The Metaverse as the Digital Leviathan: A Case Study of Bit.Country

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As Bitcoin continued to make headlines in 2021, additional digital assets such as non-fungible tokens brought more users into the blockchain ecosystem. As more individuals and entities took a closer look at the use cases for blockchain technology, the term metaverse began to emerge across news outlets and social media platforms. With Mark Zuckerberg, the Chief Executive Officer of Facebook, announcing that the organization would become a metaverse company and change the organization's name to Meta, this announcement came with some criticism in that the Meta metaverse would be centralized. In this case study, the current state of nation-states was viewed through the lens of Hobbes' The Leviathan to assess whether decentralized metaverses will transition to a Digital Leviathan using Bit.Country - a metaverse within the Polkadot blockchain ecosystem. The case study was conducted through interviews and uncovered that the quadruple bottom line implemented in conventional business could be transferrable to a digital world built on various blockchains, non-fungible tokens, and governance in a Digital Leviathan governed by the people.

Keywords: metaverse, non-fungible tokens, virtual reality, virtual worlds, augmented reality, cryptocurrencies, blockchain technology, governance, social impact, decentralization, web3

INTRODUCTION

Blockchain is a technology that acts as a ledger that is decentralized from any controlling central interest. The data - or transactions - are recorded in blocks connected to form an information chain. As this technology continues to grow in adoption, individuals worldwide are collaborating to develop new use cases and solutions due to the decentralized nature of the technology. In late 2020 into 2021, the re-introduction of non-fungible tokens (NFTs) and digital ownership began to be discussed in both industry and academia. To better understand the difference between fungible and non-fungible assets, fungible assets are equivalent goods that can be traded interchangeably and do not hold individual value but instead have a measurable worth based on their supply, like money. Non-fungible assets, on the other hand, consist of unique units which cannot be substituted, like houses or physical land (Dowling, 2021; Goanta, 2020).

Today, these assets are protected by centralized authorities, like the government or an institution, by issuing documents such as birth certificates, licenses, or a passport.

Non-fungible tokens are distinguishable and divisible by an individual NFT project, similar to how shares in a company represent ownership in the business. NFTs, therefore, can be considered crypto-collectibles that are unique and verifiable through the use of smart contracts on the blockchain - protocols that facilitate, verify, and enforce the performance of a contract, making a contractual clause unnecessary. For instance, CryptoKitties is one of the earlier NFT decentralized applications (dApps) built on the Ethereum network. The CryptoKitties dApp allowed users to breed unique virtual cats, resulting in the ownership of an NFT token that other users could buy on the CryptoKitties platform (Serada et al., 2021).

In another early NFT project on the Ethereum blockchain, the CryptoPunk project was composed of 10,000 procedurally generated NTFs that were given away for free in 2017. As NFT archeologists began to note the project's significance, demand grew for these pixelated portraits, resulting in nine CyptoPunks being sold for under $17 million USD at a Christie's auction in May of 2021 (Matney, 2021). A few months later, Budweiser, a subsidiary of Anheuser-Busch InBev, purchased a fan art NFT along with the beer.eth domain - a Web3 domain - for $120,000 USD (Wright, 2021). As other NFT projects were also auctioned off for millions of dollars (e.g., The Bored Ape Yacht Club and Gary Vaynerchuk's Vee Friends), it can be argued that NFTs were not a fad and, consequently, may potentially reach mainstream adoption in the near future.

As more NFT projects began to emerge, teams uncovered additional use cases for NFTs. Projects such as Decentraland, Somnium Space, Cryptovoxels, and The Sandbox started to introduce the concept of procuring digital land that could provide several uses for owners. Consequently, there was an 1132% increase in the number of unique landowners, with over 24,500 individuals owning land across the four pioneer metaverses by the end of 2021 (Republic Realm, 2021). In what researchers call the Internet of Value (IoV), blockchain ecosystems and the NFTs within these ecosystems may unlock equity and wealth to a new social class of individuals worldwide in an automated and secure manner (Goanta, 2020; Skinner, 2016). According to Statistica (2021), as of January of 2020, the global social media rate stood at 49% or 3.8 billion people, with a forecasted growth of 4.41 billion by 2025. As of 2022, social media platforms, such as Meta - formerly Facebook - and Twitter, remain centralized. In addition to this, many content contributors are not rewarded for their contributions. As such, will users in this Web 2.0 environment see an opportunity in a Web3 environment? Let us enter into the metaverse.

LITERATURE REVIEW

What Is the Metaverse?

It is argued that the term metaverse was introduced by Stephenson (1993) in the science fiction novel *Snow Crash,* where the story refers to personas created by computer programmers. The term was then adopted by *Second Life* founder Philip Rosendale when he launched the virtual world in 2003 (Suzuki et al., 2020). Finally, the metaverse reached mainstream audiences when Cline's (2012) book, *Ready Player One*, was made into a major motion picture by Stephen Spielberg. In the story, humans live in a not-so-distant future, escape their desolated physical world, and enter into a metaverse called OASIS. When OASIS creator, James Halliday, dies without leaving an heir, he announced that he would leave behind three keys hidden in OASIS that would grant access to his fortune and total control over the company he left behind. The protagonist of the story, Wade Watts, manages to find the first key and begins an adventure through the OASIS metaverse with many dangers along the way.

As with other science fiction movies based in the future, fans of movies look to make fiction a reality. With many teams using blockchain technology to create their own OASIS metaverse in a number of different blockchain ecosystems, the Web3 movement has begun. The metaverse concept in relation to blockchain carries different meanings depending upon how it is framed. For example, a purely technological perspective will focus on the architecture, whereas business theory might look at revenue generation by using virtual goods and services through games monetized through NFTs (Kiong, 2021). Other researchers may view the metaverse as a place where individuals can learn and socialize with their

peers. In another perspective of the metaverse, Yang (2020) utilizes the various dimensions depicted in Nolan's film *Interstellar* as an analogy for a platform that enables human imagination to build upon itself while, at the same time, facilitating community building through collaboration between individuals located anywhere in real-time.

At the current state, the metaverse can be viewed as overlapping the previously noted definitions. During the COVID-19 Pandemic, which officially began in 2020, many individuals worldwide were out of work due to government-mandated shutdowns. During the same timeframe, it is interesting to note that one project within the Ethereum ecosystem, Axie Infinity, gained popularity worldwide, namely in the Philippines with a play-to-earn gameplay model. Through NFTs, players collected the in-game cryptocurrency Smooth Love Potion (SLP), which were exchanged for the player's local fiat currency. Therefore, the Axie Infinity project can be considered a metaverse as users played on land - in the form of an NFT - owned by other individuals.

Interestingly, in October of 2021, Axie Infinity became the most traded NFT collection, with a reported Q3 performance of over $30 billion USD (Herrera, 2021). As outlined in Table 1, Ante (2021) tracked 14 NFT projects built on the Ethereum blockchain from the project's launch date to May 19, 2021. Of these 14 NFT projects, five are metaverse-based projects - Axie Infinity, Decentraland, Cryptovoxels, Somnium Space, and The Sandbox.

