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2023

Imagining the Prospects and Possibilities of Metaverse in Library and Information Services

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Gupta, Saumya and Walia, Paramjeet K., "Imagining the Prospects and Possibilities of Metaverse in Library and Information Services" (2023). *Library Philosophy and Practice (e-journal)*. 7882.
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Imagining the Prospects and Possibilities of Metaverse in Library and Information Services

Abstract

The metaverse is a novice and innovative technology with a huge potential to revolutionise the digital world and provide a more immersive user experience. The study discusses the layers and technologies associated with the metaverse, potential applications of the metaverse in library and information services and its inherent challenges. Metaverse technology has recently gained attention, and literature was mainly found in blogs and websites, and few from research articles. After analysing those studies, the researchers have tried to visualise the future application of the metaverse in the libraries. The findings shows that libraries can leverage the metaverse technology to render more effective and immersive virtual services such as virtual tours, virtual exhibitions, virtual reference services, virtual learning spaces, organising LIS conferences and events, providing more effective LIS education and training and provide better library services for differently-abled people. The article will create awareness about this new technology and its possible applications in the library and information services.

Keywords: Metaverse, Metaverse in Libraries, Innovative Library Services, Emerging Technologies in Libraries, Virtual Library Services

1. Introduction

From the advancement of the internet till now, various innovative technologies have occupied their space in the digital landscape. Digital technology has gained enough attention after the covid pandemic. Metaverse has already started crawling in various sectors, and tech companies such as Facebook, Microsoft, Google and Nvidia have started investing in this technology. Metaverse is called by different names such as mirror world, virtual 3D world and extension of the internet. The concept of metaverse raised popularity after the pandemic due to the widespread adoption of online and digital modes of communication. The idea of the metaverse is not new but gained significant attention after Facebook announced that the company was rebranding to the name Meta on October 28, 2021, which is seen as the development of the metaverse. In the late 1970s and early 1980s, the technology community foresaw the metaverse as the future development of the internet. Past attempts were also made like second life, a technology developed by linden lab that offered people to create a virtual avatar for themselves and has a second life in the virtual world (Ravi, 2022).

The term “metaverse” was first time used in the science fiction novel “Snow Crash, authored by Neal Stephenson in 1992, to explain a 3D virtual world where people were represented in the form of avatars and could interact with each other (Patel, 2022). The novel gave some glimpse of the metaverse where humans entered into the virtual world through digital avatars via virtual reality (VR) equipment and started living in the metaverse. Stephenson’s idea about

the metaverse was confined to virtual reality headsets, but the modern-day metaverse has a broader vision and incorporates other technologies for a fully immersive experience (Technologies, 2022). The advancement of smart devices and breakthrough technologies driving metaverse from infancy to upcoming reality soon (Wang et al., 2022).

Metaverse means Beyond the Universe. "Meta" for "beyond" and "verse" for "universe". In general terms, the metaverse is defined as the open and accessible 3D virtual world where users can create their own digital avatars to interact with other people virtually and immerse themselves in performing virtual activities that give real experiences. According to (Ning et al., 2021), "Metaverse provides an immersive experience based on augmented reality technology, creates a mirror image of the real world based on digital twin technology, builds an economic system based on blockchain technology, and tightly integrates the virtual world and the real world into the economic system, the social system, and the identity system, allowing each user to produce content and edit the world".

