Policy, Ethical, Social, and Environmental Considerations of Web3 and the Metaverse

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This article analyzes national, political, global geopolitical, ethical, social, and environmental issues associated with Web3 and the metaverse. It also introduces the feature articles, columns, and departments that appear in this issue.

IT Professional's Editor-in-Chief, Irena Bojanova, kindly invited me to write this From the Editors (FTE) article on a current topic. I have decided to focus on Web3 and the metaverse, which are viewed by many analysts as the next big things. In the previous issue's IT Economics department article, I discussed these concepts in the context of organizations' brand and product strategies.[1] The effects of Web3 and the metaverse, however, go beyond organizations. In this article, I specifically focus on the national, political, global geopolitical, ethical, social, and environmental issues raised by the Web3 and metaverse.

WEB3 AND THE METAVERSE, AND THEIR CURRENT STATUS

First, what exactly are Web3 and the metaverse? And are they already here? As I have briefly explained in the previous issue, Web3 succeeds Web 1.0 and Web 2.0 and is the decentralized internet and the next phase of the Internet's evolution. While centralized social networks have dominated Web 2.0, Web3 is expected to foster more open environments with decentralized technologies based on blockchain, such as decentralized finance (DeFi), cryptocurrencies, and nonfungible tokens (NFTs).

Web3 is already finding growing numbers of users and applications in diverse areas. One estimate suggested that Web3 will have 1 billion users by 2027.[2] Some current Web3 applications include DeFi, NFTs, play-to-earn (P2E) games, and decentralized autonomous organizations (DAOs).[3] DeFi protocols are run by smart contracts to connect lenders and borrowers, which eliminate intermediaries, can increase yields and returns. In 2021, over $250 billion worth of digital assets were assigned to DeFi protocols (https://tinyurl.com/ku5m4p59).

Thanks to blockchain, Web3, and smart contracts, many *content creators*, such as artists and musicians are directly selling their works to global consumers without relying on labels, streaming services, or other intermediaries.[3] These technologies have allowed artists to control their pricing, earn royalties in secondary, tertiary, and higher order market sales, and connect with their community (https://fortune.com/2022/04/27/music-nfts-web3-snoop-dogg-crypto-artists/). For instance, many African artists are minting their arts' NFTs and making them available to consumers worldwide (https://tinyurl.com/cxmbhd56). Thus, these technologies have created a global market for products and services.

Regarding the use of Web3 in the P2E gaming industry, according to a report published by Lithuania-based data acquisition and analysis company DappRadar, which tracks decentralized applications (dapps) across multiple blockchains, and the Blockchain Game Alliance, which promotes blockchain in the gaming industry, blockchain-based P2E games, such as Axie Infinity, Splinterlands, Crazy Defense Heroes, Pegaxy, Arc8, and Aavegotchi led the dApps sector in the first quarter (Q1) of 2022 (https://tinyurl.com/2p9de3rm). As of February 2022, the biggest P2E game Axie Infinity had more than 2 million daily active users (https://tinyurl.com/2yjtdb9c).

Among the most transformative applications of Web3 are DAOs, which are self-managed organizations that are run by blockchain-based smart contracts and have their own bylaws and rules of procedure. According to DAO stats platform DeepDAO, as of April 1, 2022, there were 4157 DAOs with a market capitalization of $24.8 billion (https://twitter.com/AragonProject/status/1509912050201468930). An example of a DAO is PleasrDAO, which was formed to bid on works created by high-profile digital artists. Among its purchased assets, the group bought an NFT affiliated with the

whistleblower and activist Edward Snowden for $5.4 million. PleasrDAO also bought the sole copy of American hip hop group Wu-Tang Clan's Once Upon a Time in Shaolin album from the U.S. government for $4 million. The album was originally purchased by pharmaceutical executive and hedge fund manager Martin Shkreli. When Shkreli was convicted of securities fraud in 2018, he was ordered to forfeit more than $7.36 million as part of his criminal sentence and U.S. marshals had seized the album along with other assets (https://tinyurl.com/3kfwwy9c). A system of token-based on-chain voting will decide how the assets will be managed. For instance, the DAO's members can vote to exhibit them in a show or create NFTs and sell them to the public.[4]

While Web3 focuses on ownership and control issues on the Internet, the metaverse is about the user experience aspect (https://tinyurl.com/bdz8nhb7). The metaverse can be viewed as a shared, 3-D virtual reality environment featuring avatars, digital objects, and functioning economies.[5] More generally, the metaverse is an online space with an immersive environment that creates an illusionary experience, and the user feels part of the environment (https://tinyurl.com/2p983csf).