TABLE 1
**NFT SALES PER DAY AND DAILY SALES VOLUME IN MILLIONS ON THE ETHEREUM BLOCKCHAIN**

NFT Market	Days recorded	NFT Sales			NFT volume			NFT wallets		
		Mean	SD	Max	Mean	SD	Max	Mean	SD	Max
CryptoPunks	1,428	9.4	24.4	329	0.236	1.139	21.200	10.0	21.4	234
Decentraland	1,329	93.6	399.0	6,573	0.045	0.156	2.872	36.6	76.7	1,406
CryptoKitties	1,276	2250.8	4,270.4	52,451	0.034	0.165	2.436	442.5	1,078.7	12,867
Axie Infinity	1,190	276.0	285.8	2,269	0.017	0.043	0.340	135.9	183.9	1,092
SuperRare	1,144	19.3	25.6	152	0.068	0.234	2.692	27.1	35.0	202
CeyptoVoxels	1,080	8.1	12.6	101	0.009	0.029	0.409	7.2	7.1	49
MakersPlace	1,046	15.4	22.6	189	0.019	0.079	1.303	18.1	27.0	227
Gods Unchained	1,045	543.9	1,645.9	15,868	0.021	0.511	16.500	74.0	134.7	767
Sorare	686	480.9	763.3	6,324	0.085	0.199	1.971	318.3	513.6	2,725
Somnium Space	618	5.8	24.3	406	0.016	0.051	0.585	4.4	6.9	104
The Sandbox	535	167.6	910.4	13,947	0.039	0.170	3.457	32.7	77.7	875
Art Blocks	174	283.3	347.7	1,858	0.151	0.191	0.988	147.6	190.0	1,530
Hashmasks	112	226.7	698.3	5,297	0.572	1.031	6.755	131.6	201.0	1,390
Meebits	17	753.1	2,336.4	9,770	8.181	20.500	85.200	368.8	740.9	1,137
Others	1,238	1,010.8	1,006.8	24,383	0.076	0.185	3.478	n/a	n/a	n/a
All	1,428	4,002.6	4,456.8	52,457	0.702	3.397	102.000	1,222.6	970.5	12,874

Adapted from L. Ante, 2021, Blockchain Research Lab Working Paper Series, 22, P.

Enablers of the Metaverse

The metaverse emerged as a byproduct of technological advancements such as electricity and the mobile internet, which laid the groundwork for innovative systems that build upon one another in a somewhat unpredictable fashion. Therefore, it may be plausible to view the metaverse as an emergent property. However, an emergent property appears at higher levels of a system and cannot be easily predicted based on the properties of the lower-level components (Ball, 2021). For example, in biological terms, the ability of deoxyribonucleic acid (DNA) to self-replicate, which is a higher-order and complex mechanism, cannot be predicted from its chemical composition of carbons, oxygen, hydrogen, phosphate, and nitrogen bases separately. As such, this is why an examination of lower-level components, such as electricity and mobile internet, makes it difficult to predict how the metaverse, an emergent property, came to be. However, it is important to mention that there are working theories on how the metaverse came to be. Matthew Ball, a pioneering metaverse theorist, offers a compelling explanation of how the metaverse emerged. Ball (2021) breaks down the emergence of the metaverse into eight core enablers.

FIGURE 1
BALL'S SEVEN ENABLERS OF THE METAVERSE
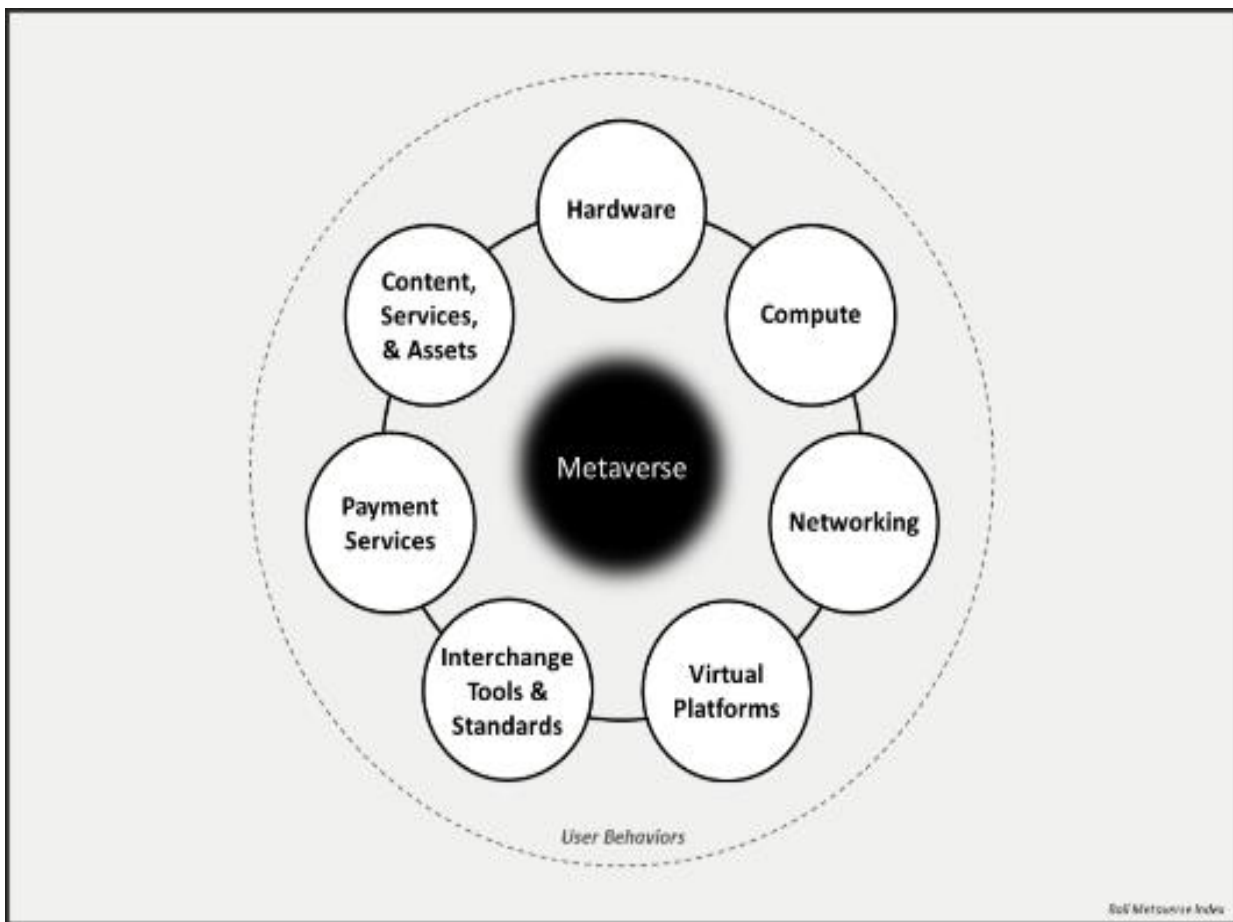
Ball, 2021

The first core enabler is hardware. Indeed, users must access, interact with, and develop in the metaverse using physical technologies, such as consumer-facing hardware (i.e., mobile phones and virtual reality equipment or headsets). The second core component - networking - considers bandwidth, latency, and reliability, which are constraints when designing metaverse products and services. Third, for the compute consideration, enabling the supply of computing power to support the metaverse is central to

blockchain technologies and their role in running programs in the virtual world. The fourth core enabler - virtual platforms - are immersive digital simulations, environments, and worlds where one can partake in various experiences, from attending a class to engaging in economic activity.