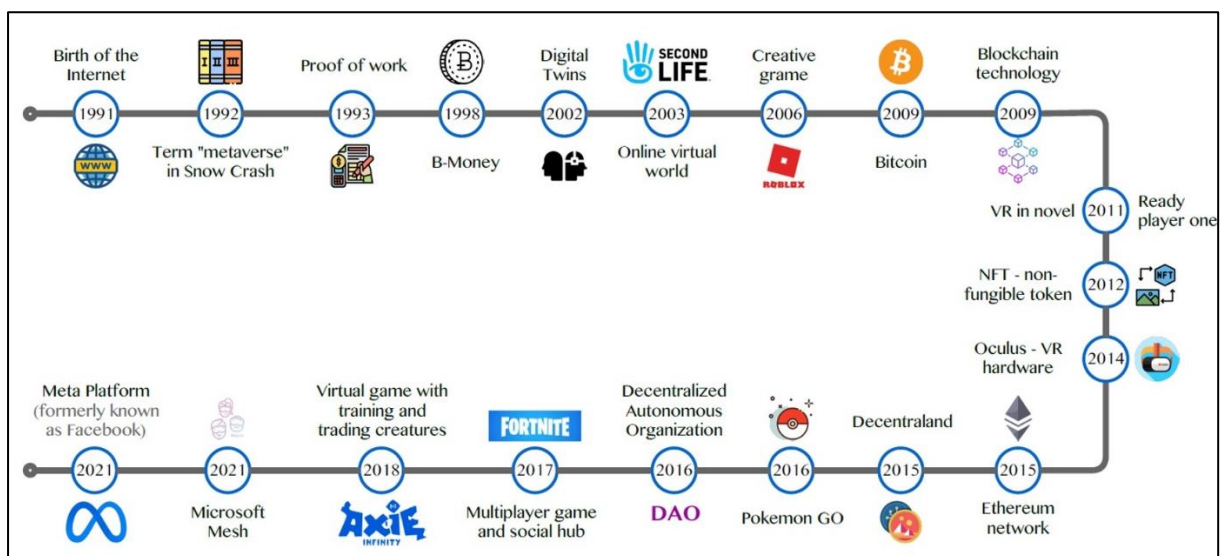


Figure 1: Timeline of the Metaverse from 1991 to 2021 (Huynh-The et al., 2022)

Figure 1 illustrates the major and primary events responsible for the development of the metaverse from the birth of the internet in 1991 followed by first use of the term metaverse in Snow Crash, a fiction novel which gave some idea about metaverse in 1992, development of the concept of proof of work, a consensus algorithm in a blockchain network published first time in 1993 by Cynthia Dwork and Moni Naor. Later in 1998, B-money proposal created by Wei Dai, anonymous, distributed electronic cash system, later referenced by Satoshi Nakamoto to build the world-famous Bitcoin in 2009 and the first virtual online world project called Second Life in 2003 that offered people to create their own virtual avatars. The emergence of powerful technologies such as Digital twins, blockchain technology, VR, NFTS and VR sets, Ethereum network and the decentralisation world are also the major drivers for the enhanced version of the virtual world. The games like Pokemon GO in 2016 and Fortnite in 2017 based on VR and AR technology also gained popularity among people. Recently big companies have

introduced metaverse projects such as mesh by Microsoft and Meta Platform (formerly known as Facebook).

Meta CEO Mark Zuckerberg said "the best way to understand the metaverse is to experience it yourself, but it is a little tough because it does not fully exist yet" (Barbazzeni, 2021). Roblox, an online gaming platform, is the perfect example of the future of metaverse, which allows players to create their own games and interact with each other in real-time to be a part of the experience. Another metaverse event in the limelight is Justin Bieber and Ariana Grande hosting virtual concerts by partnering with tech giants like Wave and Fortnite, where Bieber wore a motion-capture suit to control the movements of his digital avatar and people could interact with the singer and even create their own avatars.

The purpose of the study is to unleash the discourse on the metaverse among the library and information science community and explore the potential applications and prospects of metaverse in libraries.

2. Application of Metaverse in Different Sectors

The metaverse is a new technological development that has the potential to transform and impact every possible sector. Each sector and organisations have different vision and possibilities to leverage the metaverse, but there is no doubt that it will soon become a crucial driving force for the tech world and the applications of metaverse are countless in every industry (Technologies, 2022). Metaverse can enhance the gaming experience by appearing in a 3D virtual reality and developing their own content and building sub-games within a game, the fashion industry can attach their products to NFTs, e-commerce could provide a more personalised and immersive shopping experience to customers, health care sector can leverage metaverse for physical, telehealth consultations and for health care education by rendering computer-generated laboratories and virtual surgical training platforms (Patel, 2022). It provides new opportunities to artists and sellers to leverage virtual worlds for showcasing, selling and purchasing digital artworks and much more in other sectors. Tourism industry is also exploring the Metaverse and other virtual technologies to promote virtual traveling in 3D space. With the help of gadgets and smart devices, people can do virtual tours around the globe and allow people to visit simulations of popular tourist spots in their original state (Neeti, 2022). Big companies have started working towards metaverse to make it reality such as Meta (formally Facebook) has planned to invest in Augmented Reality (AR) technology to build out their virtual world capabilities. Microsoft is working with Qualcomm to work in extended reality (XR) and make Holoportation technology, an immersive and interactive experiences built inside mixed reality apps. NVIDIA is making Omniverse tool that supports developers in building their applications for 3D simulations and design and enable users to create their realistic virtual avatar (Pritchard, 2022).

