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Architecting the Metaverse: Blockchain and the Financial and Legal Regulatory Challenges of Virtual Real Estate

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Abstract

There has been disagreement over the value of purchasing space in the metaverse, but many businesses including Nike, The Wendy's Company, and McDonald's have jumped in headfirst. While the metaverse land rush has been called an "illusion" given underdeveloped infrastructure, including inadequate software and servers, and the potential opportunities for economic and legal abuse, the "real estate of the future" shows no signs of slowing. While the current virtual space of the metaverse is worth \$6.30 billion, that is expected to grow to \$84.09 billion by the end of 2028. But the long-term legal and regulatory considerations of capitalizing on the investment, as well as the manner in which blockchain technology can secure users' data and digital assets, has yet to be properly investigated. With the metaverse still in a conceptual phase, building a new 3D social environment capable of digital transactions will represent most of the initial investment in time in human capital. Digital twin technologies, already well-established in industry, will be ported to support the need to architect and furnish the new digital world. The return on and viability of investing in the "real estate of the future" raises questions fundamental to the success or failure of the enterprise. As such this paper proposes a novel framing of the issue and looks at the intersection where finance, technology, and law are converging to prevent another Dot-com bubble of the late 1990s in metaverse-based virtual real estate transactions. Furthermore, the paper will argue that these domains are technologically feasible, but the main challenges for commercial users remain in the legal and

regulatory arenas. As has been the case with the emergence of online commerce, a legal assessment of the metaverse indicates that courts will look to traditional and established legal principles when addressing issues until the enactment of federal and/or state statutes and accompanying regulations. Lastly, whereas traditional regulation of real estate would involve property law, the current legal framing of ownership of metaverse assets is governed by contract law.

Keywords

Blockchain, Digital Real Estate, Digital Retail, Digital Twin, Digital Content, Finance, Metaverse

1. Introduction

The word “Metaverse” is a finalist for the word of the year for Oxford University Press, and the past year has demonstrated why. Formerly Facebook, Meta invested billions into building an immersive reality platform, while Decentraland and The Sandbox worked to create Web3 versions of 3D social environments [1]. With films like *Ready Player One* (2018), immersive virtual environments are at the forefront of popular imagination, and seemingly within reach. Ball [2] defined the metaverse in terms of an interoperable and scalable real-time network that can be experienced in 3D virtually and synchronously. There would be no limit on the number of users and all interactions, including social, financial, and so on, would take place within this persistent virtual community. However, the version of the metaverse that we currently see with companies like Meta is not interoperable or scalable. Instead of being inside a virtual or 3D version of the internet, there are many portals to enter different virtual spaces on different platforms. Therefore, we actually have a multiverse of metaverses existing simultaneously [3]. One limitation on interoperability is that technology alone cannot be leveraged to build the metaverse. A stable and trustworthy economy is also required, and the current digital economy is still based around centralized organizations, such as banks and companies, who own digital properties instead of users [4]. Blockchain-related technologies have been cited as a potential solution for decentralization and a step closer to a true metaverse [5].

First introduced as bitcoin cryptocurrency, blockchain technology laid the foundation of today’s digital currency market given the ability to create a shared economy [6]. As a ledger that stores committed transactions, blockchain facilitates digital asset tracking and security in a financial network. Each transaction is stored as a block that is linked together using cryptographic methods or hashing mechanisms to ensure the immutability of the ledger. The process allows for the potential for securing sharing even when the commercial environment is insecure. Most importantly, blockchain can operate without a centralized authority to oversee it and thus operates on a decentralized ledger [7]. Given that proof

of work is employed as the consensus mechanism in blockchain, the process is ideal for e-commerce platforms. When considering the metaverse, blockchain can provide accountability in an unproven and unstable digital, financial eco-system. For example, since the ledgers are plainly visible to all involved, trust is not necessary between different parties as there is improved cybersecurity and protection against data manipulation with security provided by the network of participants and the technology itself [8] [9] [10]. Intermediaries that provided trust and security, such as central banks, and central counterparties would be obsolete [11] [12]. At the same time, the potential benefits of blockchain do not exist without inevitable challenges. Current world authorities have found applying technology-neutral regulation to distributed ledger technology (DLT) in finance. The emergence of cryptocurrencies also has the ability to bypass existing legislation regarding money laundering and has been used to facilitate illegal activity [13] [14] [15], which resulted in calls to action and further regulation [16] [17] [18].

In addition to blockchain disrupting financial models and potential challenges to the centralized banking system to monitor transactions, the potential social, professional, and economic changes to be wrought by the forthcoming metaverse should be equally weighed. In fact, the two will work in tandem to form a new manner in which the global economy will exchange information and currency in the near future. Businesses must now operate in three dimensions of commerce. Whereas having a brick-and-mortar establishment was sufficient to remain competitive until the rise of smartphones and web shopping, so was having a website domain with a company's name until the rise of the metaverse. Every professional, let alone every business is expected to have a website to be seen as credible, legitimate, and also to provide a portal to review and purchase potential goods and services.

Retailers are expected to have high-quality photographic reproductions of their products for consumers to peruse. The value of the website domain (and specific name) can thus be quantifiable, just as the value of a physical store shoppers purchase goods and services. Many companies have been using the metaverse to move beyond the two-dimensional display of products to "retail theater" and three-dimensional products that consumers can interact with as avatars in a 3D virtual world. The latest round of companies is continuing the trend since Second Life launched in 2003. Therefore, from the perspective of marketing and advertising, the investment in "real estate of the future" in the metaverse can be equated to the value of a company website. In the same fashion, a digital twin of a store in the metaverse must be designed, built, hosted on a server, and maintained. But how will businesses move past mere advertising in the metaverse to consider digital twins of retail establishments economically viable?