The fifth core enabler is interchangeable tools and standards (e.g., standards for interoperability), which enable the creation, operation, and ongoing improvements to the metaverse. The sixth enabler - payments - supports digital payment processes that drive financial services in the metaverse. Naturally, then, the seventh enabler relates to metaverse content, services, and assets, which allow for the financial management of digital assets to be connected to user data and identity. Lastly, the eighth core enabler is user behaviors, which, if history is any indication, serve as a guide for mapping the evolution of socio-cultural and economic trajectories.

Layers of the Metaverse

Another explanation for how the metaverse emerged can be found within Jon Radoff's (2021) commentary on the metaverse value chain. Radoff, another pioneer of the metaverse, focuses his efforts on the intersection of the Internet, entertainment, and social communities. Radoff outlined the seven layers of the metaverse that, much like Ball's (2021) commentary, provided a theory for how the metaverse came to be.

FIGURE 2
THE SEVEN LAYERS OF THE METAVERSE
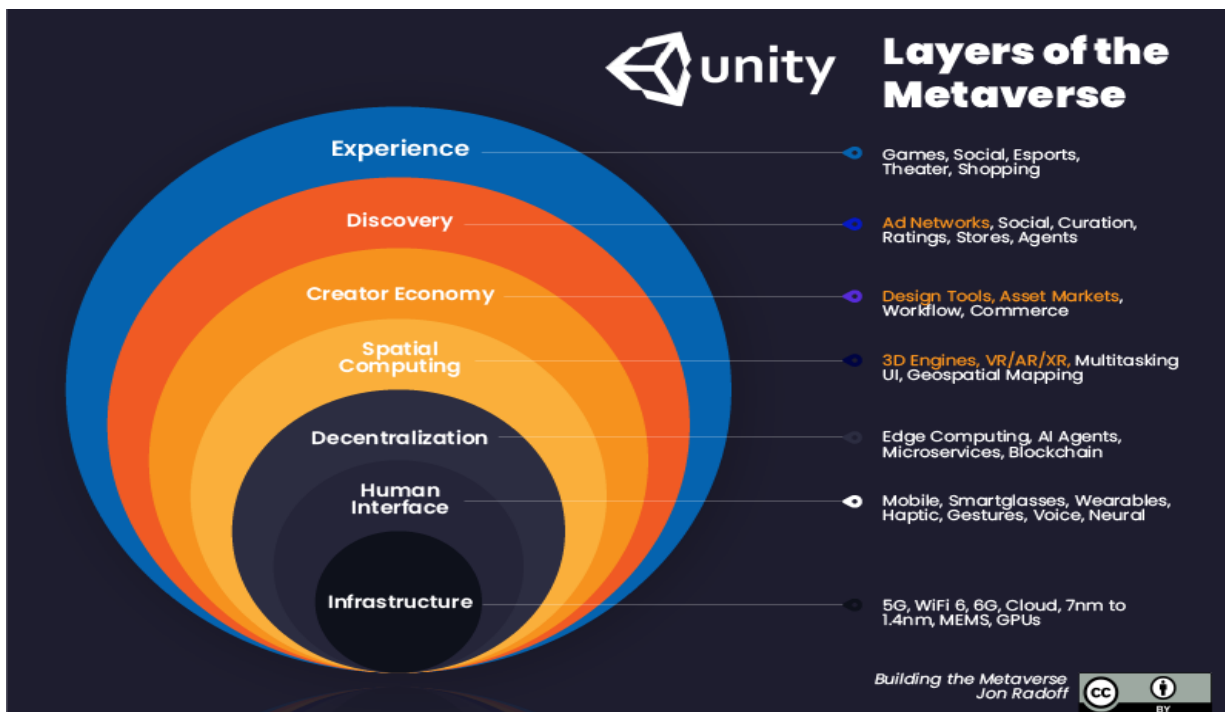
Radoff, 2021

Radoff's (2021) first layer relates to the experiences that users can engage in within the metaverse. Virtual platforms within the metaverse provide users with such an abundance of experiences. The second layer - the discovery layer - pertains to how users uncover novel experiences within the metaverse, such as clicking on ads, search engine results, or community-driven content shared through word-of-mouth. The third layer, known as the creator economy, highlights the increasing potential for ideas to become a reality in the metaverse. As solutions providers in the Web 2.0 (Web2) world begin to enter into the metaverse,

creators may be offered a vast suite of tools, templates, and marketplaces that will enable them to share their products and content with others.

As the creator economy begins to grow in the metaverse, the fourth layer - spatial computing - will redefine the boundaries set by the physical and the virtual worlds. The key features of spatial computing include three-dimensional (3D) engines that display geometry and animation, data integration from devices and biometrics from people, and next-generation user interfaces to support concurrent information streams. The fifth layer - decentralization - pertains to how interoperability promotes experimentation and growth within the metaverse by leveraging blockchain, edge computing, and artificial intelligence (AI) technologies. The decentralization layer may be the primary component differentiating blockchain-based metaverses from centralized offerings, such as the metaverse developed by Meta.

Although AI is mentioned in the fifth layer, the centralization of AI and data privacy concerns have been a topic of discussion among AI, Blockchain, and Computer Science researchers (Fazi, 2022; Vikhyath et al., 2021). As new sources of information could be collected from large technology organizations, will centralized metaverses pose a greater risk from a cybersecurity perspective? In January of 2022, Meta announced that scientists within the organization were building the world's most powerful AI-specific supercomputer to support the organization's metaverse development efforts. Referred to as the AI Research SuperCluster (RSC), Meta's supercomputer consists of 16,000 graphics processing units (GPUs) (Sparkes, 2022). Additionally, a portion of the project was included in the $50 million USD investment budget by Meta for the organization's Extended Reality (XR) Programs and Research Fund to ensure data privacy and safety within the metaverse (Dang, 2021).

The sixth layer relates to how the human interface is driving the increased accessibility to the metaverse. With the inclusion of wearable and headsets that are used to augment real-life environments, a number of innovative developments may emerge out of the sixth layer. Finally, the seventh layer - infrastructure - includes the technology enabling devices that connect users with content in the metaverse (Radoff, 2021). Given the amount of computing power required to power various metaverses, scalability considerations should be continuously reviewed as more users enter into the metaverse.