3. Layers of Metaverse

To understand the concept of metaverse, it is pivotal to know how it works, and its main building blocks. Metaverse consists of seven fundamental layers which give a proper outline of its architecture.

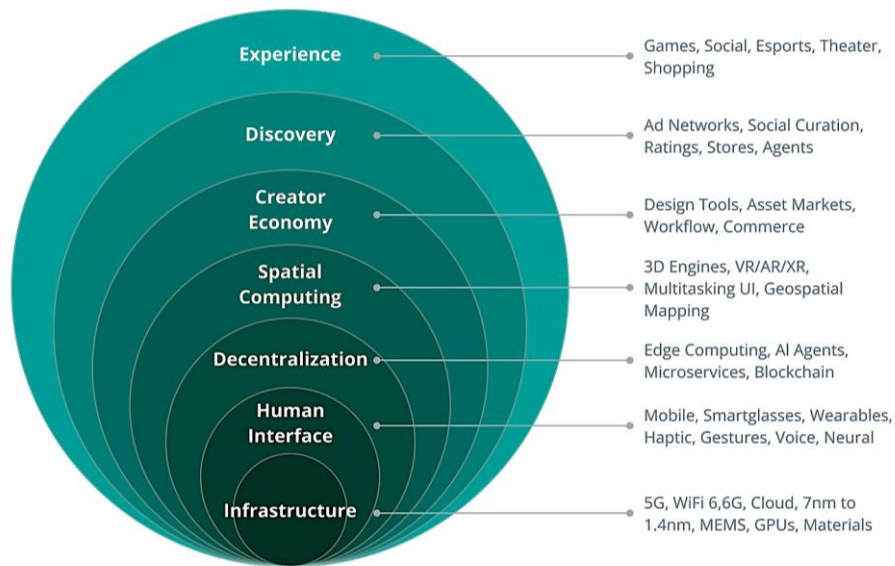


Figure 2: Layers of Metaverse (Holonext, 2022)

- **Experience** – It will be the ultimate dematerialised version of physical space, objects and distance. It gives the experience of both 3D and 2D visuals and graphics (Holonext, 2022).
- **Discovery**- The discovery layer means “push and pull that introduces people to new experiences”. The inbound and outbound discovery system exists in the metaverse. Inbound discovery occurs when people are actively looking for information. Meanwhile, outbound refers to providing information to people, whether they are seeking it or not (Holonext, 2022; Singh, 2022).
- **Creator economy** - Nowadays, anyone can contribute to the web without coding skills. Due to this number of designers and creators has been exponentially growing on the web (Holonext, 2022). In the metaverse, users can create or design their digital assets, which they can trade or sell in the marketplace, further driving society towards the creator economy (Weston, 2022).
- **Spatial computing**- It is the combination of virtual reality (VR), augmented reality (AR) and mixed reality (MR) technology that blurs the boundaries between the virtual and physical world. Spatial computing could develop human-machine and machine-machine interactions to the other level of efficiency. Microsoft’s HoloLens and Snapchat’s Landmarker are great examples of this technology (Holonext, 2022).
- **Decentralisation**- The metaverse can create a virtual world without any interventions from the central authorities. Decentralisation enables users to have complete control and ownership over their assets and experiences in the metaverse, which is a pivotal feature in deciding the freedom of the users (Weston, 2022). The blockchain, smart contracts, and open-source platforms are parts of the decentralisation process (Holonext, 2022).
- **Human interface**- The user interacts with the digital device to enter or access the virtual world. Users can access and join the metaverse using technologies such as VR headsets, haptics, and AR glasses. Metaverse can also be accessed with smartphones,

laptops, tablets, and PCs when designed with the right features (Weston, 2022). It is possible to interact with the metaverse through phones and laptops, but a better immersive experience requires a virtual reality (VR) headset and augmented reality (AR) devices to properly integrate between the virtual and the physical world.

