THE JBBA

ESSAY

OPEN ACCESS
ISSN Online: 2516-3957
ISSN Print: 2516-3949
https://doi.org/10.31585/jbba-5-2-(2)2022

NFT of NFT: Is Our Imagination the Only Limitation of the Metaverse?

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Received: 20 April 2022 **Accepted**: 03 June 2022 **Published**: 16 June 2022

Token economy and Web 3.0 have caught the attention of financial and investment institutions worldwide. Temasek, one of Singapore's major sovereign wealth funds, led a $200 million investment in Amber Group – a firm that provides liquidity and market-making services to clients throughout Asia (Lee, 2022). It has also teamed up with the Chinese tech giant Tencent and metaverse investment agency Animoca Brands to invest $200 million in Immutable, an Australian non-fungible token (NFT) start-up (Lim, 2022). As one of the world's key token economy hubs, the Singapore government and regulators adopt an encouraging, open, and inclusive approach towards innovative business models harnessing cutting-edge technology.

"Metaverse" was first mentioned in Neal Stephenson's 1992 science fiction novel *Snow Crash*. In that context, the metaverse is a virtual reality-based successor to the internet, where humans use digital avatars to explore the online world. Matthew Ball (2021) defined metaverse as a "massively scaled and interoperable network of real-time rendered 3D virtual worlds which 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."

The metaverse is persistent, live, and synchronous in the time dimension. The metaverse's time and interactions do not pause for a user after it powers off the device it uses to connect to the metaverse. Interactions between users happen in real time, and the experience is consistent for all users within a specific metaverse space. In the space dimension, the metaverse consists of virtual spaces. Metaverse users (or inhabitants) are represented in the form of digital avatars. Businesses can create a metaverse version of their physical stores (or simply a virtual space that exists only in the metaverse). Such spaces may expand themselves to accommodate more digital avatars as and when needed.

The metaverse concept means that we can simultaneously exist in one or more parallel worlds (or universes). Our cloned selves, i.e., digital avatars, can live in the metaverse, and we can switch seamlessly in and out between the virtual and the real worlds. Therefore, the "metaverse" is meta (transcendence) + verse (universe). It may be a kind of universe that transcends reality, virtual reality, and the two realms of virtual and real.

Milgram and Kishino defined "mixed reality" as an environment that blends real and virtual objects (Skarbez, Smith, & Whitton, 2021). While augmented reality is where we augment the real world with virtual content, augmented virtuality is where real-world content is in or made aware in a virtual world. Kevin Kelly, the founding editor-in-chief of *Wired* magazine, put forward an idea of a "mirror world" by expounding on mixed reality (CoinYuppie, 2022). In Kelly's notion of a mirror world, users wear glasses to see the superimposed real world with a virtual world composed of digital assets. Instead of experiencing a virtual space using our digital avatars, we can envision that the virtual space is also the physical space. Whatever happens in the virtual space is mirrored in the physical space and vice versa.

Therefore, the metaverse is not a simple fusion of technologies such as virtual reality, augmented reality, and extended reality. Instead, there will be "mirrored" virtual reality, i.e., real virtuality, augmented virtuality,

[1] Appreciation to Yan Li and Zheng Jincheng for their contribution.

extended virtuality, and various combinations which enable more novel applications.

If the metaverse does not integrate the virtual and the real worlds and if it does not realise decentralisation, it is no more than just a game infused with real-life elements or simply a contextualised game. On the other hand, a "distributed metaverse" that removes boundaries between the virtual and the real worlds, governed by a decentralised autonomous organisation (DAO), will see a paradigm shift in human–computer interaction (HCI).

Human–Computer Interaction

In the early 1900s, programmers would use punch cards (also known as Hollerith cards or IBM cards) to feed instructions, i.e., programs, into early computers (Computer Hope, 2021). Computer data and instructions were punched by hand or machine into holes and fed into a card reader. The card reader would convert the sequence of holes to digital information. Troubleshooting is exceptionally tedious if anything goes inadvertently wrong. Subsequently, the introduction of the disk operating system (DOS) and the Microsoft DOS systems significantly improved human–computer interaction (HCI) efficiency as they allowed humans to interact with the machines through typed instructions. The emergence of the graphical user interface (GUI) fundamentally changed how humans interact with computers. GUI translates complex (and low-level) computer language into visualisations. As Google's Clay Bavor (2017) pointed out, every time we removed a layer of abstraction between humans and machines, the machines became more broadly accessible, useful, and valuable to us. Now, HCI is no longer a specialised field that relies on large organisations that can afford high computation power; the technology has scaled and become practical and widely accessible on consumer computing devices (Frank, 2022). In other words, large-scale HCI is now becoming a reality.

The fusion of big data, artificial intelligence, virtual reality, cryptography, distributed technology, and other emerging technologies enables eight essential elements in the metaverse – identity, friends, incentive system, ownership, culture, diversification, immersive experience, and economic transaction system. Coupled with immersive HCI technology, we can lead an attractive on-chain lifestyle with an unprecedentedly rich interactive experience in the metaverse.

In fact, such an HCI interface blurs the boundary between "virtual" and "real." Research and development in brain neuroscience brings a possible realisation of the brain–computer interaction. This realisation further blurs the boundary between the "living" and the "non-living." Now, machines can perceive human thinking and "respond" accordingly. New value systems and new forms of collaboration will gradually emerge. We may need to redefine humans as biological beings and challenge or subvert many traditional cognitions and viewpoints in such an instance.

