

Metaverse and its Potential

A Primer on Metaverse and its Application across Industries

December 2022

What is Metaverse?

Metaverse can be viewed as a parallel universe consisting of highly interactive 3D virtual worlds or real world augmented with data and features, providing users with rich immersive experiences in all spaces

Augmented Reality (A)

Interactive real-world environment modified by visual elements, sounds or other sensory stimuli



Virtual Reality (B)

3D computer generated environment similar or different from the real world, which can be explored and interacted by a person



Mixed Reality (A+B)

Merging of real and digital worlds; unlocking natural and intuitive 3D human, computer, and environmental interactions



Used in the gaming world over the last two decades, metaverse's current popularity spurred from infinite use cases discovered for other industries and made more relevant post pandemic

A Peek into Metaverse World

Estimated to take an hour daily for 1/4th of the world population by 2026, metaverse needs several aspects fulfilled for it to become a reality – low-cost hardware, cheaper and ultrafast internet connectivity

...imperatives to accelerate metaverse adoption

Cheap and **accessible hardware** along with **always-on connectivity** via high-speed, **high-bandwidth 5G** internet with low latency

...metaverse potential

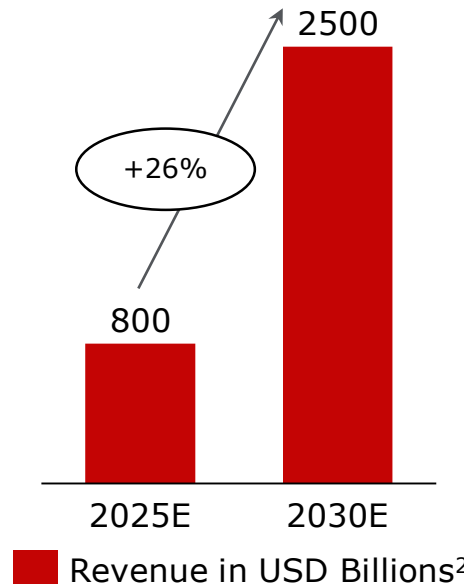
Potential to make the **real and virtual spaces completely interchangeable** with wide variety of uses across industries

...industries it can impact

- Industrials
- Manufacturing
- Automotive
- Financial Services
- Energy
- Ecommerce
- Architecture & Engineering
- Media and Entertainment

How big can the Metaverse get?

By 2026, **~1/4th** of the world would spend at least **an hour** on metaverse¹



Leading the metaverse innovations



- Renamed itself as **Meta Platforms**
- \$10 bn spending plans in the **development of VR/ AR/ MR**
- Virtual meetings, digital real estate, live concerts



- **Omniverse metaverse** heavily used in manufacturing via **digital twin technology**
- **AI-based omniverse avatars** communicate with other avatars – useful in customer service, banking, shopping, and airlines
- **Digital twin project** for planet Earth



Metaverse and Industries

Application and Possible Use cases

Metaverse and Industries (1/5)

While metaverse can help the education industry with interactive and immersive learning, it can also advance the automobile industry further in adoption of autonomous vehicles, R&D and target consumer branding

Eduverse



Sub-verse for education

Based on web3 platform, Eduverse is a virtual world that aims to bring learners together as avatars using AR/ VR



How big is the eduverse

According to Research and Markets, the industry saw robust growth in 2021 and was valued at \$95 B. The Market is poised to surpass \$288 B in revenues by 2031



Immersive experience

VR/ AR can be used in demonstration of concepts in a fully 3D-immersive way. For e.g., an electrical engineer can use AR/ VR to map the flow of electricity, thus providing better understanding of the topic



E-learning revolution

Eduverse promotes collaboration and hands-on learning experiences which the current e-learning system lacks. It maximizes involvement and boosts operational skills

Automobile



Enriched experience

Metaverse and automobile are a promising mix with features such as assist with navigation, adaptive cruise control, lane departure warnings, AR-assisted dashboards, real-time traffic signs



Metaverse advertising

Brands can advertise in metaverse to establish a global presence and get more recognition. Brands can rent or purchase plots of virtual land to advertise their goods and services through billboards or organize promotional events