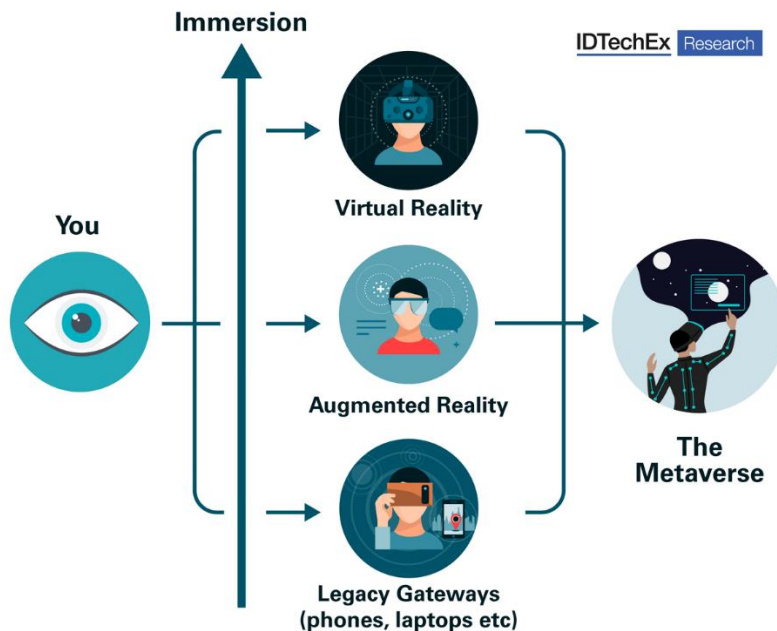


Figure 3: The metaverse requires capabilities from AR, VR, and legacy devices (IDTechEx, 2021)

- **Infrastructure-** Metaverse requires high internet speeds, high bandwidth, and very low latency. The development of network technologies such as 5G and 6G empower ubiquitous network access and real-time massive data transmission between real and virtual worlds (Wang et al., 2022). Powerful hardware is also crucial for the effective functioning of devices used for human interference (Holonext, 2022). A robust infrastructure renders seamless, value-based experiences for all users in the metaverse (Weston, 2022).

4. Technologies Powering the Metaverse

Metaverse is the amalgamation of various technologies that come together to create an immersive user-experience that bridge the gap between real and virtual world. The various technologies that are powering metaverse are-

- **Blockchain-** By leveraging the blockchain in the metaverse, one can build decentralised and transparent solutions to provide digital proof of ownership, digital collectability, transfer, governing access, and ensuring interoperability (Takyar, 2022; Wealth Quint, 2022).
- **Cryptocurrency-** Cryptocurrencies are powered with blockchain to secure the ownership of virtual lands. It can be used as a medium of exchange to buy digital assets in the 3-D virtual space.