Ownership Rights

"Property rights are human rights" is an idea brought forward by the former British Prime Minister William Pitt in a March 1763 speech. While the idea was progressive and advanced in the early days of the capitalist revolution, it may become irrelevant in the future. As the metaverse integrates both the virtual and the real worlds in a live and synchronous manner, it requires and generates a massive amount of data. Therefore, the metaverse is only sustainable when decentralised and based primarily on user-generated content. Every inhabitant in the metaverse is a user and the creator. In other words, we are going into the realm of a "distributed metaverse." A metaverse token economy is therefore vital to incentivise creation (or co-creation), promote inclusiveness, and encourage community effort to contribute to the metaverse economy sustainably.

It is thus an opportune time to look at ownership from a broader perspective – that is, to ensure that every user in the metaverse owns equal usage and creation rights in the metaverse. Private property in the metaverse should be subordinate to the common usage right and subject to the idea that it is created for everyone in the metaverse. By ensuring the self-sovereignty of a user's data, we safeguard the permanence of metaverse assets and the interest, sustainability, and stability of the metaverse community. A metaverse without the altruistic spirit is not a true, perfect, and secure metaverse.

However, we are now experiencing the Matthew effect, where the rich get richer, and the poor get poorer. The floor price of Bored Ape is as high as 110 ethers, which is an unattainable reach for the majority of players in the metaverse. On March 17th, Yuga Lab (the parent company of BAYC) airdropped ApeCoin, the governance token for their metaverse plan, to

holders of Bored Ape NFTs with an equivalent value of about 35 ethers. This wealth-making effect is a manifestation of the active market. It begs the question of whether the metaverse is an equal, just, and a shared world, or is it a winner-takes-all society?

The metaverse must not become centralised. It must avoid oligopoly, ensure a fair distribution and ownership of digital items (e.g., assets), and incentivise participation to use and create in the metaverse. How could we achieve this goal while providing reasonable ownership protection to guard the interest of the metaverse inhabitants?

To this end, the non-fungible tokens (NFTs) provide us with the opportunity to design a new value system. One of the more popular methods now is for high-value NFT owners to lock their NFTs in smart contracts. The owners then issue ERC20 tokens representing the NFT shares to improve the liquidity of NFTs and lower the barrier of entry for ordinary users to participate. This approach is innovative. However, it ignores a critical property of NFTs – ownership determination.

In the above approach, the ERC20 tokens represent the governance rights of the NFT; the ownership remains with the NFT holder who issued the NFT.

In response to this phenomenon, we innovatively put forward the idea of "NFT-ing the NFT." A standard on "divisible NFTs" will allow hundreds of millions of future metaverse inhabitants to share ownership and collectively be the user and creator of metaverse items.

The first idea of "NFT-ing the NFT" is to NFT non-fungible tokens with a single, consistent representation. These NFTs include music, movies, virtual real estate, club membership, and so on. For example, a song's NFT can be divided into 25 NFTs, allowing 25 buyers to own the piece jointly. For an NFT representing virtual real estate, separating a 100 sqm NFT land into ten 10 sqm of NFT lands enables more residents to own a piece of land. It promotes land transfers, which are conducive to the overall metaverse economy.

Another example would be club membership. If a country club offers access to swimming pools and golf courses with a minimum service threshold and one is only interested in swimming, it is possible to buy the club's NFT with another resident interested in golf. Such ability to "aggregate demand" benefits consumers and fuels the overall economy.

The second idea of "NFT-ing the NFTs" is to NFT the unique non-fungible tokens. Popular and unique metaverse characters such as Doodles, Azuki, and Clone X are pre-designed by the designers. If we can further create divisible NFTs from these NFTs (e.g., dividing the various parts of the characters into unique NFTs), players can freely compose and combine different parts of these NFTs to create their own NFTs. This possibility makes the metaverse more interactive and playable. Dividing the NFTs effectively distributes the creator's control across the metaverse inhabitants. It decentralises ownership rights while incentivising all users to participate, create, and own their creations. This bottom-up gameplay allows users to enjoy the metaverse at an affordable price. The composability will be welcomed by the market. In return, it will bring awareness to the true usage and development of NFTs. Such awareness drives further creation of new NFTs, which further invite community contribution, fuelling the ecosystem to be self-sustainable.

Governance

A distributed metaverse must have a sound governance structure that takes care of its user's interests to ensure stability, security, and sustainability of the metaverse economy. The governance should be baked into the system, transparent, and based on the community's collective decision. The decentralised autonomous organisation (DAO) is an on-chain governance structure based on community consensus. It is exclusively online and operates based on smart contracts on the blockchain. The DAO allows members to work together to achieve a joint mission without trusting each other; the rules are coded in a smart contract. Whether it is on a change to the DAO's mission, governance rules, or the token economy model, decisions are made based on community consensus.

Conclusion

Metaverse is not a new concept. In the 1990s, Sainsbury's had a shopping demo using virtual reality. However, the metaverse is a parallel virtual world that is persistent, live, and synchronous. While virtual reality, augmented reality, or mixed reality is essential, open blockchains that enable secure and verifiable NFT transaction settlement will fuel the metaverse economy. The technology will motivate users to co-create and facilitate verifiable ownership of their digital assets. On another note, virtual reality adoption is low.

In 2020, global virtual and augmented reality headset shipments were at 5.5 million units, and the main factor hindering adoption is content offerings, followed by user experience (Gilbert). We may see exponential growth in adoption only with advances in more immersive human–computer interaction experience (or even brain–computer interaction). Overcoming the barrier means having a truly distributed, decentralised, and inclusive metaverse. However, ethics, governance, and ways to incentivise peer creations are the keys to sustainable social scalability. It is thus essential to have a sound decentralised governance structure such as the DAO and an effective token economy model that distributes ownership control and encourages user-generated content in the metaverse.

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