What is the Metaverse?
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The Metaverse is an increasingly prominent concept in Information Technology. But what exactly is it? Precisely which technologies are involved? And is it really that new?

A Problem of Perception

When we hear about the Metaverse in the media, it tends to be in one of two contexts. Enthusiasts conjure a world in which the next iteration of IT will revolutionise how we work and play, disrupt established economic markets, and challenge the dominance of Big Tech companies, all through the wearing of headsets that look like they have come from straight from the set of Star Trek. Conversely, this vision is just as readily shot down, its advocates ridiculed for their idealism or for not developing the required technology quickly enough.

Unpicking what exactly the Metaverse is and its feasibility is made more difficult by the fact that the very term has its roots in science fiction. It is generally agreed that it was first coined in Neal Stephenson's 1992 novel *Snow Crash*, where it denotes an alternate reality, a virtual world into which characters escape a dystopian near future. Conceiving of the Internet as an environment one can enter physically and emotionally has become a trope to readers and cinema goers through books such as William Gibson's *Neuromancer*, and movies such as *Tron*, the *Matrix* franchise, and Disney's *Ralph Breaks the Internet*. Even the fact that the word Metaverse is a portmanteau blending of Ancient Greek – 'meta' being the word for 'beyond', 'with', or 'among' – and the English 'universe' makes for a concept that feels remote from most people's understanding, scientifically niche, fantastic even.

Once we peel back the layers of hype and reaction, we see that the Metaverse is in fact more of an umbrella term for a number of different features and technologies that are already in development or, in some cases, mainstream use. The evolution of these technologies in such a way and at such a rate that they enable and accelerate each other, and are able to converge seamlessly in connected environments, is the story of how we *may* get from where we are now, as summed up by the Oxford English Dictionary's current definition of 'metaverse' -

> /ˈmɛtəvəːs/ I. Noun
>
> [Computing] a virtual-reality space in which users can interact with a computer-generated environment and other users.

- to media theorist Matthew Ball's recent book, *The Metaverse and How It Will Revolutionize Everything*, in which the Metaverse is defined as

> "A massively scaled and interoperable network of real-time rendered 3D virtual worlds that can be experienced synchronously and persistently by an effectively unlimited number of users with an individual sense of presence, and with continuity of data, such as identity, history, entitlements, objects, communications, and payments."
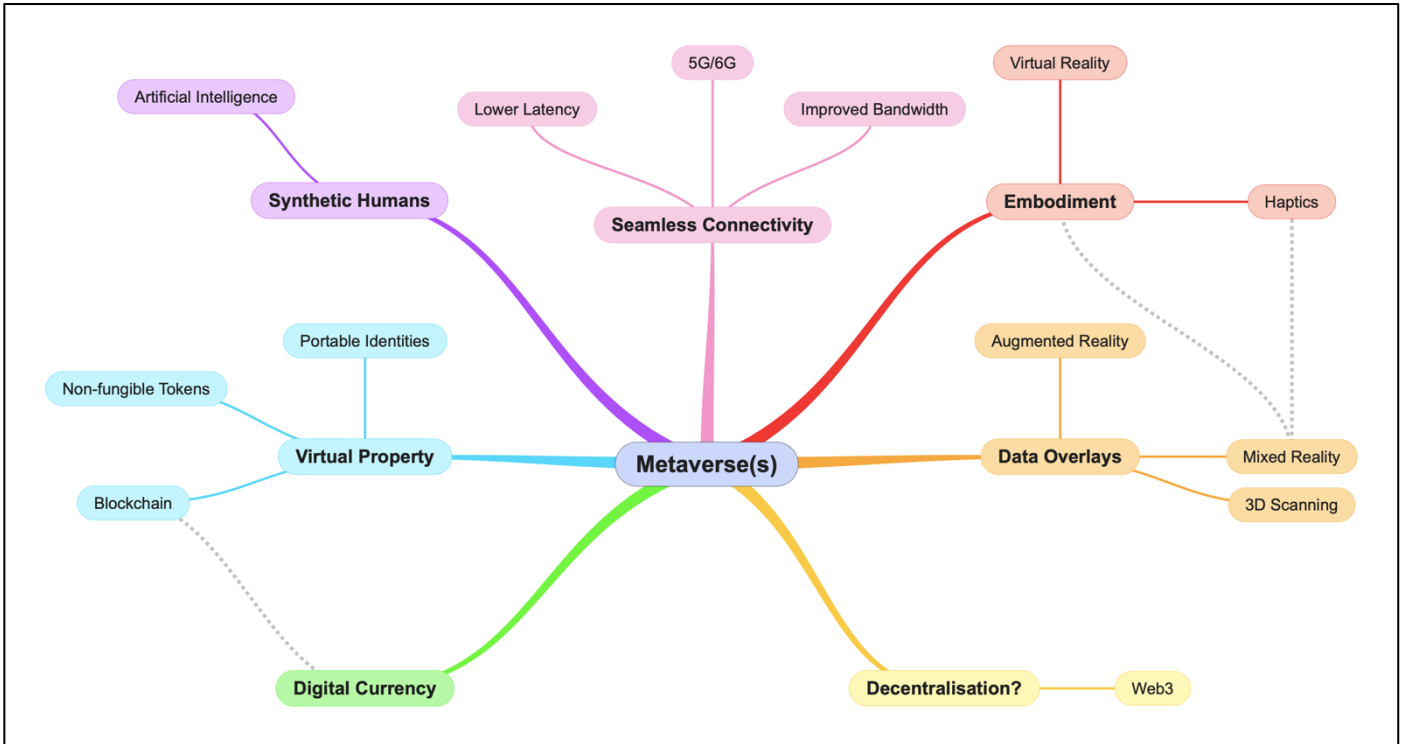
Fig. 1 Select Metaverse features and technologies (non-exhaustive)