Just like the case of Web3, users and applications of the metaverse are also rapidly growing and it has already become an integral part of the lives of a large number of people. For instance, in February 2022, the gaming platform Roblox in which independent developers create games popular with children and young adults, had 55.1 million daily active users, who spent 3.8 billion hours on the platform (https://tinyurl.com/yxtt97nj). While the most well-known metaverses currently are in the gaming sector, technology companies are developing metaverses focusing on diverse areas, such as fashion, virtual concerts, and performances. For instance, according to management consulting firm McKinsey, in 2021, users spent $110 billion to buy digital goods in the metaverse and about 30% of that amount went on "virtual fashion" (https://tinyurl.com/a923zyp3).

According to a survey conducted by information technology research and consultancy company Gartner, by 2026, 25% of the world's population will spend at least one hour a day in the metaverse for activities, such as working, shopping, attending schools, socializing, or consuming entertainment (https://tinyurl.com/mttyy3wn). The global bank, Citi, estimates that by 2030 there will be up to five billion metaverse users and the metaverse economy will reach between $8 trillion to $13 trillion (https://tinyurl.com/5dnt2y5p).

NATIONAL POLITICAL AND GLOBAL GEOPOLITICAL ISSUES

Web3 and the metaverse are being debated as a major national policy issue in some countries. In April 2022, the Japanese Government's NFT task force recommended that the government should create a position for a Web3 minister, who would handle Web3-related issues. The recommendation was that the Web3 minister should work closely with the NFT task force as a part of the leadership team. One of the envisioned roles of the Web3 minister is to reform regulations and tax-related hurdles in NFTs and related areas (https://tinyurl.com/25xmzx6v).

Moving to a different issue, a key policy concern for nations is that Web3 can also create challenges for modern states in a variety of tasks they perform, such as enforcing laws and collecting tax from sales. For instance, website takedown notices cannot be issued. There are no corporate CEOs, who can be approached to enforce regulations.[6] Likewise, if the metaverse replaces the current online market, regulators may face challenges to track those transactions and tax them.[7]

At the international level, Web3 can also potentially change the relative power of nations and hence the current geopolitical dynamics. For instance, Web3 is more likely to benefit nations that value democracy and personal privacy. It is likely to force authoritarian states, such as China to address their weaknesses. If these nations fail to make adaptations to meet the requirements of Web3, they may fall behind. Some nations can no longer realize the advantages that are currently offered by Web 2.0. For instance, the Web's current framework has allowed countries, such as China to gather large amount of data to power their artificial intelligence systems for political and military activities. Due to Web3's decentralization and personal data control, authoritarian regimes, such as China, may find to harder to maintain data dominance.[6]

There have also been concerns that enemy states may engage in a new kind of cyberwarfare using the metaverse to attack each other. For instance, adversary states may target biometric data, financial information, and other digital assets. Some have also pointed to the possibility of the emergence of geopolitical dimensions in the metaverse, such as the emergence of western and Chinese metaverses.[8] Since some nations and nationalistic hackers have shown a tendency to engage in cyberwars against nations that are viewed as adversaries,[9] the metaverse has the potential to take the cyberwarfare to the next level.

ETHICAL, SOCIAL, AND ENVIRONMENTAL ISSUES

There are also a broad range of ethical, social, and environmental issues that can be anticipated in the development of Web3 and the metaverse. For instance, its proponents have touted the metaverse as a potential solution to address ethical issues facing the gaming industry. A major criticism that has been made against online games in the Web 2.0 era is that they have been run as sweatshops (https://tinyurl.com/ywexf4zv). However, games in the metaverse have their own ethical issues. Concerns have been raised regarding the exploitation of young game developers and game players. For instance, Roblox is reported to pay a game developer only 28.1% of the revenues associated with the game (https://tinyurl.com/2p9dsr7k).

