation in urban planning processes from anywhere with an internet connection, and have discussions and work together in real time. This can make it easier for people with disabilities or who live in remote areas to get an education and learn.

In the METAVERSE, users can work together on projects, participate in virtual events – meetings, conferences, learning activities, and connect with others in their field of study. This can help stakeholders feel like they are part of a group and give them the chance to meet new people and work with others.

One of the biggest challenges facing the METAVERSE is the technical infrastructure required to support the virtual world. This infrastructure must handle high levels of data transfer, support real-time interactions, and provide a stable and secure environment. There are also problems with privacy, data protection, and intellectual property rights that come with the METAVERSE. These problems need to be fixed so that the METAVERSE can be used for participation, learning and education in a safe and responsible way (Morgan 2023).

Having in mind disadvantages and advantages of METAVERSE it can be concluded that this type of interactive engagement of different groups has its potential especially in the pandemic conditions, and/or in circumstances where it is impossible to organize meetings in a short period of time, primarily due to territorial distance, but also due to other limiting factors (Picture 1)

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Picture 1. Virtual meeting organized in METAVERSE

Source: https://diginomica.com/meta-brings-vr-business-meetings-enterprise-gateway-METAVERSE

5 Analysis of METAVERSE – impressions of the survivor

METAVERSE was widely spread as the most desirable way of communication (although it was not developed for that purpose) during 2020., 2021. and even 2022. after post-covid crises all around the world, since travelling to distant countries was banned due to different levels of restrictions.

New surroundings were born and developed, forming a parallel universe in which all activities were maintained according to earlier habits.

World universities organized lectures in faithful replicas of their rooms, amphitheaters and classrooms, easing the already too difficult situation for students, caused by COVID--19. In the new METAVERSE, in addition to lectures, universities also organized conferences on various topics. One of these conferences was the WASTE TO ENERGY workshop organized in November 2022 by Zheijang university in Hangzhou, China. The conference lasted for 2 weeks and with participation of more than 40 experts from the third world countries, mostly from Africa.

The conference and workshop were organized via zoom, with the main event organized in the METAVERSE environment.

None of the participants had previous experience in METAVERSE, although they were technologically fully educated and had adequate infrastructure that supported their attendance.

Before the main event, where all of the participants should attend the conference in METAVERSE and to present their work, an additional education was organized for the experts, where they learnt how to manage in the virtual space, learnt how to walk, talk, and how to operate their avatar. Each participant got his own avatar, whose facial expressions were operated by the person behind the camera. It gave new perspective to the virtual reality concept, since the avatar really got the personality of the person who operates them (Pictures 2a-c)

Picture 2. Avatars of the experts on the final conference of WASTE TO ENERGY WORKSHOP

a)   b)   c)

Source: Author

Participant-driven avatar had wide range of possibilities for communication with other participants through video calls, chat, gestures, exchange of the business cards etc.

The architecture of the university building was completely replicated with all the details of the object. Participants had to opportunity to visit virtual exhibition of the best works of the university students and also to have a very vivid experience in communication with the colleagues, almost like in the real world. Also, the mentioned method of communication enabled greater intimacy between the large number of participants who

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also attended other social events, apart from the conference itself (awards awarding, celebration of the end-of-conference and awarding of diplomas, etc.)

Technical obstacles have sometimes made a minor problem, but all things considered – METAVERSE experience is not nearly as unpleasant as critics of this concept elaborate in their work.

Main obstacles observed in this experience are related to the difficulties in learning to perform basic operations in the METAVERSE (walking, sitting, navigation in space and surrounding), as well as problems caused by internet communication breakdowns that can greatly detract from a positive experience.

6 Conclusion

The concept of the METAVERSE holds tremendous promise for reshaping the way we participate in urban planning. As our cities continue to grow and evolve, the need for more inclusive, collaborative, and innovative approaches to urban planning becomes increasingly apparent. The METAVERSE, with its immersive and interconnected digital environments, offers a unique opportunity to bridge the gap between citizens, urban planners, architects, and policymakers.

By allowing individuals to engage in virtual representations of their cities, the METAVERSE can democratize the planning process, enabling a wider range of voices and perspectives to be heard. It has the potential to break down physical barriers, making participation more accessible to those who may have been marginalized in traditional urban planning processes.

Moreover, the METAVERSE can serve as a powerful tool for visualizing and simulating different urban design scenarios, helping stakeholders make more informed decisions. This technology can facilitate real-time feedback, fostering a sense of community ownership over the urban environment.

However, it's important to acknowledge that the successful integration of the METAVERSE into urban planning will require careful consideration of privacy, security, and equity concerns. As with any transformative technology, there are challenges and risks that must be addressed to ensure that the METAVERSE enhances rather than diminishes the quality of urban life.