The Future State Nation-State

Authors have cited that individuals may continue to move to the metaverse due to various situations in a number of countries around the world (Crawford, 2018; Smith & Burrows, 2021). Referred to nation-states, Hobbes (1909) was one of the first to publish content centered around the topic in the 17th century with *The Leviathan*. Written during political upheavals, which included civil war, while the literature may seem to be centered around politics, a closer look will uncover that the message is centered around the philosophy of history and the future of mankind. Hobbes' work continues to generate interest among contemporary scholars for a number of reasons (Johnston, 2021; Oakeshott, 2017). Through his forward-thinking ways in which he conceived of society, his thoughts on power and government, and his methodology of self-sovereignty, *The Leviathan* continues to be referenced in philosophical, political, and social works.

Hobbes (1909) provided some interesting claims about what kind of society would exist if people were to have complete freedom from outside forces such as government or church. One thing he claimed would be certain death for societies are societies without strong rulers or governments. Readers have widely accepted that Hobbes believes in a type of social contract between the ruler and the ruled (Olssen, 2021; Zhang, 2020). This concept of a social contract can be viewed as the ruler maintaining power over the people by promising to look after their well-being in return for complete obedience and peace without infighting. This type of society has greatly influenced modern-day governments.

The United States of America used the idea of freedom when their independence was declared, which was stated in the Declaration of Independence, "All men are created equal; they are endowed by their Creator with certain unalienable Rights; among these are Life, Liberty and the pursuit of Happiness" (United States, 1776). This kind of thinking can be found throughout society today as a number of countries use social contracts that states must follow. Although these types of social contracts were written on paper for the people, the people still experienced inequalities in various nation-states for centuries. Hobbes argues

that since everyone has freedom by nature, then no one can be denied what he or she would like to do. With this perspective initially written in the 17th century, could the metaverse provide another option?

The Digital Leviathan

In an analysis of Hobbes' *The Leviathan,* Hoffman (2020) noted that the 21st-century Leviathan might be evolving into the Digital Leviathan. Hoffman notes that "The Digital Leviathan is headless. No president, no king, just unstoppable, openly verifiable code. Power to the people" (p. 1). As the concept of the metaverse began to arise once again in 2021, Mark Zuckerberg, the Chief Executive Officer of Meta, shared with investors that the organization would evolve into a metaverse company (Sparkes, 2021). In reviewing Hoffman's definition of the Digital Leviathan, the Meta metaverse could be considered to have a head, with a president - or CEO - and is still considered to be centralized. In order to have a true Digital Leviathan, it can be argued that the metaverse should be decentralized and governed by the people.

Governance is essential to the success of blockchain technologies. Blockchains have economic incentives included within the protocol, and blockchain protocols can hold a lot of value for many people worldwide. However, this value gives power to certain individuals who control portions of either network that at times can be very centralized and susceptible to attacks such as majority mining or staking attacks (51% attacks) (Saad et al., 2019). While many people focus on how blockchain systems are decentralized at the base layer, maybe we should start focusing more on how systems can be decentralized from a governance perspective as well.

While existing blockchain projects have adopted traditional voting as their governance method, some of these projects have created power structures by accident by giving too much power to an individual or a small set of individuals (Hoffman et al., 2021; Graglia & Mellon, 2018). However, voting is a very powerful process, and it should only be used when needed - not to just push things over the finish line. For this reason, blockchain projects have incorporated different types of voting weights, such as quadratic voting. Quadratic voting allows people who care more about an issue to have a greater say on the proposal's outcome while preventing certain parties from controlling large portions of votes on specific issues.

With the importance of governance, how do you govern the Digital Leviathan - which we will frame as the metaverse? How do you incentivize people to act in the right way when there is monetary gain through the means of crypto assets? Second Life gained criticism during their growth due to little governance in one of the first metaverses created. When asked in an interview about the governance structure within Second Life, Philip Rosedale, the creator of Second Life and the CEO of Linden Labs, stated: "We're sort of being run over by the train that is Second Life right now" (p. 26) (Helmer & Light, 2007). As metaverse projects are developing governance structures through various governance mechanisms such as decentralized autonomous organizations (DAOs) and governance tokens, the case study section of this article will detail Bit. Country's governance structure as an example.

METHOD

As a research methodology provides the foundation for a study, a case study methodology was adopted for this research due to the lack of empirical research on the Polkadot blockchain ecosystem and the metaverse (Batubara et al., 2018; Filippova et al., 2019). As one of the first metaverse projects developed on the Polkadot blockchain, the initial data collection for this case study was performed through an interview with Mr. Ray Lu and Mr. Shannon Christie, two of the co-founders of Bit.Country. During this interview, Lu and Christie discussed the motive and purpose behind Bit.Country, why the team chose the Polkadot blockchain, the positive global societal impact of this project, and the future for Bit.Country and the metaverse.

After the initial interview, separate interviews were conducted with Ray Lu, where developments were discussed leading up to Bit. Country's participation in securing a parachain slot within the Kusama network - the 'canary network' for Polkadot. After the individual interviews, a number of conference presentations were performed by the Bit.Country team, and the second part of this case study was transcribed and synthesized based on the information shared during those conference presentations.

CASE STUDY

The Framework for the Utopia

Bit.Country was created from the vision of Ray Lu at a conference in January of 2018 at a US-China blockchain conference in San Francisco. After securing the Bit.Country domain, he formed a team that began to evaluate a number of blockchain solutions that were aligned with their vision of a truly decentralized Web3 world. During the development of this case study, the Bit.Country team secured the 14th slot on the Kusama network. Through the means of a crowdloan, Bit.Country raised over $100 million USD from 25,634 contributors, setting a new record within the Polkadot ecosystem for capital raised during a crowdloan event. With over 60,000 users signed up to create individual metaverses, the Bit.Country team created a community-first approach to the metaverse.

The Perpetual Machine

Wang et al., (2017) noted that blockchains will need to have the ability to intercommunicate due to the exchange of information across various platforms. The authors concluded that the blockchain ecosystem may require a 'router' that can handle the different blockchain protocols, much like how a network router can be used to connect dissimilar network products in a Web2 environment. As a number of researchers and analysts have identified the need for interoperability across different blockchain ecosystems, Dr. Gavin Wood, a founding team member of Ethereum, developed a fully extendable and scalable blockchain - Polkadot.

The value that Polkadot provides is the interoperability of the protocol. Indeed, the extendibility in its core infrastructure is purposely done to prevent creating a "hard fork" situation in the use and extension of the infrastructure. Furthermore, Polkadot is a scalable heterogeneous multi-chain that allows the interaction and exchange of information of other dissimilar blockchain structures with the support of "pooled security" and "trust-free interchain transactability," allowing the need to scale, giving the ability to scale out through a parachain mechanism (Wood, 2016). Parachains work with relay chains, a mechanism used for registering and concluding the transaction between the parachains. Using a proof of stake (PoS) consensus algorithm, relay chains utilize the $DOT utility token to perform bookkeeping activities used for the PoS activities (Monika and Bhatia, 2020). Furthermore, Polkadot allows each respective chain to handle its security and integrity mechanisms inherent to its chain, enabling the cooperation of shared governance through chain interaction.