- **Artificial Intelligence** - AI can replicate the more realistic human avatars by analysing 3-D scan images. To further enhance the digital experience, AI can be used to make facial expressions, hairstyles, clothes, and other features. AI algorithms can develop personalised avatars and intelligently recommend interesting goods or information to users in the metaverse (Wang et al., 2022).
- **Augmented Reality (AR) and Virtual Reality (VR)**- AR and VR are the most crucial and the backbone of metaverse that give users an immersive and realistic immersive 3D experience. AR augment the real-world surroundings using visual elements and graphical characters such as games like AR Dragon and Pokemon GO that can be accessed by a digital device, or smart cameras can be used to access the AR applications. VR can build a computer-generated digital world that users can access using VR headsets, gloves, and digital sensors (Takyar, 2022). VR can further be expanded to enhance the virtual experience by incorporating simulations with VR equipment. These technologies are at the development stage and would be mature to shape the future of the metaverse.
- **Internet of Things (IoT)**- This technology can connect every physical object to the internet through sensors and devices, and each device has a unique identifier that can send or receive information automatically. This technology is pivotal in bridging the gap between the physical and virtual worlds. IoT can be utilised for sending or receiving data through sensors from the physical world and incorporated into virtual space to give a more realistic experience of digital world objects (Takyar, 2022).
- **3D Construction**- The virtual replica of physical world objects can be produced using 3D spatial data and 4K HD photography which passes through the computer to process and generate a virtual replica of objects (Binance Academy, 2022). It helps in developing realistic and organic-looking spaces through 3D reconstruction using 3D cameras, which create accurate 3D models of buildings, locations, and objects on the web (Wealth Quint, 2022).

5. Prospects of Metaverse in Library and Information Services

Metaverse is a radical innovation that could bring disruptive transformation in many aspects of life. Earlier, attempts were also made to create a library in the virtual world. Bell, Peters and Pope (2007) explained the development of the Alliance Second Life Library project. Second Life is a virtual simulated world that was entirely built and developed by users, called residents. The Alliance Library System created the library in the Second Life in 2006. Metaverse has incredible possibilities and provides an entirely new way of human-computer interaction and user experience. The prospects and possibilities of the metaverse in libraries are-

- **Virtual Reference Services**- Most users prefer to meet the library professional in-person over virtual assistance for their queries. Users can communicate with libraries in the metaverse, as it is much closer to an in-person meeting (Iyengar, 2022). Metaverse augments the visit of librarians and users together in the 3D virtual library in their virtual avatars to solve user queries and provide personal assistance to users in real-time. The

metaverse is an evolution of 2D virtual model and can provide more immersive and engaging experience for librarian and users.

- **3D Virtual library Tour** –The metaverse enables an immersive experience where users in their virtual avatars can virtually enter the 3D library virtual world to get familiar with the different sections of the library, facilities, resources and services. It will give a more personalise user experience rather than watching the library tour video. Users can experience real-world scenarios. For example, during the user orientation program, instead of going through a lengthy presentation about the library, users can be given a virtual tour of the library facilities, meet other users in a shared virtual space and get a real experience of the library where library professionals can better showcase and demonstrate about the library resources and services to users (Nijland, n.d.).
- **Virtual Exhibitions-** Libraries hold exhibits for education, and awareness, reflecting the intellectual quality of their collections and promoting library resources. Metaverse is a great place to organise those exhibitions that provide a more immersive and engaging experience to the library users. More artists are turning to digital platforms like the metaverse's Roblox, Decentraland, Sandbox, or Roblox, to showcase their latest digital art (Sayej, 2022).
- **Virtual Learning Spaces-** Before and after covid, learning has experienced major shift from physical classrooms to more virtual and blended space. With the help of metaverse, it is possible to enter the virtual campus and library to learn, explore, and socialise (Jagannathan, n.d.). Libraries can provide virtual spaces for students in the metaverse to collaborate, brainstorm and discuss group assignments.
- **Organizing Library Conferences and Events** - The people have been using video-conferencing and live-streamed sessions over the years to conduct virtual conferences and events that have accelerated substantially during the covid times. The metaverse has the potential to provide a highly immersive and interactive experience where LIS-based conferences and events can organise the metaverse, and people can move freely from session to session or booth to booth, which is impossible in the existing digital platforms (Chodor, 2022). Even after the covid period, holding a conference virtually saves a lot of travel costs and provides more accessibility to people around the world to attend the conference online.
- **LIS Education and Training-** During the covid period, there was a complete shutdown of educational institutions, and students were getting an education in the form of video-conferencing and online classes. Metaverse can transform access to education, and the way knowledge is delivered. Metaverse can redesign education, making it more exciting and meaningful by demonstrating complex theoretical concepts practically (Iyengar, 2022). In online education, it is touch or feel the objects but using AR/VR visuals, one can replicate the physical environment or objects in 3D visuals, which will make the LIS education and training more interactive, engaging and enhance overall learning experience. Metaverse can also be leveraged for virtual training experiences. While explaining a concept, they can provide 3D models for a more enhanced emphasis and help them to hone their skills and develop a better understanding before going to the real world (Neeti, 2022). It can enhance the learning experience through simulations and get hands-on experience of different topics and concepts. The significant advantage of a metaverse in education and training is the full immersion of students in the digital classroom, where students can interact with their