But what about investments that seem to outpace that value proposition? Given the rise of digital locations that only exist online, digital real estate has provided the ability for creators to sell directly to others in the metaverse. As an

example, owning digital real estate and selling tickets to virtual events or digital art as non-fungible tokens (NFT). There are many opportunities to prospect land in the metaverse with more and more platforms appearing. In the real estate market, new construction of luxury homes is being marketed by pairing a digital twin of the new construction in the metaverse. ONE Sotheby's International Realty has recently aligned with a general contractor and NFT collector to offer a virtual counterpart to its real-world mansion in The Sandbox metaverse platform. The Purchaser of the NFT asset, which will be transacted on the Ethereum blockchain, will also acquire the rights to physical property [19]. Firms have begun to spend millions to purchase space in the metaverse, seemingly banking on the value of the blockchain-supported technology becoming something more than a 3D website. For instance, in 2021, an investment firm purchased 2000 acres of virtual real estate for around \$4 million. The virtual real estate existed only in the metaverse platform known as The Sandbox. The firm then owned the equivalent of 1,200 city blocks in the virtual space which was paid for via 792 nonfungible tokens (NFTs) on Ethereum blockchain [20]. Another example can be found with the investment fund Republic Realm, which in June, 2021 bought a parcel of digital land in Decentraland for more than US\$900,000. The fund has plans to develop the virtual plot of land into a virtual mall named Metajuku, which is designed after the Harajuku district in Tokyo [21]. As such, various firms are most interested in platforms with specific market caps because limiting the number of parcels of virtual real estate limits supply. As with Decentraland and The Sandbox, which both have market caps, as the demand for digital real estate rises, so does the price per parcel of land.

At the moment, however, the nature of ownership in the metaverse is still being negotiated [22]. What remains unclear still is which platforms will become the most popular. And because of that, it can be challenging to determine what real estate in the metaverse will be worth a significant amount in the future. In these and other examples, the spaces and even the products that they sell are either hosted on privately owned servers, or products sold in the metaverse as NFTs still limit control of the digital asset. With this in mind, what will be the major legal considerations with such an approach in the future? To allow economic interactions in the metaverse, the platform must allow for currency, goods, and services to be traded. While blockchain has the potential to address these challenges, immediate obstacles will be regulatory and not technological. For instance, even though there are claims that virtual ownership is guaranteed, the current legal framing of ownership of metaverse assets is not governed by property law at all, but rather by contract law. Ownership of land has always been a fundamental right with accompanying privileges in the United States. Indeed, the right to vote in most states was limited to freeholders upon the ratification of the Constitution. Without legislative change, the statutory protections attendant to the ownership, possession, and sale of real property will not apply to metaverse property, which is not land—but a digital asset. This study seeks to investigate potential future research and consider the forthcoming regulatory

issues with metaverse-based virtual real estate transactions.

2. Literature Review

2.1. Building Regulation: Blockchain Finance and the Metaverse

A potential solution to regulation in a decentralized financial system is embedded supervision. Auer [23] argues that the rise of blockchain in finance will improve efficiency regarding supervision. Embedded supervision would provide a specific regulatory framework where a specific ledger would no longer need to be verified given the automatic monitoring built in with blockchain. However, the conditions required are currently hypothetical and would need to consider the following [24]. As outlined by Auer [23], embedded supervision must:

- 1) Be supported by a regulatory framework and an effective legal system;
- 2) Applied to achieve economic finality-once a transaction is not profitable to undo;
- 3) Be designed for economic consensus, knowing that the market will be automatically supervised; and
- 4) Promote low-cost compliance to be equitable for both large and small firms

The benefits of such an approach are evident in that, like blockchain, there is no need for oversight, which is also the primary point detractors point out. Such embedded supervision could easily be adapted to the current e-commerce strategies from the gaming industry. In fact, the combination of blockchain technologies and gaming has already led to play-to-earn games with tokens that use their own economy, commerce, and so on. Blockchain developers have drawn inspiration from gamification, which can currently be seen in Decentralized Finance (DeFi) and GameFi [25].

Moreover, developments in the gaming industry and blockchain continue to run parallel, leading to inevitable integration. With respect to the metaverse, blockchain is well-suited as a decentralized, financial solution for the following reasons, as outlined by Turdialiev [26]:

- 1) **Digital proof of ownership:** Through digital wallets, ownership can be demonstrated with regards to any asset on the blockchain.
- 2) **Digital collectability:** Using NFTs, entirely unique assets can be created that can be collected, reflecting practices in the real world.
- 3) **Transferable value:** Current multiplayer games online can transfer value between users. Such an approach can be adopted with blockchain as more currency is exchanged in the metaverse.
- 4) **Governance:** In a decentralized system, blockchain can replace centralized authority and ensure rules are adhered to instead of elected officials.
- 5) **Accessibility:** Instead of limiting who can open an account, as in a standard bank, digital wallets are open to the public to create with blockchain.
- 6) **Interoperability:** Developers are already creating custom blockchains that are interoperable, such as Polkadot (DOT) and Avalanche (AVAX). In a true metaverse, interoperability will be key and blockchain has demonstrated poten-

tial in this area.

Since the metaverse is envisioned as a parallel plane for human activity, the relative success of the enterprise will depend upon a strong, robust and secure economy. While this new virtual economy may seem a far cry from that in current use, Ball [2] points out that the metaverse economy will follow real-world patterns. The attributes that contribute to a thriving economy include competition, profitable businesses, agreed upon “rules” and sense of “fairness,” along with consistent consumer spending and rights.

2.2. Payment Rails

However, there is one major factor that will shape the exchange of currency for goods or services in this new digital realm, and that is payment rails. There have been a number of new payment rails created thanks to communication technologies. In fact, the use of cash as a method of transaction has been dramatically declining. As Ball [2] relates, from 2010 to 2021, the share of US transactions that used cash dropped from 40% to nearly 20%. Today, the most common payment rails in the US are CHIPS (Clearing House Interbank Payment System), Fedwire (formerly the Federal Reserve Wire Network), ACH (Automated Clearing House), along with various credit cards and peer-to-peer payment applications such as PayPal, Venmo and others.

In considering how these transactions were used to purchase rights to software, one would imagine that the growth in the virtual world would have led to advances that were more flexible and forward thinking. In 2021, consumers spent over \$50 billion on digital-only video games and the GDP of this virtual world quintupled since 2005. With that being said, payment rails of the virtual economy are more restrictive than in the real-world due to forced bundling of services, such as PlayStation’s wallet, Apple’s Apple Pay, and in-app payment services. Consoles such as Xbox and PlayStation allow consumers to download a version of a game, but only for use on their hardware. In 2003, Valve launched Steam as a PC alternative to the console economy. As many multiplayer online games were moving to a “games-as-service” model anyway, Valve was able to handle game updates and install internally with a “game launcher” that indexed and centrally managed the game installer files. The approach also handled a user’s rights to the games, allowing automatic download when desired. The economic model still ensured 30% ongoing revenues for Valve as every sale kept that amount as with console game platforms. The 30% payment rails also govern Apple and Google and their app stores, which additionally restrain virtual world platforms.