The Polkadot framework previously mentioned was modeled in Kusama - a live network where theories can be tested and proven before a project's transition to the Polkadot network. For further clarification, in relation to the Bit.Country project, the team built Bit.Country Pioneer on the Kusama network and Bit.Country Continuum on Polkadot network. As NFTs are the foundation of the Bit.Country metaverses, Kusama and Polkadot's brouter capability - the bridging and routing of various blockchains - are vital to the ecosystem's success. Given that a number of NFTs are built within the Ethereum blockchain, the integration and partnerships of Ethereum Virtual Machine (EVM) providers such as Moonriver within the Kusama network and Moonbeam within the Polkadot network are important as the Bit.Country ecosystems grow, creating a perpetual machine.

Demonstrating the Quadruple Bottom Line in the Metaverse

If one looks at the world economy, society, the environment, and technology as a whole, what is obtainable is the interconnection of these entities. The triple bottom line (TBL) shines the gaze of business success metrics upon contributions and efforts to environmental, health, social well-being, and a just economic impact, not just items found in the profit and loss statement (Elkington, 1998). The TBL plays a significant role when discussing social responsibility as it operates on the assumption that businesses are members of the community, which confers social responsibilities on them. Governments have implemented this idea through laws such as Section 75 of the United Kingdom's Local Government Act, which requires public authorities to consider environmental issues when spending money (Duxbury & Jeannotte 2013). These laws extend even further into policy terms where governments have introduced social responsibility

strategies that require companies who wish to bid for government contracts to publish their plans for managing their economic, social, and environmental responsibilities.

As the concept of the TBL has grown in adoption globally, Sawaf and Gabrielle (2014) provided an extension to the TBL with the quadruple bottom line (QBL). The authors proposed that leaders should embody the organization's purpose through action. Figure 3 highlights the QBL with the overarching focus on an organization's purpose with sustainability at the heart. Given the interviews conducted with the co-founders of Bit.Country could be viewed as a definition of the QBL, the following sections will outline how the co-founders look to demonstrate the QBL through their creation of a metaverse within the Polkadot and Kusama ecosystems.

FIGURE 3
THE QUADRUPLE BOTTOM LINE
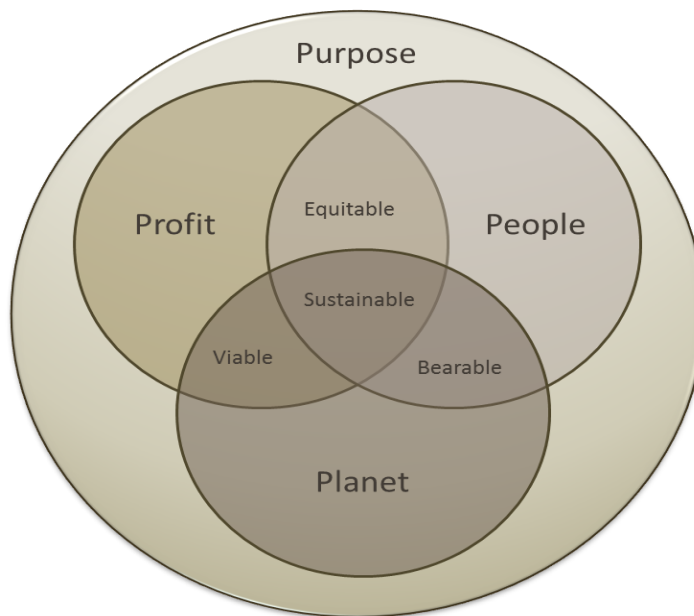
Adapted from "Corporate Sustainability Performance Measurement – Suggestions for Quantitative Research," by N. D. LY, 2021, New Zealand Journal of Business & Technology, 3, P. 10.

Purpose

Coming from different backgrounds in different parts of the world, the co-founders of Bit.Country grew up in different social classes. As an entrepreneur who has founded multiple multi-million-dollar organizations in the past, Ray Lu mentioned his personal sense of purpose is to create new opportunities for people worldwide in the Web3 movement. This personal purpose is transferred to the Bit.Country project. One example that was provided was during the COVID-19 Pandemic of 2020, when thousands of people lost their jobs in the Philippines, where the people did not have the social welfare support like in countries such as New Zealand and the United States. Through the use of blockchain games such as Axie Infinity, individuals worldwide supported those in regions that did not receive assistance from their local governments.

As race, background, religion, or political affiliation do not deter them from coming together on this project, the team's diverse backgrounds are seen as a competitive advantage. With these life experiences, the Bit.Country metaverse will be one with no fixed social structure. While metaverse owners could begin to build social structures and social networks seen in Web2 environments such as Meta, Twitter, TikTok, and Instagram, the users will create these structures within a decentralized environment that supports each user's interests. This concept may be appealing to organizations and influencers as these individuals and entities can manage the growth of their individual metaverses.

Referring back to the Digital Leviathan introduced in the Literature Review section of this study, developing the governance structure of Bit.Country was also important. Within the metaverse, Bit.Country has a two-level governance system structure - the network level and the metaverse level. The network level is where NUUM holders - the governance token of Bit.Country - can aid in determining the future of the network and the Bit.Country ecosystem. Governance will be composed of four groups:

- Democracy - Anyone can participate in issuing proposals, feature requests, or any improvement to the ecosystem.
- General Council - Council members are elected by NUUM holders and manage the development of the Bit.Country ecosystem and protocol upgrades.
- Metaverse Council - Council members are elected by NUUM holders and are responsible for the overall operational issues within the metaverse. For example, these responsibilities could include code of conduct issues brought forth by the General Council and approvals for social tokens within a Bit.Country owner's metaverse.
- Technical Council - Council members are appointed by the General Council and are responsible for bug fixes.

One aspect that may be a differentiator from other early metaverse projects is the fact that within a user's individual Bit.Country, each owner will have their own DAO, allowing individuals to expand their own Bit.Country through the use of a social token. In comparing this structure to the physical world, this structure could be similar to the federal government - the governance structure at the Bit.Country network level - and the state or local government - at the individual metaverse level. The only difference between the state and local levels is that the individuals are self-governing. In one interview, Ray Lu noted that governance can be very complicated in a decentralized environment. As one of the project's primary objectives is to create a perpetual machine - a metaverse that runs forever - it is important for the community to co-govern the society to shape the future of the metaverse.