teachers and more effectively participate in day-to-day activities such as classes, workshops, projects and seminars (Ravi, 2022). For example, Khon Kaen University library has started an ultramodern learning resource which uses VR headsets to enhance learning and acquire new knowledge through metaverse experience for students and the public. The public libraries can also leverage the metaverse to provide community information service in a suitable form as per the requirement of different communities.

- **Research** – One of the possible applications of metaverse in research is to collect data from sample population. LIS Researchers across universities and organisations can use metaverse technology for data collection. Traditional research methods such as surveys, focus groups and questionnaires can give biased results. With the use of immersive technologies like eye tracking VR combined with biometric devices allow researchers to capture involuntary muscle movements like emotional levels, heart-rate, gaze and other key performance metrics (Nijland, n.d.).
- **Improve accessibility for people with differently-abled-** People with disabilities often face difficulties in accessing the content in various multimedia formats. As per the report by Book trust, just 7% of books are accessible in designs that help the visually impaired, and only 2% are in braille. 3D-audio echo-location, audio descriptive menus, and Haptic Feedback tools can potentially mitigate those barriers (Arti, 2022). The libraries could be more accessible for people with physical disabilities in the metaverse, where a person can experience the virtual library tour. AR Apps like TapTapSee allow users to point their phones at any object to better describe them and galvanise a movement to improve accessibility in the metaverse.

6. Challenges and Issues of the Metaverse

- **Privacy and Security-** Privacy and security are the major areas of concern in the metaverse. The weak security procedures lead to the escalation of cyber-attacks, theft, and fraud, where proper regulations and policies are required to mitigate this risk (Wasnik & Bhasin, 2022). Developers and technology companies should also make an effort to keep the data secure and safe for the large-scale adoption of this technology (Ameen, 2022). For example, metaverse could be a big threat to any individual personal identification in a virtual environment that anyone can replicate. It is crucial to secure an individual's identity, and neither a bot nor anybody else can fake it (Aziz, 2022).
- **Cost of Technology-** Metaverse will require high-tech hardware like glasses, gloves, sensors, and other wearable devices, which are very costlier and everyone cannot afford it. The cost factor limits the reach of this technology which creates more inequality and a digital divide in society (Ameen, 2022).
- **Data-related Threats-** The data generated or produced from wearable devices and users/avatars may suffer high risks regarding data tampering, false data injection, and intellectual property violation in the metaverse. The issues of IPRs have also been experienced owing to the use of celebrity lookalikes in video games (Wang et al., 2022).
- **Authentication of Avatar-** It is a serious concern in the virtual world more than the physical world. Metaverse can be more challenging through verifying facial features, voice,

and video footage and can be tempered by creating multiple AI bots (i.e., digital humans), which appear, hear, and behave identically to the user's real avatar in the virtual world (Wang et al., 2022).

7. Conclusion

With the continuous advancement of technological development, libraries have been reengineering and redesigning their role and function in the modern digital information society. Metaverse is still at the nascent stage and yet to explore its true potential. This new technology will come up with its advantages, problems and issues. There is still uncertainty about how this technological disruption will impact different sectors, society and libraries. The world has a close eye on the metaverse and its prospects and possibilities in reshaping society and how the convergence of physical and virtual worlds go hand in hand, which can be seen as the next generation of the internet. The different sectors are exploring the power of the metaverse and approaching the metaverse in different ways. There is a high possibility that current issues in the information field will be amplified with the use of the metaverse in the near future (Pack, 2022). However, libraries could also leverage the metaverse benefits for better-personalised services and a more immersive digital user experience. In the near future, the world will witness numerous applications of the metaverse that can revolutionise how we work, collaborate and socialise with each other.

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