2.3. Rise of Metaverse Retail

While seemingly only recently dominating financial headlines, the term “metaverse” has been applied to retail for almost two decades. Bourlakis and Papa-
giannidis [27] investigated the emergence of metaverse retailing following the

release of the first smartphones and divided the evolution into three phases: traditional, electronic, and metaverse. The study focused on the new strategies retailers needed to adopt to operate in three different, but intertwined spaces. Key promotional aspects are highlighted with the different challenges faced by traditional (brick-and-mortar retailers), e-retailers (utilizing the Internet), and metaverse retailers. For the study, the researchers analyzed the “metaversephenomenon” of Second Life, but also note *World of Warcraft*, *Ever Quest*, *Eve Online*, and *Star Wars Galaxies*, as ground zero for the “third dimension of commerce”. As evinced by the examples cited, most metaverses began as games, or, more specifically, massively multiplayer online role play games (MMORPGs). These would quickly evolve into alternate worlds that extended players virtual and electronic spaces. Given the sheer number of consumers spending large swaths of time (in some cases 12 hours straight) in these virtual environments, new social and business environments grew to accommodate with larger spaces. With such economic and social exchanges taking place between the players in these games and metaverses, greater crossover became common between physical businesses in the real-world and those e-businesses in the virtual. These developments have led to a new multi-faced, multi-spaced economic environment that has vastly increased in complexity. The intertwined nature of this new business environment, electronic, virtual, and physical space must be mapped out in order to conceptualize the economic, social and policy implications [28]. In order to be successful, Bourlakis and Papagiannidis [27] recommend a holistic promotional strategy that operates in all three arenas.

The precursor to the contemporary metaverse is often cited to frame many of these discussions. Launched in 2003, Second Life allowed users to monetize their efforts in the virtual world. Copyright for content created by users on the platform belonged to users, who were then able to monetize said content. Predating NFTs and blockchain technology, Linden Lab’s Second Life (<https://www.lindenlab.com/>) allowed content creators to protect their creations using a system of three options either allowing or blocking owners to copy, modify or transfer their creations or purchases [29]. The system also tracked items and their creators, as well as functions in similar capacity creating digital items that are unique and identifiable. All transactions in Second Life were based on the Linden Dollar. These can be exchanged in-world for goods or services but can also be transferred for real currency to benefit creators in the real world. Given that a business license is not required to operate in the virtual platform as an entrepreneur, identifying how many are trading and how successful they are is not possible. The Positive Linden Dollar Flow (PMLF), however, is used to estimate the more than 66 million “business owners” on the platform. Businesses perceived the value of reaching customers in such a platform and began operating in the space [30]. Examples of these real-world firms span many different markets and industries, including ABN AMRO, Adidas, American Apparel, Dell, Harvard Law School, IBM, Microsoft, Pontiac, Reuters, Sony Ericsson, the Swedish Government, Toyota, and others. While most examples here use the plat-

form merely for marketing purposes, some have announced intentions of actually trading in Second Life. Mainstream adoption still remains unrealized [31].

The major difference in traditional or e-retailing from that found in the metaverse is how customers expect to interact with the brands they encounter. In traditional two-dimensional marketing and advertising, print, images, videos, and music may be introduced to provide some idea of the product being sold, but in the metaverse customers expect to interact with it in a three-dimensional simulation. The practice is what Harris, Harris, and Baron [32] predicted with the rise of “retail theater”. Papagiannidis and Bourlakis [33] argue that some retailers in Second Life designed experiences where potential customers could interact with products to lead to sales. Still other retailers prefer to develop a sense of community or belonging among their consumer bases. Even though this affords even greater access and the ability to customize marketing to specific customers, Haig [34] warned, and Bourlakis and Papagiannidis [27] reiterated, that businesses should be wary of the effects of overly bombarding potential customers. For example, when visiting busy locations in a metaverse platform, an automated system may deliver messages or notecards with information for products or services. While users have the option of muting a bot or automated agent, doing so repeatedly can result in frustration [35]. At the same time, if experiences are judiciously designed, the augmented 3D information provided can positively affect sales and the retail shopping experience. Virtual retail affords the ability to combine augmented reality (AR) and virtual reality (VR) to create a seamless shopping experience. Virtual objects and digital information can be viewed and reviewed within a virtual space. The benefits are self-evident since instead of viewing products on a flat screen, billboard, or piece of paper, the product could be transported out of the catalog and placed in the real environment or clothes modeled for size and fit. Such product experiences could assist in a purchasing decision and lead to greater assuredness among customers [36].

2.4. Law and Finance in the Metaverse

New legislation and regulation rose in response to the internet age [37]. Similarly, the potential economic and social change on the horizon with the metaverse will require addressing the disruptive influences on current law [38]. There is a precedent for the metaverse and that is with artificial intelligence (AI), which will modify the legal role of behavior and require new antitrust or contract laws [39]. The major consideration is how the metaverse and XR will change how objects interact in real or virtual space, and, in turn, how humans interact with and use them. For instance, augmented reality (AR) applications overlay digital objects onto the real world; virtual reality (VR) immerses users in a completely virtual environment and, using avatars, these users interact with others in virtual spaces and with virtual objects. As with AI, AR and VR have the potential to disrupt legal categories by way of the distinction between a real and virtual object and issues of ownership [40]. With an alternate comprehension of virtual and social surroundings, the potential for legal disruption is high. The use of an

avatar, which can be digitally altered to look like virtually anything real or imagined, also complicates the matter. As humans interact in virtual or augmented environments, the potential for legal problems via relationships and legal expectations will arise that have not been considered until now. As virtual objects, such as NFTs, become closer to or combined with physical objects, the more legal expectations of ownership will blur. Furthermore, the more time spent in virtual spaces for more social and business interactions, the more questions will rise regarding legal complexities [41]. Dwivedi *et al.* [38] pose two key questions for further consideration: 1) How will the personality in the metaverse in avatar form be protected considering data protection laws and the mutability of the avatar and individual behavior in a virtual environment? and 2) How will concepts of property law need to develop to address virtual land and real estate in relation to blockchain technology?