Product development and maintenance

Spatial AR can be used to match a variety of design concepts to actual vehicle models. Technicians can get paperwork and instructions without being distracted by AR eyewear

Recent Developments



Meta in edutech

Facebook Reality labs will be investing \$150 M for educational programs, and are partnering with Coursera and EdX to offer the Spark AR curriculum of Meta that will use both VR and AR



Mixed reality in classrooms

Microsoft launched Microsoft Mesh in 2021 to promote the adoption of metaverse, offering it to educational institutions and edtech sectors



Metaverse on wheels

Wayray, a Zürich based startup in the connected cars and consumer electronics space, has developed the car "Holograktor", the first one designed around true AR technology for ride-hailing business. It has a holographic deep reality display with which one can personalize the ride in terms of activities, such as gaming, singing or just resting

Metaverse and Industries (2/5)

With real-like experiences on VR/ AR/ MR, metaverse can greatly transform the healthcare and ecommerce consumers to give personalized recommendations and expand services to remote locations

Healthcare



Telemedicine

Telemedicine, particularly via VR, will vastly reduce the need of physical presence for diagnostics and treatments



Medical training tool

By leveraging VR technology, medical professionals are being trained with a replicated look at patient's ailments and simulating real world treatment procedures



Digital twin technology

In the metaverse, patients' digital twins can be created and used as test dummies to predict how a patient will recover from surgery or how one would react to a treatment



Mental health treatment

The immersive experience of metaverse can be used to treat a vast array of mental disorders. Additionally, it could provide mental healthcare access to disabled people or to the ones in remote locations

E-Commerce



Personalized experience

Using AR/VR technologies, customers will be able to try the products virtually to acquire a better understanding, thereby increasing the conversion ratio of a product



Behavioral insights

Virtual shopping assistants and other AR/ VR tools can provide product performance insights and assess customer behavior, hence providing a tailored retail experience



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NFTs

Brands can launch their own NFTs for multiple purposes, e.g., private programs for selective audience or exclusive access to brand events and product launches in the metaverse, providing a more personalized experience

Recent Developments



Johns Hopkins neurosurgeons perform institution's first AR surgery

With the assistance of robotic arms and AR technology, physicians placed six screws in a patient's spine for spinal fusion surgery to fuse three vertebrae in the first procedure held on 8 June 2020



Expanding into NFTs and virtual shoes

Nike launched a range of 20,000 sneakers on metaverse named 'Nike Dunk Genesis Cryptokicks' ranging from \$2,500 - \$449,000



3D layout of houses using AR

An AR/ VR room that gives the basic layout of house in 3D and helps buyers with quick interior designs. Buyers can check and review the aesthetics and ambience of the rooms before purchase

Metaverse and Industries (3/5)

Construction and entertainment industries can use the metaverse world to create digital twins that saves time and resources in building and filmmaking, respectively

Construction



Interactive prototyping

VR helps make designing new products more interactive and intuitive as one can simulate the design without having to build a physical mockup, which saves both time and money



Real-time visualization

With AR, one can review site facades in real-world conditions, tweak materials for clients and test options in a realistic context, reducing costly design cycles and delays



Remote collaboration

VR enables architectural, engineering and construction teams to collaborate on projects in real time from anywhere in the world, reducing the need for business travel and ensuring faster approvals



BIM coordination

VR takes Building Information Modeling (BIM) a step further with robust digital twins that replicate a physical asset with incredible level of detailing. This can assist builders in the use of modular technology and shorten project lifecycles

Entertainment



Virtual production

Virtual production eliminates the need for physical production in social media and streaming sectors. Instead of shooting scenes against a green screen, filmmakers can visualize entire scenes live using screen backdrops rendered in real-time



Real-time 3D

Adoption of real-time 3D will provide improved and advanced media experience that will dominate future metaverses



Virtual concerts

Metaverse will facilitate construction of digital venues where artists can collaborate and interact. It will also drive enormous visibility for users while ensuring that artists are able to control their audiences and engagements



Integrated gamification

VR powered gaming platforms offer realistic experiences using VR headsets and 3D images leading to virtual collaborations, and integrated gamification