On the positive side, the metaverses' P2E games are reported to help many people in developing economies earn their living. For instance, the crypto metaverse P2E game Axie Infinity had 2.5 million daily active users in February 2022. According to SimilarWeb, which provides traffic-monitoring data, four of the top five countries in terms of the number of Axie Infinity players were developing countries: Philippines, Venezuela, Argentina, and Brazil (https://www.similarweb.com/website/axieinfinity.com/#geography). Players can earn Axie's native token Smooth Love Potion (SLP), which is an Ethereum-based ERC-20 token. In July 2021, the average Axie player was reported to earn 4500 SLP a month (https://tinyurl.com/534zw6dk) and the SLP had the all-time high price of SLP was $0.399727 in that month (https://www.coingecko.com/en/coins/smooth-love-potion). This translated to a monthly income of $1799, which was significantly higher than an average Filipino worker.

However, a negative aspect of such games is that cryptocurrencies, such as SLP are highly volatile. For instance, on April 3, 2022, the value of 1 SLP was 94.2% lower than in July 2021. Naavik's Blockchain Games report of November 2021 reported that Axie Infinity players' earnings were below the minimum wage in the Philippines (https://tinyurl.com/fuzusnje).

A further negative component of many P2E games is that players that are unable to buy NFTs need to rent them from token-wealthy individuals, and such rents are extremely high. For instance, Axie Infinity has what is referred to as "scholarship." In this scheme players that own AXS tokens, which are Ethereum tokens that powers Axie Infinity, but do not have enough time to play the game (known as managers) lend out their tokens to others (known as scholars) who want to play the game but lack adequate financial resources to buy

the tokens. According to analytics firm Naavik, a scholar gets only 60%–70% of the earnings and the rest goes to the manager (https://tinyurl.com/bde2jnxx). This practice in the digital world is akin to sharecropping since the NFT owners take a large share of players' earnings.[10]

Western technology companies' use of unfair and deceptive practices to collect data needed to build Web3 and metaverse applications have also been controversial. These companies' data collection efforts have mainly focused on countries where people live in poverty and thus it is cheaper and easier to collect data. There are also few legal protections in these countries. To take an example, Berlin, Germany-based Crypto startup Worldcoin wants to develop itself as Web3's preferred identity solution. It uses metallic orbs to scan people's irises and other biometric data, such as faces and bodies. People who agree to be scanned were offered a voucher for $20 worth of Worldcoin tokens (https://tinyurl.com/4kttsa8m). However, the tokens are only theoretical money that existed only on paper. The launch date of Worldcoin tokens was delayed several times and as of April 2022, the currency had not been launched. As of March 2022, data were collected from 24 countries, of which 14 were developing nations.

It is argued that the operations of developed world-based technology companies competing for economic advantage in the cyberspace is akin to the way the European colonial powers competed to secure allegiance and extract resources from the colonies.[11] The above-mentioned discussion makes it clear that there are even more serious data colonialism issues to consider in the context of Web3. It can also be argued that Web3 is even more harmful than other forms of data colonialism because blockchain's decentralization means that there is no accountability for wrongdoing toward the victim when things go wrong.

Since blockchain is a key building block of Web 3.0, and the metaverse, it is also worth noting that blockchain networks' energy consumption has been a hot and controversial issue. An estimate by the website tracking the sustainability of cryptocurrencies Digiconomist suggested that Ethereum's annual electricity consumption was 112.44 TWH based on annualized data as of March 23, 2022 (https://digiconomist.net/ethereum-energy-consumption/). Likewise, artist and creative technologist Memo Akten's analysis of 8000 transactions from the NFT platform SuperRare *suggested that an average NFT consumes 340 KWH of energy* (https://tinyurl.com/ym78aj5h). As a point of comparison, this amount of energy is similar to that consumed by an individual in South Sudan in 7.7 years or by an individual in high income countries in

ALSO IN THIS ISSUE

There are four feature articles and four column/department articles in this issue.

FEATURES

In the article, "Coping With Technological Shifts: Organizational Actions to Adapt IT Infrastructures," Bourdeau *et al.* have identified 20 organizational actions that can help organizations build agility, deal effectively with technological shifts, and adapt their Information technology infrastructures (ITI). The authors have grouped these actions into three broad categories.