2.5. Purchasing Land in the Metaverse

The history of purchasing land in the metaverse varies from incarnation to incarnation. Early metaverse contender Second Life had digital land “ownership” built right in the paid tier of gameplay. While users can play for free if a user opts for the paid subscription, they are awarded a small parcel of land that they can develop on. This digital land ownership has been the focus on several court cases with Linden Labs, eventually leading to the removal of the term “owned” from the marketing materials. This process of land “ownership” led to the rise of one of the most well-known business owners and real estate moguls in Second Life, Anshe Chung. Anshe Chung is the avatar of Ailin Graef and was featured on the cover of BusinessWeek magazine and has been referred to as the “Rockefeller of Second Life” by CNN. Anshe Chung was reported by Fortune magazine as the “first virtual millionaire” through purchasing a renting virtual real estate and charging land taxes [42].

Another virtual platform that began as a game, MindArk’s Entropia Universe, originally Project Entropia before it’s metaverse expanded into multiple planets, has broken several Guinness World records for owning “the most expensive virtual item” in reference to a digital property [43]. In 2005, NEVERDIE, an avatar of Jon Jacobs, purchased an asteroid space resort in a public auction for \$100,000 USD or 1,000,000 PED. Much like Second Life, Entropia Universe has a currency exchange rate with the Project Entropia Dollar's exchange rate being 10:1 or rather it takes 10 PED to equal \$1 US. This record would be passed in 2009 by the sale of Crystal Palace space station for 330,000 USD and again a year later when the planet Calypso was sold for \$6 million [44]. LAND also uses NFTs, which measure 16×16 meters in parcels of land which can be purchased with the MANA cryptocurrency on the Decentraland platform. The purpose of such a purchase is for owners to build on these virtual spaces and earn money from them through rent or other means, creating a complex crypto economy (Bitlo, 2022). There are a growing number of platforms on which such virtual land can be bought and sold, including Decentraland, The Sandbox, Somnium Space,

OVR, SuperWorld and Axie Infinity, Bloktopia, Next Earth [45] [46]. In order to purchase land on these platforms, a digital wallet must be created first. Once the wallet has been created, these companies can be searched, and the desired plots of virtual property may be purchased using specific cryptocurrency of that platform via the digital wallet. Many companies have seen the value and have opened stores, such as Samsung in Decentraland. The value, and thus cost, of virtual land often increases the closer to real-world regions (e.g. Paris or New York). The value may also increase depending on the features on the land, its size, or other objects contained within [47].

There have been notable detractors that point to the early limitations and volatility of virtual real estate prospecting, such as with Decentraland. The value proposition with Decentraland lies in the purchase of land on the platform, but the process is complicated. For instance, future virtual landowners cannot purchase tokens directly with standard currency. Even ether (ETH), the most popular bitcoin alternative, cannot be used to purchase virtual real estate. In the case of Decentraland, like other crypto projects, a cryptocurrency unique to the platform called MANA (ERC-20 token) must be used [21]. The most affordable plots of virtual land on the platform sell for around 4000 MANA, or the equivalent of nearly \$2489 (down more than two thirds in value in the last year). Since the virtual land is non-fungible, the owner of a plot of land owns it until another user wishes to purchase from them. Alternatively, MANA can be sold to other users who may have needed to purchase land and be exchanged between users on the platform [21]. Given the volatility of the crypto market, the cost and value of land can be influenced relatively easily and quickly by several factors. Therefore, the value of virtual storefronts to generate revenue is unpredictable and in some cases has quintupled in value in about a month and then dropped dramatically [21].

2.6. Ownership and NFTs

While blockchain has the potential to undergird the metaverse and replace existing payment rails, concepts such as ownership cannot be readily transposed from the traditional economy into the new virtual world. Even when using blockchain to decentralize digital assets, reviewing the terms of service of the specific metaverse platform these were purchased on is still necessary [20]. The prevailing belief of those that support crypto currency is that true ownership of NFTs is possible due to decentralization and interoperability. With such an understanding, owners believe that tokens provide non-fungible proof of ownership of a digital asset that can be used across metaverse environments [48]. Because of decentralization, the ability to buy and sell virtual items on the blockchain is believed even without an individual or company providing permission [41] [49]. However, despite claims of ownership, the situation is more complicated given that current ownership of metaverse assets is governed, not by property law, but contract law. As noted above, Marinotti [20] clarified the nature of ownership is different in the physical and virtual worlds and consumers may be

misled. When an item is purchased in the metaverse, the transaction is recorded on a blockchain, which is a decentralized, digital ledger where such records cannot be deleted or altered [49]. As outlined, the process assigns ownership of an NFT in the user's digital, crypto wallet that can only be accessed by the owner. Since access is only possible via the "wallet's" private key, the NFT appears to be inaccessible to anyone other than the owner. However, a distinction needs to be made between the NFT and the digital asset because owning digital objects in a virtual world is not the same as in the physical world [41].

The distinction made here with "ownership" is outlined in the terms and conditions of service. Upon first joining any metaverse platform, users are required to agree to the terms of service, terms of use, or end-user license agreement. Since these are legally binding documents, the legal rights of users are defined. Most users do not read these terms of service. One study concluded that only 1.7% of users were able to locate and then question the "child assignment clause" which is embedded in a terms-of-service document, giving away their firstborn child [50]. Not surprisingly, the legal nuances of ownership are outlined in these long and dense documents, and unlike blockchain, the terms of service for each platform are centralized. Given that legal ownership is controlled by a single company, and that existing multiverse of metaverses is not connected, a user is unable to move an avatar or other digital asset between virtual worlds. Platforms are still connecting specific NFTs to proprietary digital assets. Therefore, according to the terms of service, those NFTs purchased on a metaverse platform and the digital goods they represent are rarely the same thing. While NFTs exist on the blockchain, the digital assets and real estate are stored and only exist on private servers on inaccessible databases [51]. With companies owning the servers on which digital assets are stored, they also have the ability to delete links and decouple to disallow use from owners. These platforms also reserve the right to amend their terms of service at any time and are often not required to provide notice to users [52]. In order to know if one is compliant with the terms of service, users would need to refresh and then reread the terms to ensure any language has been added that would lead to their banishment from the platform and deletion of their assets.