Recent Developments



Strategic partnership to build a digital-twin plant

In 2022, Hyundai and Unity announced partnership to build a digital twin of a major auto plant. Hyundai plans to use 'Meta-Factory' to test run a factory virtually, thus allowing plant managers to calculate plant operation efficiently and solve problems without having to physically visit the plant. This will also create a virtual platform for Hyundai customers for a more comprehensive services set



A theme park in metaverse

In 2020, Disney announced plans to build a theme park on metaverse, with the CEO affirming commitment during the 2021 Q4 earnings call



Building simulated scenarios

At Connect 2021, Meta unveiled several simulations of the metaverse, including one for media and entertainment. It uses both MR and VR to blur the lines between digital and physical spaces

Metaverse and Industries (4/5)

Financial services can use the metaverse to expand the banking services and augment trading floors; Energy sector can benefit from remote maintenance, monitoring and worker training on the metaverse

Financial Services



Metaverse wallets

Metaverse wallets are digital wallets or blockchain wallets but come with additional features. They can receive and store tokens and allow users to develop or distribute their digital assets



AR/VR banking

Financial institutions can use MR to make the banking experience more convenient and user-friendly by providing financial data visualization and budgeting through smartphone-based AR



Holographic workstation

VR enables traders to interact with more data effectively through holographic workstations, which allows them to make better informed financial decisions



Virtual assistants

Financial institutions can take their AI-powered virtual assistant services, such as chatbots and robo-advisors, to the next level by adapting VR

Energy



Remote maintenance

VR, AR, MR technologies in combination with IoT enable virtual site visits, remote assistance and maintenance



Precise localization

MR tools enhance operations by assessing and locating highly precise excavation sites



Employee training

Personnel can be trained by simulating real-life scenarios, e.g., abnormal operations, and emergency responses



Real-time monitoring

3D models in real-time can be used to immediately assist in operational documentation and asset-type analysis enabling proactive monitoring



Improving worker safety

Workers can assess hazardous sites with the help of VR and AR for robust worker safety

Recent Developments

J.P.Morgan

First investment bank to set foot in metaverse

JP Morgan entered the metaverse and purchased a large plot in Decentraland and boasts a prowling tiger as a feature in its Onyx Lounge



AR enabled branches

South Korea's Kookmin Bank has opened its customer services by offering in-person consultations in the metaverse. HSBC also established branch in the Sandbox region of the metaverse

ExxonMobil

3D AR virtual plant training

Exxon Mobil, in partnership with EON Reality, developed an immersive 3D AR virtual plant training environment taking the field training to a new level while eliminating risks connected to regular training



AR-enabled digital instructions

GE Renewable claims to have enhanced the speed of assembly for their field employees by 34% with the use of AR glasses that superimpose digital instructions

Metaverse and Industries (5/5)

Industrial firms are adopting digital twin technology at a faster speed to reduce costs and better plan their plant operations | Metaverse opens a new medium for marketing and branding firms to create influential ads

Industrials



Virtual presentations

3D rendering of mutual interaction of machines, plants, supply chains, and even whole ecosystems can be used to train, report, and analyze



Optimized asset management

Monitoring of assets by overlaying real-time data from IoT, done in an AR environment will help industries optimize assets and reduce uncertainty



Digital twin technology

Digital depiction of a physical asset that is configured to respond just like its physical counterpart would in real time



Improved scope of R&D

Simulated designs, testing and services is more cost effective, simultaneously increasing room for experimentation



AR in strategy planning

AR rendering in combination with AI allows for strategic plans to be superimposed in digital simulations to see cause and effect in real-time

Marketing



Digital walk-in stores

VR can allow users to interact with environments and objects of interest without being present in the same place



Cross-channel marketing

Metaverse consists of a mix of different platforms that include online and physical, private and public, and open and closed networks and platforms. Companies can target their audience across mediums, such as, in a 3D world or a VR platform



Brand avatars

Customers can create their own avatars in metaverse and endorse products used by them, helping promote brand awareness



Data-driven marketing

Metaverse and the gadgets used to interact with it generate a lot of data. This data can be used to promote a brand to a targeted set of audience both on and off the virtual world

Recent Developments



BMW's virtual Factory

In collaboration with Nvidia, BMW has successfully rendered and simulated 3D car models in metaverse prior to actual production. BMW created a virtual factory in late 2021