Anyone who has interacted with a chatbot is already familiar with the concept of synthetic beings. Synthetic influencers like Lil Miquela have some human characteristics, even though they do not have a life outside of data.[1] In recent years, cryptocurrencies such as Bitcoin and Ethereum, blockchain-based technologies, and non-fungible tokens (NFTs) have all become increasingly visible in the economy. Ongoing rollout of 5G and development of 6G connectivity promise greater reliability and speed and fewer delays. Together with continuous improvements to processing power, all these may provide the infrastructure required for the most aspirational visions of the Metaverse to become reality. For some, especially those for whom the Metaverse is a chance to re-shape the Internet, the Metaverse is in fact many different metaverses, or at the very least an ecosystem in which not only finance but also software and governance are decentralised.

The Future Is Already Here

Technologies such as Augmented Reality (AR), which overlay data on our view of the offline world, are already widely in use, with mapping software and interactive games such as Pokémon Go some of the best known examples. When we use Google Maps, our view is enriched with data a static map couldn't possibly provide. 3D image capture enables us to see around corners, while data on vehicle congestion, public transport load and pedestrian footfall privileges us with information that would not otherwise be visible until we were at that location. AR glasses such as Google Glass, and Mixed Reality (MR) headsets such as Microsoft's Hololens that project 3D models and spaces into the wearer's physical environment, are already used in industries where workers need to have their hands free, including manufacturing and healthcare.

A multiplicity of Virtual Reality (VR) hardware and experiences are already available and not confined to headsets. Game controllers and smartphones make use of haptic feedback to communicate touch. The creation of digital twins that may be viewed and manipulated in VR or MR enable medical specialists to train and experiment without risk to patients. Earlier this year, the Gemini team at Great Ormond Street Hospital, led by Dr Noor Ul Owase Jeelani, separated three-year old conjoined twins with fused skulls, intertwined brains, and shared blood vessels.[2] Use of 3D modelling and VR enabled the team to perform a procedure previously thought impossible, with teams in London and Rio de Janeiro trialling techniques and practising the procedure in the same virtual room.

We're also already beginning to see the results of therapeutic use of VR in primary care. The benefits of

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[1] https://www.thecut.com/2018/05/lil-miquela-digital-avatar-instagram-influencer.html
[2] https://www.bbc.co.uk/news/technology-62378452

psychological therapy in VR don't only extend to being able to reach more people more often. Successful trials of its use to treat conditions such as agoraphobia, to combat social isolation among the elderly, and to help dementia patients recall past memories all promise that immersive environments will bring improvements to our health and wellbeing.