3. Analysis

3.1. Financial Considerations

The following analysis considers the previous sections, potential and volatility of virtual real estate in terms of financial, cyber security, and legal implications. In analyzing the financial implications for virtual real estate, one should first consider the costs and benefits of the application of block chain technology in this sector. Since the medium of exchange in this virtual sector would involve cryptocurrency, a brief review of the evolution and potential challenges in using digital currency would also be prudent. The decentralized finance system underlying blockchain technology has some clear advantages over the current centra-

lized system. There would be increased efficiency in remittances in real time by avoiding any delay whatsoever in transaction receipts through traditional financial intermediaries in a centralized banking system [53]. The use of digital currencies in virtual real estate transactions could also ensure a more democratic process in terms of enabling easier access to users without a traditional bank account, while maintaining security in terms of digital identity validated through the sequential coding technology in blockchain transactions. As a result, transaction costs would fall dramatically due to the low cost of digital payments [54].

On the other hand, the potential challenges in using blockchain technology in transactions in the virtual real estate space should also be considered. A fundamental requirement of a medium of exchange in a market transaction between two parties involves whether that action is a good store of value and universally acceptable medium of exchange for the involved parties in the market. These two properties are currently lacking in the cryptocurrency market. One of the main problems with bitcoin's usage has been related to its extremely high volatility in market value thereby increasing the financial risk of use and limiting acceptability as a standard medium of exchange. High volatility in value for cryptocurrency could spill over to the value of virtual real estate using blockchain technology. The situation could potentially create a "virtual real estate crisis" in a decentralized financial system.

The costs and benefits of the application of blockchain technology can be compared but would instead be a matter of "when" and not "if" decentralized finance becomes the dominant financial system with the support of the younger tech savvy generation. Central banks across the world are aware of the acceptance of the decentralized financial system by the future generations and are presently designing central bank digital currencies (CBDC) that may be regulated to provide more stability to the system [55]. Since store of value is a fundamentally important property of an acceptable medium of exchange, we could foresee the application of blockchain technology in virtual real estate transactions in a more regulated cryptocurrency market in the future.

3.2. Infrastructure and Cybersecurity Considerations

Turning to the infrastructure and cybersecurity considerations for virtual real state, the measure of security over the web and trust represented is paramount. Managing transparency, trust along with the satisfaction of customers and citizens is needed to improve the efficiency of public service delivery [56]. There is an overwhelming aversion to centralizing authority in today's cyber world [57]. Rich user interaction and user involvement can be defined via metaverse in its digital representation. The technology behind the world's popular cryptocurrencies (the disruptive Blockchain technology) has numerous applications, and among them some of the major advantages can certainly benefit virtual world of real state in the metaverse [58]. The limitations of only investing in physical property will sooner or later come to an end because the new world of virtual real estate is growing and blooming [59].

In recent days, blockchain technology has been applied beyond finance and metaverse, including healthcare, public service, governance, currency exchange, food supply chain, e-voting, music royalty tracking, personal identification security on web, and elsewhere. Blockchain can also be considered in agricultural supply chain (popular as agribusiness) where there is lack of customer trust or traceability [60]. Blockchain can promise several advantages such as product traceability, efficiency enhancement, improving quality, benefiting farmers, and building customer’s trust over traditional supply chains in agribusiness. The efficiency in supply chain management (SCM) can be improved and delivered in real-time to all members (especially to the farmers) that can change the product inventory and product price.

The infrastructure and analysis for metaverse architecting and regulatory challenges rely on the type of blockchain used. Although we have three popular types as public blockchain (permissionless BC), private blockchain (permissioned BC) and hybrid blockchain, depending upon the mode of peer participation, financial perspectives can be slightly different. Blockchain types based on financial perspectives with respect to business and currency can be categorized as C2C (Type One), B2C (Type Two) and B2B (Type Three) types [61] (Figure 1). Type One C2C is the Only Cryptocurrency blockchain type with High-Node scalability (and low-performance scalability). Type Three B2B, on the contrary, is the Only Business type with Low-Node scalability (and high-performance scalability). Type Two B2C is the Cryptography + Business type with High-Node scalability (and low-performance scalability).

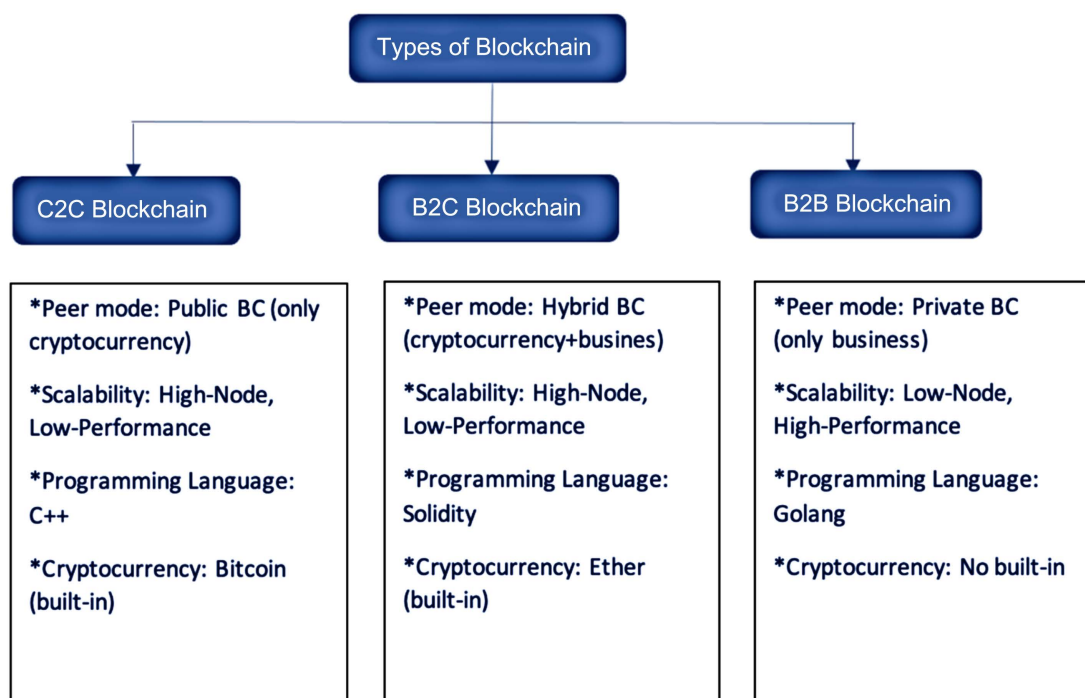


Figure 1. Three Blockchain types with mode of peer participation, scalability, programming language used, and built-in cryptocurrency of that blockchain type.