People

At the onset, the co-founders of Bit.Country looked for ways to build a community-driven platform that would enable all members to benefit from creating and building, and a metaverse seemed like the perfect way to do that. As the Bit.Country metaverse will be governed by the people, the governance structure creates the Digital Leviathian by incentivizing community ownership. By allowing users to own and operate their individual metaverses, owners can provide community members with digital assets, enabling the owners and the community to expand their metaverse while being rewarded for their efforts. As an owner's metaverse grows, they will be a part of the Bit.Country Continuum, where owners will be able to view their relationship to other metaverses within the Bit.Country ecosystem. Within the Continuum, new land blocks can be proposed using an on-chain algorithm determined by the people - the NUUM token holders. As outlined in Figure 4, once an individual secures a land block, they are able to build their own metaverse and other activities such as displaying their NFT art within their bit country.

Keeping the people in mind, Bit.Country also included a good neighbor protocol within the Continuum to encourage good behavior, while discouraging bad behavior through staking and governance. Additionally, suppose users elect to include their metaverse within the Continuum. In that case, they will be able to travel from metaverse to metaverse, enabling themselves and their community members to interact with a variety of individuals throughout the Bit.Country ecosystem. This concept will provide an experiential learning concept to individuals in that as more users from around the world build out their bit countries, and other metaverse owners will be able to experience different cultures and environments.

Another positive societal impact Bit.Country can provide would be therapy to individuals with illnesses. Studies focused on prolonged isolation during the COVID-19 Pandemic of 2020 uncovered that widespread loneliness led to diminished mental health (Pimentel et al., 2021). Even as the world emerged out of the pandemic, individuals continued to be hesitant to return to a pre-pandemic regimen such as socializing and collaborating with large groups of people within physical spaces. While the metaverse does not entirely fill the void of face-to-face interaction, studies have shown that collaboration within virtual

environments reduces the feeling of loneliness after extended periods of isolation (Rzeszewski & Evans, 2020). In an empirical use case, Second Life provided an outlet for chronically ill users with three therapy-related environments, one being Wheelies, a disability-themed nightclub (Kizelshteyn, 2008). To translate this to the Bit.Country environment, using the good neighborhood protocol, individuals with similar ailments could build their own metaverse to have a safe, unbiased world to support each other where they don't have to deal with the stigma associated with mental health issues or disabilities. Given that the metaverse brings people from around the world together, the concept of being virtually immersed in an environment with individuals that can relate to one's situations, feelings, and experiences potentially makes a life-changing impact on many individuals worldwide.

FIGURE 4
THE BIT.COUNTRY CONTINUUM

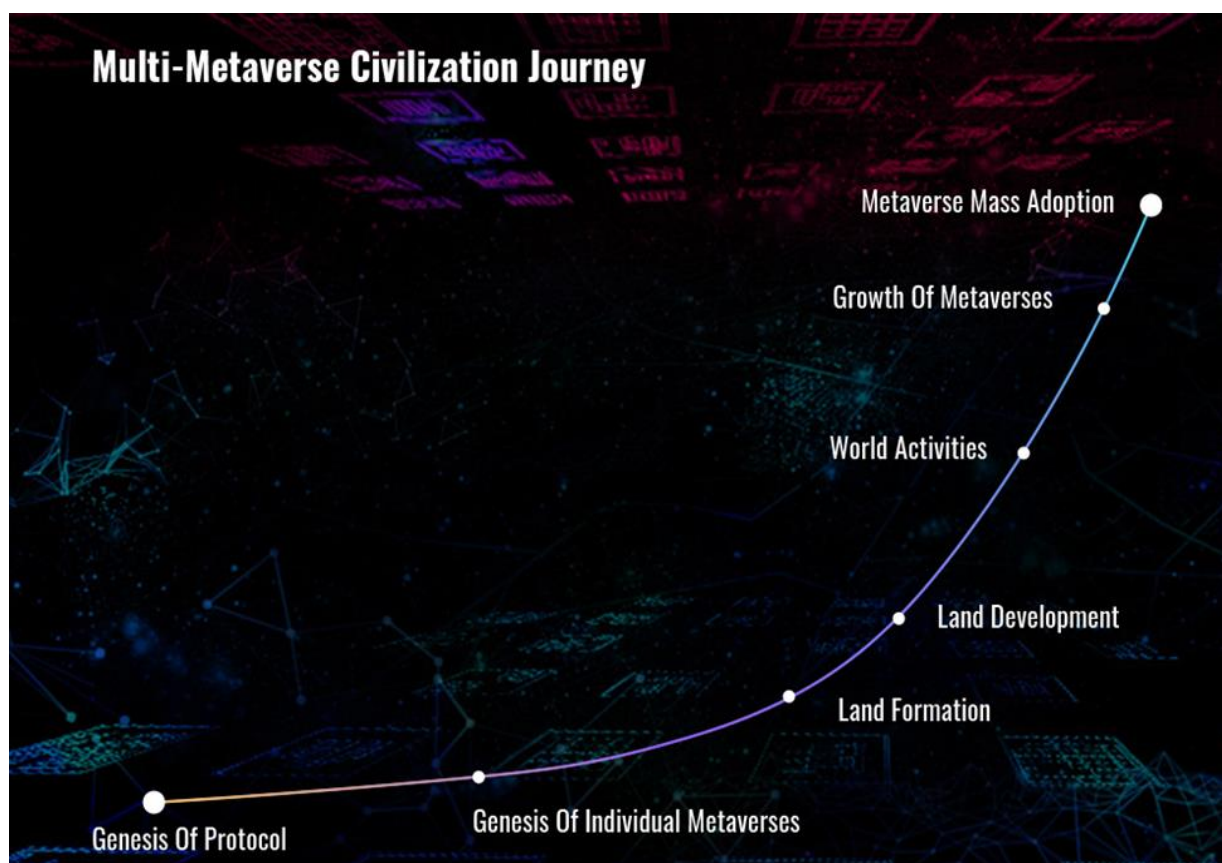Adapted from "Bit.Country Metaverse Network," by R. Lu, 2021, WhitePaper, 0.7, P. 9.

Profit

The founders of Bit.Country had a vision for owners and contributors to create a legacy within their bit countries to generate value within their worlds through the means of social tokens. Regardless of social class in the physical world, if users build and develop a community within their respective metaverses, individuals and their communities will benefit from the growth of their metaverse and the utility - or use - of their social token. To incentivize users to participate and contribute to one's individual metaverse, owners can issue a certain number of social tokens based on a pre-defined activity level. This approach not only

rewards individuals for participating and contributing, but it also increases the utility of the token for all participants.

For landowners, as outlined in Figure 5, Bit.Country owners will also be able to monetize off of their land by selling or renting blocks within their metaverse as each land block can be subdivided into 100 land units. In addition to opportunities that can be gained by subdividing land, land unit owners can perform self-staking of the NEER or NUUM tokens in both the Kusama and Polkadot networks to earn a portion of the BIT allocation. BIT is an in-game utility token of Bit.Country - similar to how SLP is the in-game utility token of Axie Infinity, as previously mentioned - and is used throughout the Bit.Country ecosystem for actions such as deploying bricks to build structures within a metaverse, energizing personal avatars, or for performing updates at the metaverse level.