The second article, "Low-Latency Intrusion Detection Using a Deep Neural Network" by Ahmad *et al.,* proposes a lightweight intrusion detection system (IDS) that can potentially improve efficiency and reduce cyberattack detection time. The authors report that their proposed technique can improve the deep neural network-based IDS system's execution time and performance. The authors also argue that compared to other techniques, their approach results in low latency for intrusion detection

In the third article, "A Novel Framework for Smart Systems Using Blockchain-Enabled Internet of Things," Badshah *et al.* propose blockchain-enabled IoT (BIoT) framework to provide data reliability, privacy, and scalability in IoT ecosystems. The proposed solution incorporates blockchain as an intermediary layer in the IoT ecosystem. The authors also discuss several BIoT case studies to illustrate their framework.

In the final article, "Trusted Platform Module-Based Privacy in the Public Cloud: Challenges and Future Perspective," Nandan Jha *et al.* look at security threats in cloud applications and analyze various software- and hardware-based solutions to deal with such threats. The authors argue that software-based solutions are insufficient to secure the cloud environment. While hardware-based solutions utilizing the trusted platform module (TPM) perform better, implement such solutions face various challenges in a public cloud environment. The authors propose a TPM-software guard extension (SGX)-based approach that relies on software TPM and SGX, which can provide the same level of security as the hardware-based approach.

COLUMNS AND DEPARTMENTS

The column/department articles in this issue explore diverse topics such as C-suite management struggles and failures, origin, functioning, and development of deep learning, startups' prototyping technology adoption, and supply chain cyberattacks. In "'What' Vs 'How' C-Suite Management Struggles," Andriole takes a look at the many realities of management's struggles and failures. The article argues that most managers *react* to markets, competition, legislation, and crises rather than being proactive. The author emphasizes the importance of creative strategizing, critical thinking, and decision-making based on data, experience, and best practices in order to be proactive.

In "Masterminds of Deep Learning," Strawn highlights the origin and functioning of artificial neural networks (ANNs), which are today referred to as deep learning algorithms, and delves into the period of declining interest and investment in this technology or the ANN winter. The author then discusses the accomplishments of three of the scientists—Geoffrey Hinton, Yann LeCun, and Joshua Bengio —who played major roles in bringing the current surge in interest, investment, innovation, and actions related to deep learning.

In "Strategic Prototyping Technology Adoption in Startups: Framework, Challenges, and Opportunities," Gupta *et al.* analyze factors that affect decisions regarding the types of prototyping technology that startups can use in order to develop, and validate products and business models. Based on their experiences in various industries, the authors also present opportunities for startups to improve their prototype adoption process.

Finally, in "Economics of Supply Chain Cyberattacks," Kshetri argues that supply chain cyberattacks are a major problem that have substantial costs to businesses and national economies. This article gives an overview of the sources and nature of such attacks and discusses legislative and regulatory developments that are taking place to address risks associated with such attacks.
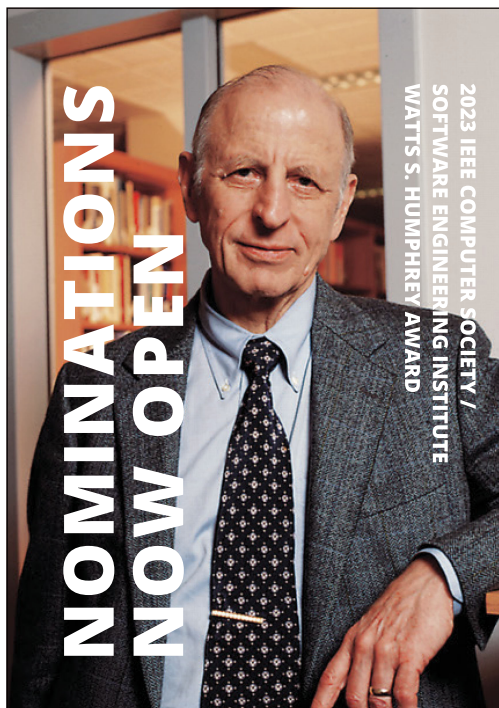
13.7 days (https://data.worldbank.org/indicator/EG.USE.ELEC.KH.PC). Whether or not high energy consumption of blockchain applications is viewed as justifiable depends on how much we value the functions and services blockchain provides in the Web 3.0, and the metaverse applications.

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