The financial and legal perspectives while architecting the metaverse are incomplete without cybersecurity and cyber defense considerations. Since the rise of the internet age, cyber war has been a concern. With more recent technological advancements, the global rise of online users and devices multiplied and become ever more complex, leaving new avenues for cyber-attack. These threats can also be seen in the financial and military sectors [62]. The upcoming new internet infrastructure will be at greater risk if the issues are not dealt with more effectively.

3.3. Legal Considerations

As noted above, the virtual world of the metaverse greatly surpasses the internet as we have known and presents significant challenges for persons and investors seeking protection for their investments—often sizeable—in this new frontier. As Lehot notes, “While the real-world property has years of established laws behind it, metaverse virtual land is the new Wild West...” A fundamental problem is how the law will recognize—or not recognize—the tokenization of real property as a digital asset. What does one acquire when purchasing an NFT? As noted by certain commentators, the concept of tokens being tied to property rights is not a new concept. Negotiable instruments, securities, deeds, and bills of lading are some examples where a document or certificate served as the basis for establishing a property right in a physical asset. But the relationship of an NFT to real world assets is questionable. To determine what rights are obtained when acquiring an NFT, one must review the terms of service and associated agreements of those entities enabling the creation and transfer of NFTs. Moringello and Odinet [63] did just that when reviewing the service documents of eight platforms. Consistent in their findings was a disconnect between the broad statements suggesting the conveyance of property rights which would include the right of ownership, possession and control of the underlying asset and the actual terms of service, which were more analogous to licensing agreements that often reserve considerable rights to the platform to remove access to the NFT’s on their sites and remove the user’s assets from the site. In fact, the binding Terms of Service reviewed for Superworld placed quotation marks around the word “purchase” and reserved Superworld the right to terminate a user’s access to its metaverse in certain circumstances [63].

Adding to the illusion of property rights in an NFT is the fact that the NFTs are not tethered to a physical thing—unlike a deed which has a legal connection to land, a title which has a legal connection to an automobile, or negotiable instruments which grant the party in possession of the instrument certain rights in an underlying debt. In these examples, an underlying body of law establishes the underlying control that is inherent in a property right [63]. Acknowledging the deficiencies of existing laws to address these conflicts, a committee was appointed to draft amendments to the Uniform Commercial Code to address emerging and past-emerged technologies. Any amendments approved and suggested by the American Law Institute and the Uniform Law Commission must

be enacted by the state legislatures before having the force of law.

Currently, the most critical issue to be addressed regarding NFTs and real estate in the metaverse is found in the representations made by the platforms as to the rights received upon obtaining an NFT and the reality of what has been received. A major consumer protection issue in the metaverse is misrepresentation. NFT platforms often directly promote NFTs as being capable of conveying more than what the law will allow or send mixed messages about what is being offered and what the buyer will obtain [63]. Concurrent with claims of misrepresentation is the duty of performing due diligence. Sufficiently evaluating investments in the metaverse will require an understanding of the custody of the digital asset and the terms and conditions of the platform. Failure to perform the required due diligence to become familiar with those terms and conditions can severely undermine a claim of misrepresentation when the person who thought he or she acquired ownership of 100 parcels in the metaverse as evidenced by the NFT acquired from the platform one day learns that he or she no longer has access to that platform's metaverse. Courts will apply traditional principles of contract law to address contract disputes—even those disputes arising in the metaverse. Why? Because those disputes will be anchored to the contracts entered between the purchaser and the platform when acquiring the NFT that represents the purchaser's "ownership" of assets within the metaverse.

Without question, the federal government has the authority to investigate and pursue legal action in claims of deceptive trade practice against metaverse platforms. The Federal Trade Commission is empowered to police unfair and deceptive trade practices under Section 5 of the Federal Trade Commission Act. Also, many states authorize their state attorney general to act against unfair and deceptive trade practices under similar statutes. Missouri for example authorizes investigations and action by the state attorney general under the Missouri Merchandising Practices Act. But reliance on government to address claims of deceptive trade practices is not always practical. To be sure, one train of thought rejects the idea of governmental involvement when claims arise in the NFT market and suggests that such disputes are best left to be resolved by the private parties involved. Given a strong line of cases issued in recent years by the United States Supreme Court, purchasers of NFT real estate and other digital assets in the metaverse who seek to litigate claims against the metaverse platforms in courts of law will encounter a major obstacle commonly found in contracts today—mandatory arbitration and class action waiver provisions.

Nearly all the NFT minting platforms contain mandatory arbitration and class action waiver provisions in their service contracts [63]. Beginning with *AT & T Mobility LLC v. Conception*, 563 U.S. 333 (2011), continuing with *Epic Systems Inc. v. Lewis*, 584 U.S., 138 S. Ct. 1612, 200 L. Ed. 2D 889 (2018) and most recently in *Viking River Cruises Inc. v. Angie Moriana*, 596 U.S., 142 U.S. 1906 (2022), the Supreme Court has consistently reaffirmed the validity and enforceability of such provisions under the Federal Arbitration Act (FAA), "which makes arbitration agreements 'valid, irrevocable and enforceable, save upon such

grounds as exist in law or in equity for the revocation of any contract.” *Viking River Cruises* 142 U.S. at 1917, citing 9 U.S.C. Section 2. The prolific use of these mandatory clauses in contracts today has brought increased judicial scrutiny of such clauses. Such scrutiny has critically reviewed and sometimes voided mandatory arbitration and class action waiver clauses on common law contract principles (most often because the agreement lacked consideration, or because the terms of the agreement were found to be unconscionable). Like any contract, arbitration agreements may be invalidated by generally applicable contract defenses such as fraud, duress or unconscionability. *Rent-A-Center West, Inc. v. Jackson*, 130 S.Ct, 2772 (2010). But this same scrutiny has also reinforced the pre-emptive force of the FAA. Specifically, the FAA generally requires courts of both federal and state jurisdiction to uphold such provisions, and likewise curbs the power of state legislatures to enact legislation either limiting or invalidating mandatory arbitration and class action waiver provisions contained within an otherwise valid contract. Given the Supreme Court’s recurrent judicial pronouncements reaffirming the pre-emptive force of the FAA, and absent congressional action amending it, conflict and disputes within the metaverse seem destined to be addressed within the more private and confidential arena of arbitration—an arena exempt from procedural and evidentiary rules and not limited by the boundaries of judicial precedent.

