هيئة الحكومة الرقمية
Digital Government Authority

Metaverse

Brief Study

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Terms and history

What is Metaverse?

The term Metaverse has been first mentioned in the sci-fi novel "Snow Crash" in 1992 to describe a virtual reality world called the Matrix, presented in figure (1). In fact, the term has been formed from the combination of the two English terms "Meta" and "Universe". Nowadays, it refers to the shared virtual 3D world and even refers to the multiple cross-platform worlds that can provide users a comprehensively immersive experience with interactive and collaborative activities.

Layer	Main new content	Main new features
Metaverse 3D (depth)	Spaces and objects / contents(visual, auditory, sometimes tactile content)	The orientation and location of devices in the virtual world including the head, hands, view direction and full body dimensions.
Web 2D (flat)	Hypertext pages, e-sites, multimedia, social media posts, and e-commerce	Browsing by clicking on hyperlinks, then viewing their content and navigating through them to other web pages
Internet 1D (linear)	Data files, email, and other text-based communication	Typing and reading on teletypes, then on terminals with displays, then on personal computers

Figure 1: The Metaverse Is The 3D Experience Layer Of The Internet

What is the timeline of Metaverse development?

The Metaverse is a part of a long development journey of the Internet and other technologies for decades. The Figure (2) describes the timeline of the Metaverse development that includes many primary development stages, starting from origination of the Internet to the first virtual world project and recent Metaverse projects of big tech companies like Microsoft and Facebook.

Figure 2: A timeline of the Metaverse development involving primary events

How does Metaverse work?

The Metaverse comprises different components that constitute its environment that is required for providing interaction in both the virtual and physical worlds. For instance, users may experience Metaverse in digital avatars complemented with VR/AR technologies. Also, there are several characteristics, such as virtual world, persistency, scalability, always-on with synchronicity, financial allowance, decentralization, security, and interoperability, should be maintained in a standard Metaverse platform. The Figure (3) shows the platform's seven layers, each including various technologies:

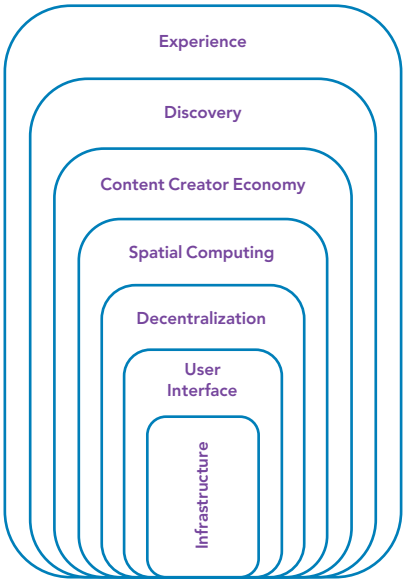

Figure 3: The Seven Layers of Metaverse

Infrastructure

5G, 6G, WiFi, cloud, data center, central processing units, and GPUs.

User Interface

mobile, smartwatch, smartglasses, wearables, head-mounted display, gestures, voice, and electrode bundle.

Decentralization

edge computing, AI agents, blockchain, and microservices.

Spatial Computing

3D engines, VR, AR, XR, geospatial mapping, and multitasking.

Content Creator Economy

design tools, asset markets, E-commerce, and workflow.

Discovery

advertising networks, virtual stores, social curation, ratings, avatar, and chatbot.

Experience

games, social center, E-sports, shopping, festivals, events, learning, and working.

The Technical Aspects of Metaverse

The figure (4) summarizes the Metaverse's main technical aspects comprises of six state-of-the-art AI-based methods, including:

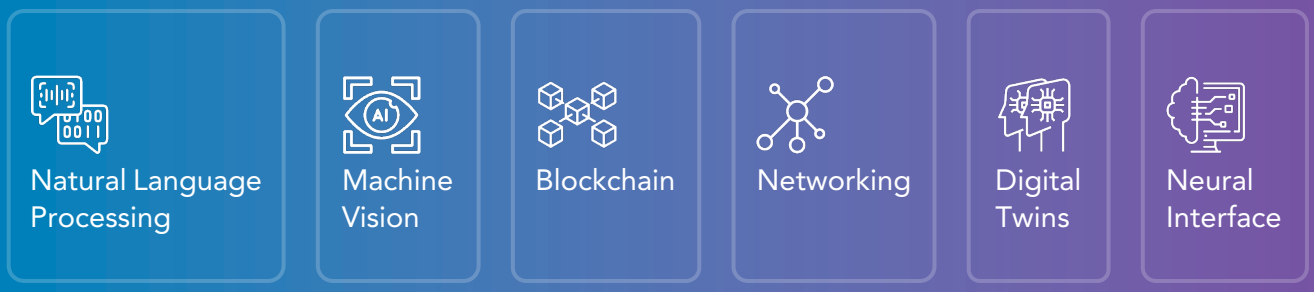

Figure 4: Technical aspects of Metaverse

What is the impact of Metaverse on Government Entities?

The Metaverse could be used as a platform to enable citizens to seamlessly access services and applications using technology that simulates the physical world. Hence, adopting Metaverse also ensures citizens to access governmental services and applications anywhere and anytime through avatars, the matter that gives government entities a good opportunity to embrace the Metaverse environment to provide new interactive services to beneficiaries in order to achieve transparency and efficiency while reducing relative costs and complexities.

Opportunities and Challenges

Opportunities

Government entities have the ability to invest in Metaverse to facilitate their digital transformation journey through offering different always-available citizen experiences that would increase the service quality, help identify the targeted citizen effectively, provide seamless citizen access to services and applications, and improve government to citizen G2C communication and engagement. In addition, interest in this new technology is on the rise. This was clearly outlined in the World Economic Forum (WEF) that announced the roll-out of the 'Global Collaboration Village' as the virtual future of public-private cooperation in collaboration with Accenture and Microsoft. The following are service sectors that could leverage Metaverse:

Such opportunities also arise across three different types of experiences or use cases, as follows:

Transport

Availability of interactive environment to citizens "go and immerse oneself" through a 3D simulation and/or a virtual reality.

Transform

Bringing digital to the physical world, allowing the user to access real-time information, with seamless ability of collaboration, and interactive experiences in the physical world.

Transact

Enhancing the economic and financial nature of Metaverse through the use of cryptocurrencies, non-replaceable NFT codes and blockchains.

Challenges

The Metaverse is still in its early stages and could face some new challenges related to security and privacy issues for individuals and organizations. As a result, Governments shall consider deploying a robust underlying infrastructure for the network, financial, and technical capabilities required to make the Metaverse available to all citizens. The most important to be considered is data protection, governance, cyber security, digital identity, and other digital policy concerns. It is worth noting the need to ensure a sound and sustainable regulatory environment that balances both; physical and virtual worlds. Moreover, the cost of learning, exploring and preparing for metaverse is another challenge. It is important that efforts be directed by technical sector stakeholders to consider legally guaranteed practical governance and business models.

For further studies and publications,
You may visit the Digital Consulting Program Knowledge Center on:

digitalconsulting.dga.gov.sa

The State of the Metaverse – Forrester Research | Creating Value in the Metaverse – Rotman Management | Artificial intelligence for the metaverse: A survey. Engineering Applications of Artificial Intelligence

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