Boeing's digital twin use

With the help of digital twin, Boeing achieved a 40% improvement rate in the first-time quality of parts. They plan to digitize all its engineering and development systems and integrate these with its supply chain



IKEA uses AR to promote goods

IKEA's app, IKEA Place, allows user to try their products in any environment using an AR set. For e.g., one can virtually place a furniture in their homes to assess its fit



Brand avatars used by Gucci

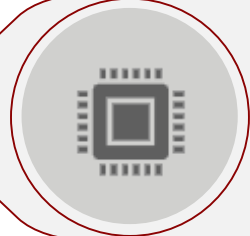
Gucci collaborated with a famous singer, Miley Cyrus, to promote their new fragrance. They used an avatar of the signer in the brand's digital version of the ad campaign

Challenges Ahead

Roadblocks in Metaverse Adoption

Roadblocks for Metaverse

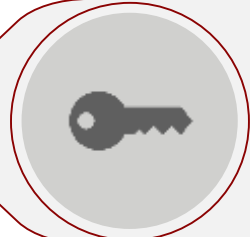
While promising, metaverse is still in the early stages of development and faces significant challenges that must be tackled first for it to realize its possibilities



Hardware

Metaverse requires costly and hefty hardware devices. It currently faces the following key challenges:

- Lack of accurate **scanning technology** for digital duplication or digital construction at an accessible cost
- Absence of **high network speeds** with low latency to digitally render the environments
- Costly and impractical **display technologies**



Privacy and data security

Without a robust cybersecurity infrastructure, **exorbitant data** collected by metaverse poses privacy and security concerns:

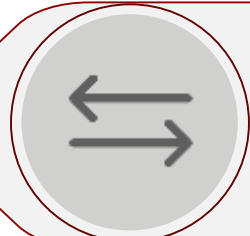
- Collected personal information, including biometrics, brainwaves and health information reduces user privacy
- With a lack of a proper legal setup protecting users, virtual identities and avatars are at high risk of being hacked, stolen, or abused
- Metaverse is **vulnerable to phishing attacks**, with multitude of malicious contracts to steal user information being reported



Law and jurisdiction

The users are vulnerable as there are **no legislations or a virtual jurisdiction** for the virtual world:

- There are problems establishing intellectual property rights due to a lack of requisite copyright laws and tracking mechanisms
- Similarly, there are no legal frameworks to prosecute unethical and amoral acts, identity thefts, and other crimes on metaverse



Platform interoperability

- Companies with varying goals and objectives have created proprietary technologies, thus creating silos in the digital world
- Because of the **lack of interoperability**, there are challenges in creating standards and protocols in a consensus manner
- Some common standards need to be implemented to allow for interoperability of different metaverses or digital worlds

Conclusion

Conclusion

While efforts to fix the gaps in infrastructure, legal, and cybersecurity aspects are underway, metaverse has the potential to completely transform the way the world operates today

- Adoption of metaverse is growing quickly as it promises massive potential for businesses, users, and the overall society
 - Metaverse promises a more immersive digital world further thinning the gap between the physical and the virtual spaces
 - Virtual worlds can open new frontiers for brands and businesses on a global scale by removing barriers of jurisdiction and borders
 - Metaverse along with AI-machine learning, IoT, web 3.0, and others will not only bring about a paradigm shift in our social interactions and business dealings, but also expand the limits of advancements possible in the field of science and technology
- Still, there are roadblocks in its path, and it must overcome technical, legal, operational, security and privacy challenges before it can have mass adoption
- While virtual worlds have existed in gaming for two decades, the recent technological advances in 5G, IoT, AI-ML, data analytics, sensors, combined with a post-pandemic spike in digital adoption, have increased its acceptance in the real world. Multiple use cases across industries/ products have emerged and are being researched upon for unparalleled experiences and new ways of doing business

Authors

Vaibhav Ranjan

Principal | Head - International Business

Nupur Mandal

Engagement Manager | Strategy and M&A Consulting

Ashish Singh

Associate | Strategy and M&A Consulting

Ritika Jain

Analyst | Strategy and M&A Consulting

Select Sources

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- Companies' websites

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