Generally, arbitration exists as an alternative form of dispute resolution—allowing parties to seek redress of claims outside of litigation in the courts. The parties choose an arbitrator who will conduct a hearing, take evidence, and make a binding decision on them. An arbitration award is final and is subject to appeal in only limited circumstances. While arbitration proceedings may be subject to the rules of organizations such as the American Arbitration Association or the International Council for Commercial Arbitration, to name just a few, arbitration proceedings are conducted outside of the oversight or supervision of the courts.

Until statutes and regulations are enacted to address transactions and conduct within the NFT metaverse, traditional application of law will be the primary means to try to tame the Wild West. Even applying the common law principles of contract law provides a limited safety net for persons and entities within the metaverse given the prevalence of mandatory arbitration and class action waivers and the judicial enforcement of such provisions. While common law principles of torts such as fraud and misrepresentation may provide a means for parties to avoid mandatory arbitration and pursue their claims in a court of law, the broad scope of many mandatory arbitration provisions applying to “any and all claims related to a transaction” will encompass even tort claims. Moreover, courts do not countenance arguments predicated upon a party’s failure to know of the existence of contract term when the party could have learned of the term by reading the contract. A person signing an agreement has a duty to read it and may not avoid the consequences of the agreement. By claiming he or she did not know its contents. *Chochorowski v. Home Depot U.S.A.* 440 S.W. 3D 220 (Mo.

banc 2013). Neither the length nor complexity of the terms of service of an NFT platform will exempt a party from its legal obligation to read the terms of the contract—no matter what may have been said or promised in prior discussions, brochures, or negotiations. As a purchaser of real estate in the metaverse, you will be held to have agreed to the terms expressly set forth in the written agreement—whether you read them or not. Another common argument presented by those parties seeking to avoid mandatory arbitration or participate in class action litigation is that such terms were non-negotiable given their lack of bargaining power and, therefore, the mandatory provisions should be void as a contract of adhesion. Missouri has codified the principle that agreements to arbitrate obtained through a contract of adhesion are invalid (Section 435.020 RSMo). In states not codifying the invalidity of arbitration agreements resulting from contracts of adhesion, the doctrine of adhesion does not automatically invalidate an arbitration agreement but is a factor in determining if a contract is so unconscionable that it will not be enforced. A contract of adhesion is manifested by a form contract that is created and imposed by the stronger party of the relationship and presented on a “take it or leave it” proposition. But evidence that parties did not negotiate contract terms is not sufficient proof that the contract’s terms were not negotiable. *State ex rel. Vincent v. Schneider*, 194 S. W. 3D 853, 857-858 (Mo banc 2006). Claims that mandatory arbitration provisions should be voided as contracts of adhesion have had limited success in the courts when the party seeking to avoid arbitration is a sophisticated party. The fundamental principle of freedom of contract prevails in arm’s length transactions between sophisticated parties. Agreements negotiated by sophisticated parties are generally enforced according to the terms of the agreement. Absent any countervailing public policy concerns, there is no reason to relieve the parties of the consequences of their bargain. *159 MP Corp. v. Redbridge Bedford LLC*, 33 N. Y. 3D 353, 128 N. E. 3D 128 (2019). A reasonable argument can be made that parties doing business in the metaverse are not average unsophisticated consumers and will have significant challenges in voiding a mandatory arbitration or class action waiver clause.

4. Conclusion

The volatility in the market can be evinced by recent events. NFTs sales witnessed a dramatic downturn at the outset of October 2022. Reuters reported a 60% drop in the third quarter from the second [64]. Directly after the report, and following American Express, Visa (V) filed two trademark applications for digital wallets and non-fungible tokens to operate within the metaverse. The application includes a management system for digital transactions and the use of a digital currency wallet and storage service. Additionally, using blockchain technology, Visa will also allow consumers to purchase “non-downloadable virtual goods” and collectible NFTs in a virtual environment [65]. Two weeks later, Apple banned NFT functionality on all iOS devices, including iPhone and iPad in order to avoid continued revenue losses [66]. Mere days later on November 11,

2022, the cryptocurrency company FTX, who had partnered with Alameda Research, filed for Chapter 11. The collapse led to calls for more regulation in crypto exchange and illustrates the pendulum that continues to swing between centralization and decentralization in the metaverse [67]. If past examples are heeded as cautionary tales, as this paper argues, the technology industry and regulators need to consider these inevitable scenarios from the outset. Additionally, the legal precedents, along with those emerging, must be considered when determining the best regulatory course. A clear legal understanding of the regulatory undergirding of the metaverse will be crucial. Technology alone will not pave the way for true ownership of digital assets in the metaverse. NFTs cannot bypass the centralized control that metaverse platforms currently have and will continue to have under their contractual terms of service. These terms of service themselves present a number of issues as the courts better define how ownership in a metaverse will work and be enforced. Future research should include a consideration of the impact of blockchain and contractual issues to regulate terms of service as in other industries, such as communication. Looking ahead, the metaverse is inevitable but the question remains whether it will be decentralized or centralized within existing corporation control. In the end, technological innovation must be accompanied by legal reform in order to ensure a free, open, and interoperable metaverse can exist.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