Extending Reality

That same ability to generate a feeling of 'presence', of being really there in the space one can see, means that VR is a powerful technology for generating empathy with others. *Clouds over Sidra*, co-produced by the United Nations, is one of several immersive experiences that allow the viewer to see life from a refugee's perspective.[3] In 2015, members of the UN General Assembly were given Google Cardboard VR headsets to experience 12 year old Sidra's life in the Za'atari Refugee Camp in Jordan. In the UK, The Alzheimer's Society has produced *A Walk Through Dementia*, a series of short VR movies that puts all of us in the shoes of someone suffering from dementia, in everyday environments such as the home, the supermarket, and on the road.[4]

Continued evolution of these technologies promises a step change in the immersive quality of our time online. Parents whose children spend time in multiplayer online games like Fortnite or Roblox may reasonably feel that virtual worlds are quite immersive enough. Likewise, people who use dating apps do not necessarily view the online aspect of their relationships as distinctly virtual or less real. Rather, technology extends reality. The quest for immersion, presence – the feeling of being really there – and co-presence – being really there together with others – is neither peculiar to the Metaverse or at all new. Reports that the Lumiere Brothers' 1896 screening of a train arriving at La Ciotat station caused chaos among cinema-goers who believed they would be obliterated speak to the power of visual depictions to draw us into a scene outside our immediate environment. The persistent recurrence of 3D versions of movies demonstrates the thrill of immersion, be this pleasurable or horrific. And it is nearly twenty years since people started owning property, earning money, socialising, falling in love, having families, immersing themselves in virtual world Second Life.

Immersive = Intense

What may well change, especially with the acceleration of haptics that engage all our senses, is the intensity of emotional engagement, and the degree to which we may feel embodied, physically present in a virtual world. Researchers have found that there is something of a feedback loop, whereby increased (co-)presence intensifies one's emotional engagement in an online space, and that increased intensity fuels a stronger feeling of (co-)presence. Positive experiences in the Metaverse may feel more positive and immediate. Equally, we may need to prepare ourselves for negative experiences that feel worse – both emotionally and physically.

Technology that allows the user to touch and be touched presents possibilities for greater intimacy, but also for abuse and assault, the sheer physicality of which we won't have seen before online. A scenario in which one can punch someone on the other side of the world may present a particular conundrum for criminal justice services used to proving bodily harm through evidence of physical proximity. Companies like Meta have already had to deploy personal space boundaries to prevent avatars coming too close to each other. News – and fake news - content may be more persuasive when delivered in our line of sight or by an avatar that engages us in conversation. YouTube videos of adults 'humorously' scaring children with unsuitable VR games signal the need to ensure that Metaverse content is age appropriate, and that people of all ages are not recklessly exposed to traumatising or triggering experiences. Since what is triggering for one person may not be so for another, monitoring and vetting in a mature Metaverse may be just as challenging as policing the offline world. Accidental physical damage may occur if people mishandle or misuse equipment – for example, the driver of a car using a VR headset intended only for passengers, or a medical practitioner injuring a patient when the data feed on their AR glasses is hacked. Insurers such as Aviva in the UK are already reporting increases in claims related to damage of household contents due to accidents when using

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[3] https://www.with.in/watch/clouds-over-sidra/
[4] https://www.awalkthroughdementia.org/

VR.[5]

Identity and Authenticity

A Metaverse which is not only more compelling and interesting, but also potentially more empowering than life offline is not something we should dismiss as frivolous. Many people have found themselves able to do things in virtual worlds that they're unable to do in the physical world. People with health conditions or impairments that prevent them from participating in sport as fully as they would like are able to become e-Sports champions. People who suffer from anxiety can find a way to socialise in a way that feels more manageable for them. In this sense, virtual worlds can already be levellers, or at least, they can alter conventional measures of success. People with limited mobility can walk, run, even fly unimpeded. And this raises the possibility that as virtual worlds become more immersive and persuasive, some of us will want to spend less and less time in the offline world. Our current concerns over young people's screen time may come to seem quite quaint as more and more of us feel embodied in digital spaces. And our current responses to digital addiction may need to evolve to provide adequate psycho-social support to those who may not want to leave the Metaverse.