FIGURE 5
PRODUCT RELEASE & ECOSYSTEM DEVELOPMENT

Adapted From "Announcement: We Won Slot 14 on Kusama," by Bit.Country Metaverse Network, 2021

As the growth of NFTs and digital art brought more users into the blockchain space in the latter part of 2020 and throughout 2021, non-landowners within the Bit.Country ecosystem will also find benefits within this virtual world. With institutional investors and corporations recognizing opportunities within the metaverse, more individuals will be needed to support these ecosystems. Through a partnership with Industry Connect, Bit.Country created The Metaverse Career Academy that trains and prepares individuals for full-time careers in the metaverse (Industry Connect, 2021). With a curriculum that includes topics such as blockchain gaming, decentralized finance, the application of NFTs in the metaverse, and how to build voxels and 3D models, opportunities will be created for individuals from various backgrounds, cultures, and social classes, regardless of where they are in the world.

After Bit.Country secured the 14th parachain slot on the Kusama network for the Pioneer Network, the team felt that they should give back to the community that enabled them to secure the parachain slot. Through an effort referred to as The Metaverse Odyssey, Bit.Country rewarded early users - the pioneers - with land to enable the mining and development of the Pioneer Network. The team's vision is for early adopters and influencers to share their land with their community to build their metaverses. The community-focused model of Bit.Country is different than other metaverses researched, such as Decentraland and The Sandbox (Goanta, 2020; Skinner, 2016). Once building and testing is completed in Bit.Country Pioneer, 'The Great Migration' will occur where the Bit.Country team will teleport select metaverses from Bit.Country Pioneer within the Kusama ecosystem to the Bit.Country Continuum once the Polkadot parachain slot is secured.

Planet

Although Bit.Country can be viewed as a Digital Leviathan, practices and processes implemented within the virtual world can be transferrable to the physical world. As sustainability is at the core of Bit. Country's mission, individuals are rewarded for activities that make a positive impact from an environmental perspective. As the metaverse is built and grows with the people, environmentally conscious communities can issue proposals using the on-chain algorithm to expand their reach within the Bit.Country Continuum within the Polkadot network. Additionally, as organizations are currently using 3D models and images during the engineering process when creating products, leaders could leverage the metaverse to increase efficiencies and profits. As many scholars and practitioners refer to the lean philosophy when looking to reduce waste to increase profitability, Taiichi Ohno (1988) introduced The Toyota Production System (TPS) in Japan, which later inspired Lean Manufacturing in the United States. As Ohno introduced the seven wastes as part of the TPS, this model can also be transferrable to the metaverse, potentially leading to a more sustainable world. Below are Ohno's seven wastes of lean viewed through the lens of the metaverse and ways we could leverage the metaverse to make a positive impact on the planet:

- Transportation - As meetings and collaboration sessions can be performed in metaverses such as Bit.Country, the unnecessary movement of people, equipment, and products can reduce emissions in the Earth's atmosphere.
- Inventory - With the integration of augmented reality (AR) and virtual reality (VR) headsets, leaders of organizations can also use these tools to create digital twins - digital representations of physical objects - within the metaverse. In industries such as fashion and apparel, designers could create a digital garment that users could wear within the metaverse, receive consumer feedback, and make adjustments before a physical garment is produced. This approach may dramatically reduce waste throughout global supply chains in a number of different industries.
- Motion - While some researchers may feel the metaverse may have a negative impact on the health of its participants, incentivization models created within metaverses such as Bit.Country could encourage individuals to be more active. A 'sweat-to-earn' model could positively impact the planet as time currently spent on activities in the real world that harm the planet may be spent in the metaverse.
- Waiting - Given organizations sometimes experience delays in data collection to make managerial decisions, demand sensing is an approach that has been adopted in recent years. Demand sensing is a near-real-time forecasting approach that leverages AI, machine learning (ML), and sometimes social media platforms such as Meta, Instagram, and Twitter to collect data from consumers (Anand Goyal & Karande, 2021, Song et al., 2021). As concerns around data privacy on social media platforms continue to emerge among organizations, a decentralized demand sensing model developed within the metaverse may be an option in the Web3 world. This approach may provide organizations with the secure near-real-time data needed to make more accurate forecasts, thus reducing unnecessary purchases of raw materials due to waiting for accurate demand data.

- Overproduction - With metaverse environments providing continuous feedback loops between leaders of organizations and consumers, the 'Voice of the Customer' approach could prevent the overproduction for new products. In addition, by conducting virtual sessions with consumers, leaders of organizations may better understand consumer preferences to meet the demand for new products more accurately.
- Overprocessing - Aligned with eliminating waste from a production aspect, using data from the metaverse to understand consumer wants and needs may also reduce waste for an organization's supply chain processes. If processes are eliminated for a number of multi-national organizations, energy is reduced for that organization and their business partners throughout the supply chain network.
- Defects - As the adoption of technologies such as AR and VR will increase with the adoption of the metaverse, leaders of organizations could use these tools to train their workforce effectively, potentially reducing defects of products manufactured worldwide.

While the options of how the metaverse can lead to a more sustainable world may be endless, additional use cases may be introduced as more users enter into these virtual worlds.

DISCUSSION

To contextualize the potential of how metaverses such as Bit.Country may impact the lives of individuals worldwide, emerging topics and trends in the blockchain space should be discussed. In doing so, researchers may consider the creation of a roadmap for how the metaverse, as a tool, can positively impact humanity if used in an ethical and socially responsible manner.

From "The Great Wealth Transfer" to "The Great Bitcoin Adoption": Implications for Digital Inheritance

Older Americans have stockpiled nearly $35 trillion USD over the last few decades and, as a result, contribute up to 27% of all wealth in the United States (Tucker & Jones, 2020). Researchers have argued that the time may have come to give this wealth away to the next generation, thereby marking the beginning of "The Great Wealth Transfer." Tucker and Jones (2020) noted that the significance of "The Great Wealth Transfer" within the context of this study is such that it may spark "The Great Bitcoin Adoption." Kraken, a United States-based cryptocurrency exchange and bank, estimate that Millennials (ages 24 to 39) and Generation Xers (ages 40 to 55) could drive over $1 trillion USD of wealth into bitcoin over the next 25 years as both generations embrace the inherent value of the emerging blockchain technology (Kraken, 2020). While many cryptocurrency enthusiasts have recognized this monetary revolution throughout the past decade, far less have discussed the crucial economic factor that sustains wealth over generations: inheritance, or, in this case, digital inheritance.

Digital inheritance emerged from the convergence of three previously separate worlds: wealth management, estate planning, and digital assets. Here, a digital asset is something that is stored digitally, is uniquely identifiable, and has some kind of value, such as cryptocurrencies and NFTs. So naturally, one of the central questions surrounding an individual's digital assets will relate to digital inheritance: How will individuals pass their cryptocurrencies and NFTs onto their beneficiaries once they pass away? This brings us to a foreseeable rise in digital asset executors, who will be responsible for administering an individual's last will and testament once they pass away and ensure that their digital assets are appropriately distributed to the relevant beneficiaries through, for example, smart contracts on the blockchain.