On the other hand, initiatives for better technological knowledge are more than welcome to overcome initial ignorance that can slow down the process, as well as improvement of technical infrastructure.

In conclusion, the METAVERSE has the potential to revolutionize urban planning by promoting inclusivity, enhancing collaboration, and providing innovative tools for decision-making. Even though there's a possibility the METAVERSE may not succeed, it's safe to say that another technology will soon follow holding a different promise. Embracing this technology thoughtfully and responsibly can lead to more sustainable, vibrant, and livable cities in the future. It is essential for urban planners, policymakers, and citizens to work together to harness the full potential of the METAVERSE in shaping the cities of tomorrow.

References

Allam Z., Sharifi A., Bibri S.E., Jones D.S, Krogstie J. (2022), The Metaverse as a Virtual Form of Smart Cities: Opportunities and Challenges for Environmental, Economic, and Social Sustainability in Urban Futures, Smart Cities 2022, 5(3), 771-801; https://doi.org/10.3390/smartcities5030040

Artaud A. (1938), , The Theater and its Double, Grove Weidenfeld, New York

Biswas S. (2023), Impact Of METAVERSE Technology: An Explanation And In-Depth Guide, https://elearningindustry.com/impact-of-METAVERSE-technology-an-explanation-and-in-depth-guide, accesed on 11th September 2023

Brooke S. (2022), The metaverse: city planner's dream or urban nightmare?, https://www.raconteur.net/technology/metaverse-planners-dream-urban-nightmare, accesed on 11th September 2023.

Dorostkar E., Najarsadeghi M. (2023), Sustainability and urban climate: How Metaverse can influence urban planning?, Environment and Planning B: Urban Analytics and City Science, OnlineFirst, https://doi.org/10.1177/23998083231181596

Dwivedi, Y. Hughes L., Baabdullah A., Ribeiro-Navarrete S., Giannakis M., Al Debei M., et al (2022), *METAVERSE beyond the hype: Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy*, International Journal of Information Management, Vol 66, October 2022, 102542

Eszeneyi R., Bednarova-Gobiva K., Edina R., (2023) Artificial Intelligence, Machine Translation & Cyborg Translators: A Clash Of Utopian and Dystopian Visions, Orbis Linguarum, Vol 21, Issue 2, DOI: https://doi.org/10.37708/ezs.swu.bg.v21i2.13

Gent, E. (2022), *Lessons from a second life> before meta, philip rosedale created an online universe,* IEEE Spectrum, 59 (1) (2022), p. 19

Greenfield A. (2017), Radical technologies: The design of everyday life, Verso, ISBN-10 ：178478043X

Joshua J., (2017), *Information Bodies: Computational Anxiety in Neal Stephenson's Snow Crash*. Interdisciplinary Literary, Studies, 19 (1), pp. 17-47

Kye B., Han N., Kim E., Park Y., Jo S. (2021), Educational applications of metaverse: possibilities and limitations, J Educ Eval Health Prof 2021;18:32, DOI: https://doi.org/10.3352/jeehp.2021.18.32

Lee, T. Braud, P. Zhou, L. Wang, D. Xu, Z. Lin, …, P. Hui, All one needs to know about METAVERSE: A complete survey on technological singularity, virtual ecosystem, and research agenda, arXiv, 2110 (2021), p. 05352,

Ludlow P, Wallace M. (2007), *The second life herald: The virtual tabloid that witnessed the dawn of the METAVERSE*, MIT press

Lv Z., Xie S., Li Y., Hossain M.S., El Saddik A., (2022), Virtual Reality & Intelligent Hardware, Volume 4, Issue 6, December 2022, Pages 459-470, https://doi.org/10.1016/j.vrih.2022.06.005

Morgan R. (2023), How The METAVERSE Impacts The eLearning Industry, https://elearningindustry.com/how-the-METAVERSE-impacts-the-elearning-industry, accesed on 12th September 2023

Petkov M. (2023), *Exploring the potential of the METAVERSE in urban planning,* https://landvault.io/blog/METAVERSE-urban-planning, accesed on 3rd September 2023.

Stephenson, N. (1992), *Snowcrash,* New York, Bantam books

Stupple, J. (1974) Towards a definition of anti-utopian literature, CEA Critic, Vol. 37, No. 1, A CEA CHAP BOOK: Science Fiction: The Academic Awakening (November 1974), pp. 24-30

Yaqoob I., Salah K., Jayaraman R. Omar M. (2023), Metaverse applications in smart cities: Enabling technologies, opportunities, challenges, and future directions, Internet of things vol 23., https://doi.org/10.1016/j.iot.2023.100884

Zallio M., Clarkson P.J. (2022), Designing the metaverse: A study on inclusion, diversity, equity, accessibility and safety for digital immersive environments, Telematics and Informatics 75 101909