Just as virtual worlds enable us to do different things, so also they give us an opportunity to look different, to be someone different. In massively multiplayer games, I can already be a World War Two infantryman, a penguin, an orc. Even on social media, I am different versions of myself. And just as most people would disapprove of someone attending an offline board meeting in their underwear, so we may find that new rules of Metaverse etiquette develop that prohibit unsuitable avatars in certain circumstances.

This then prompts the question of what authenticity might mean in the Metaverse. People who mistakenly apply cat filters to their faces on Zoom are a source of ridicule now, but we're still able to see a photo-real face behind that we can match to other identifying and authenticating information like a name, an email address.[6] Should we demand that people in immersive virtual worlds look like their offline selves? Would that requirement extend to not presenting as a different gender, or to using a wheelchair online if we do offline? The more the Metaverse is centralised, the greater the likelihood that we will have a dominant single identity, or perhaps sub-identities for different environments and activities. Conversely, if there are to be many metaverses, we will be able to have many different identities and avatars, but may not be able to transfer these or their attributes between worlds as easily.

Metaverse ←→ Meatverse Impacts

By imagining the strategic consequences of an evolved Metaverse and the steps that take us there, we can also be alert to issues in the wider would that deserve our attention. The first is digital inequality. Like many of the online games popular today, virtual worlds require large amounts of processing power and bandwidth, high speeds and low latency. Countries that already lag behind in terms of Internet infrastructure and accessibility of necessary hardware may find themselves at even less of an advantage in the Metaverse where, at least for the foreseeable future, full enfranchisement is expected to require uninterrupted, high-speed connectivity, core devices with enough processing power to render rich, even realistic environments in real time, and consumer hardware components with price points that will exclude some members of society. The rapid development of a Metaverse economy in some countries but not others may widen the digital gap. And while moving meetings into virtual worlds may have a positive impact on the environment if it means that we travel less, without sustainable energy sources the demand for greater processing power may be untenable. We've seen a signal of this in Iceland, where energy consumption for cryptocurrency mining has already exceeded supply to households.[7]

Re-framing/Reclaiming the Metaverse

None of the above really gets us any closer to answering the question of when – or even whether - the

[5] https://www.theguardian.com/technology/2022/feb/12/rising-popularity-of-vr-headsets-sparks-31-rise-in-insurance-claims

[6] https://www.theguardian.com/us-news/2021/feb/09/texas-lawyer-zoom-cat-filter-kitteniceland

[7] https://www.wired.co.uk/article/cryptocurrency-iceland-economy-bitcoin-data-centres

Metaverse(s) as envisaged by its builders will arrive. We have no way of knowing whether the recent prediction that the total addressable market (TAM) of the Metaverse will be $8 to $13 trillion per annum by 2030 is at all accurate.[8] But perhaps insisting on the Metaverse as a moment in time, as an end state, rather than an ongoing evolution, is to miss the point. The more we depict it as a futuristic farscape, the easier it is to ignore the incredible progress it has already enabled, and to put off dealing with human challenges that are already here. If we instead consider immersion, presence and co-presence as established human drives that shape technology and in turn are shaped by it, we can recognise that the Metaverse has a pre-history and a present, not just a future. Most of us are already in a version of it and can anticipate some of its future impacts. We do not have to 'wait and see.'

Resources

The following lectures by Gresham's Professor of Business, Raghavendra Rau, are of particular relevance for understanding finance in the Metaverse:

Love, Trust & Crypto - https://www.gresham.ac.uk/whats-on/trust-crypto

DeFi, Crypto, and NFTs in Business - https://www.gresham.ac.uk/whats-on/crypto-nfts

Further Reading

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Stewart, J. (2022) VR Still Stinks Because It Doesn't Smell. *Wired*. 31.07.22. https://www.wired.com/story/vr-still-stinks-because-it-doesnt-smell/

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[8] https://www.citivelocity.com/citigps/metaverse-and-money/