A useful case of digital asset executers is that of Safe Haven's (2018) Inheriti. Safe Haven utilizes a combination of smart contracts and legal instruments to empower Safe Haven's $SHA token holders with a secure inheritance of widespread digital assets. The power of Inheriti is that it encrypts an individual's assets on the blockchain by separating the keys among those named in the will. Currently, any group or organization can utilize Safe Haven's platform.

Despite the rise of digital asset executors, it would appear that, from a legal point of view, various challenges remain in the way of digital inheritance as being a reliable form of transmitting wealth across

generations. Indeed, as Kharitonova (2021) points out, the various factors concerning digital inheritance relate to emerging legal relations, the heterogeneity of digital assets, and the conflict arising from the law between the rules of succession, contract law, intellectual property, and personal data protection rules. Further, it is important to note that the anonymity cryptocurrency owners enjoy presents itself as an obstacle for digital inheritance according to the procedures provided by applicable law (Omelchuk et al., 2021). In the absence of a private key to an ancestor's digital wallet, it is neither feasible nor productive to attempt to prove the existence of digital rights through tracing of electronic correspondences, analyses of banking operations, or entries in the registry of rights that reflect transactions with objects certified by tokens (Bessarab, 2020).

The challenge of legitimizing digital inheritance as a form of transmitting wealth across generations will be to ensure that the mechanism of digital inheritance remains decentralized. This is because in the literature on the socioeconomic significance of inheritance, the relative importance of wealth inequality has been subject to considerable discussion. Indeed, inheritance as an economic factor that sustains wealth inequality has been discussed nearly a century ago (Stamp, 1926). However, since then, it has been suggested that inheritance sustains wealth inequality and may increase it (Davies, 1982). Therefore, the socioeconomic implications of inheritance are such that inequality in the housing market and higher education may be further perpetuated (Flippen, 2001). Given that the monetary revolution will bring forth novel financial opportunities for all, including those disadvantaged in current economic systems, it is important to stimulate a discussion around the following question: Will blockchain technology provide a sustainable, decentralized, and reliable mechanism for digital inheritance?

Scalability

Scalability is an increasingly important topic that is often discussed within the blockchain discipline. With the introduction of the metaverse, blockchain projects are adding more users to networks than ever before. In the case for Bit.Country, the team had over 1,600 testnet node operators - ranked number one on Polkadot Telemetry - to test the scalability of the metaverse before moving to the Kusama parachain. In order to scale in the metaverse, a number of partnerships may be required. In researching the Bit.Country ecosystem, the team developed partnerships with the Metaverse.Foundation, MVP.Studios, and MVP Ventures to support and incubate projects to fill gaps as the metaverse grows. In addition to the partnerships previously mentioned, Bit.Country has also partnered with SubDAO and Manta. Through these efforts, it is tempting to speculate that Bit.Country will provide virtual worlds for a wide range of communities, from gaming and socializing to higher education and scientific research.

The Omniverse: A 3D Virtual Reality Designer Tool for Remote Collaboration

While some metaverses will be built for community gatherings and gaming, others will be built for scientists, creators, and companies. One of the drivers of innovation in the metaverse will be the creator economy. Developers and creators will have an array of tools at their disposal that will enable them to bring innovative products to market in an unprecedented fashion. Indeed, it is very likely that creators will make more tools in virtual worlds than they do in the physical world. One of the AI programs designed for builders of these virtual worlds is Nvidia's Omniverse. The omniverse allows artists and developers to collaborate, test, design, and visualize projects from remote locations in real-time by providing a user-friendly server backend that enables users to access an inventory of 3D assets in a Universal Scene Description (USD) format. Assets from this inventory can be utilized in a number of ways as Nvidia's Omniverse provides plugins for 3D digital content creations (DCC) as well as tools that assist artists such as PhysX 5.0, RTX based real-time render engine, and a built-in Python interpreter and extension system (Jon Peddie Research, 2021). Ultimately, as every omniverse tool is built as a plugin, artists and developers can easily customize products for their specific use cases.

One of the use cases of omniverse includes Bayerische Motoren Werke AG (BMW), a German multi-national corporate manufacturer of luxury vehicles. Currently, BMW produces one new vehicle every minute. To keep up with their demand for continuous improvement and innovation, BMW requires the simulation of complex production scenarios to speed up output, increase agility, and optimize efficiency.

Nvidia's Omniverse introduces new simulation capabilities throughout the production process. To address this demand, BMW utilized Omniverse to design a complete digital twin of an entire BMW factory, and BMW continues to build on the momentum of their factory towards future initiatives that require digital solutions (Columbus, 2021).

Another use case of Nvidia's Omniverse is by Siemens Energy AG, a leading supplier of power plant technology is developing a digital twin for the multi-phase turbulent flow with point cloud data to train a physics-based AI model. The problem Siemens Energy attempted to tackle by using Omniverse is corrosion, the process that converts a refined metal into a more chemically stable form such as oxide, hydroxide, carbonate, or sulfide. Corrosion is certain, so inspection and maintenance are needed. Siemens Energy estimates that by predicting corrosion accurately, the organization can reduce inspection during regular maintenance and unplanned downtime by 70%, thereby saving utility providers nearly $2 billion USD per year (Peckham, 2021).

Remote collaboration may be vastly improved by Nvidia's Omniverse as changes by a designer in one part of the world can be updated for all connected designers globally (i.e., a cloud shared document for 3D design). Consequently, Omniverse could revolutionize how the 40 million 3D designers around the world collaborate and how companies build virtual factories that could be operated with virtual robots in the Omniverse (Jon Peddie Research, 2021). Virtual factories and robots are the digital twins of their physical replicas. These digital twins could design, train, and continuously monitor robotics factories, buildings, warehouses, and cars of the future. As such, in the foreseeable future, data will stream from individuals and systems of the real world into the omniverse - an ensemble of physics - connecting the physical and virtual world to build a more sustainable future.

CONCLUSION

This paper set out to address the gap in the metaverse body of knowledge by presenting a case study on Bit.Country – a metaverse project within the Polkadot ecosystem. The community-focused nature of Bit.Country is similar to NFT communities such as the Bored Ape Yacht Club, an NFT project that gained attention due to the price appreciation in 2021, resulting in the lowest price for a pixelated ape of over $250,000 USD. The implication of this comparison is such that Bit. Country's community-focused nature, combined with its governance structure, signifies that it could be a virtual world with an unprecedented amount of use cases. As metaverses continue to be built in both centralized and decentralized environments, ongoing research may be required to understand how these virtual environments will positively - or negatively - impact society, the planet, and the business landscape. With institutional investors entering into the decentralized blockchain metaverse space, and with organizations such as Meta making significant investments in developing centralized metaverses, the definition of Web3 may continue to evolve in the coming years and decades.

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