- [1] Quiroz-Guitierrez, M. (2022) This Week in the Metaverse: ‘Metaverse’ Could Be Word of the Year, Johnnie Walker Launches an NFT, and Mattel Creates an NFT Marketplace. Fortune Crypto. <https://fortune.com/crypto/2022/11/25/this-week-in-the-metaverse-johnnie-walker-oxford-rockstar-games/>
- [2] Ball, M. (2022) *The Metaverse and How It Will Revolutionize Everything*. Liveright Publishing, W.W. Norton & Company, New York.
- [3] Valaskova, K., Machova, V. and Lewis, E. (2022) Virtual Marketplace Dynamics Data, Spatial Analytics, and Customer Engagement Tools in a Real-Time Interoperable Decentralized Metaverse. *Linguistic and Philosophical Investigations*, **21**, 105-120. <https://doi.org/10.22381/lpi2120227>
- [4] Hollensen, S., Kotler, P. and Opresnik, M.O. (2022) Metaverse—The New Marketing Universe. *Journal of Business Strategy*. <https://doi.org/10.1108/JBS-01-2022-0014>
- [5] Berg, C., Davidson, S. and Potts, J. (2019) Blockchain Technology as Economic Infrastructure: Revisiting the Electronic Markets Hypothesis. *Frontiers in Blockchain*, **2**, Article 22. <https://doi.org/10.3389/fbloc.2019.00022>
- [6] Gadekallu, T.R., Pham, Q.-V., Nguyen, D.C., Maddikunta, P.K.R., Deepa, N., Prabadevi, B., Pathirana, P.N., Zhao, J. and Hwang, W.-J. (2022) Blockchain for Edge of Things: Applications, Opportunities, and Challenges. *IEEE Internet of Things*

- Journal*, **9**, 964-988. <https://doi.org/10.1109/IIOT.2021.3119639>
- [7] Yang, Q., Zhao, Y., Huang, H., Xiong, Z., Kang, J. and Zheng, Z. (2022) Fusing Blockchain and AI with Metaverse: A Survey. *IEEE Open Journal of the Computer Society*, **3**, 122-136. <https://doi.org/10.1109/OJCS.2022.3188249>
- [8] Avital, M., King, J.L., Beck, R., Rossi, M. and Teigland, R. (2016) Jumping on the Blockchain Bandwagon: Lessons of the Past and Outlook to the Future. *Proceedings of the 37th International Conference on Information Systems*, Dublin, 11-14 December 2016, 1-6.
- [9] Rückeshäuser, N. (2017) Do We Really Want Blockchain-Based Accounting? Decentralized Consensus as Enabler of Management Override of Internal Controls. *Proceedings of the 13th International Conference on Wirtschaftsinformatik*, St. Gallen, 12-15 February 2017, 16-30.
- [10] Weber, I., Xu, X., Riveret, R., Governatori, G., Ponomarev, A. and Mendling, J. (2016) Untrusted Business Process Monitoring and Execution. In: La Rosa, M., Loos, P. and Pastor, O., Eds., *Business Process Management. BPM 2016. Lecture Notes in Computer Science*, Vol. 9850, Springer, Cham, 329-347. https://doi.org/10.1007/978-3-319-45348-4_19
- [11] Nakamoto, S. (2008) Bitcoin: A Peer-to-Peer Electronic Cash System. *Decentralized Business Review*, 21260.
- [12] Alt, R. and Puschmann, T. (2016) Bankmodell. In: *Digitalisierung der Finanzindustrie*, Springer Gabler, Berlin, 55-117. https://doi.org/10.1007/978-3-662-50542-7_2
- [13] Möser, M., Böhme, R. and Breuker, D. (2013) An Inquiry into Money Laundering Tools in the Bitcoin Ecosystem. *Proceedings of 2013 APWG eCrime Researchers Summit*, San Francisco, 17-18 September 2013, 1-14. <https://doi.org/10.1109/eCRS.2013.6805780>
- [14] Foley, S., Karlsen, J. and Putniņš, T. (2018) Sex, Drugs, and Bitcoin: How Much Illegal Activity Is Financed through Cryptocurrencies? *Review of Financial Studies, Forthcoming*. <https://doi.org/10.2139/ssrn.3102645>
- [15] Fanusie, Y. and Robinson, T. (2018) Bitcoin Laundering: An Analysis of Illicit Flows into Digital Currency Services. Center on Sanctions & Illicit Finance, Washington DC.
- [16] Carstens, A. (2018) Money in the Digital Age: What Role for Central Banks? Lecture at the House of Finance, Goethe University, Frankfurt.
- [17] Landau, J.-P. and Genais, A. (2018) Les Crypto-Monnaies. Rapport au Ministre de l'Économie et des Finances. Ministre de l'Économie et des Finances, Paris.
- [18] Auer, R. and Claessens, S. (2018) Regulating Cryptocurrencies: Assessing Market Reactions. *BIS Quarterly Review*, September, 51-65.
- [19] PROFILEmiami (2022) Take a First Look at 'Metareal' Mansion to Be Sold via NFT as Real Home and Digital Twin in the Metaverse. <https://profilemiamire.com/miamirealestate/2022/8/11/take-a-first-look-at-metareal-mansion-to-be-sold-via-nft-as-real-home-and-digital-twin-in-metaverse>
- [20] Marinotti, J. (2022) Can You Truly Own Anything in the Metaverse? A Law Professor Explains How Blockchains and NFTs Don't Protect Virtual Property. Market Watch. <https://www.marketwatch.com/story/can-you-truly-own-anything-in-the-metaverse-a-law-professor-explains-how-blockchains-and-nfts-dont-protect-virtual-property-11650559724#:~:text=When%20you%20buy%20an%20item,a%20unique%20string%20of%20bits>

- [21] Ravenscraft, E. (2021) The Metaverse Land Rush Is an Illusion. *Wired*. <https://www.wired.com/story/metaverse-land-rush-illusion/>
- [22] Tidy, J. (2022) Billions Being Spent in Metaverse Land Grab. *BBC News*. <https://www.bbc.com/news/technology-63488059>
- [23] Auer, R. (2019) Embedded Supervision: How to Build Regulation into Blockchain Finance. Federal Reserve Bank of Dallas, Dallas. <https://doi.org/10.24149/gwp371>
- [24] Elm, M. and Montez, T. (2022) The Banking Head of Digital's Five-Year Innovation Strategy: A Playbook for Open Finance, AI, the Metaverse and beyond. *Insider Intelligence eMarketer*, New York.
- [25] Chao, C.-H., Ting, I.-H., Tseng, Y.-J., Wang, B.-W., Wang, S.-H. and Wang, Y.-Q. (2022) The Study of DeFi in Virtual Community and Financial Supervision. *Proceedings of the 9th Multidisciplinary International Social Networks Conference*, Matsuyama, 29-31 October 2022, 74-80. <https://doi.org/10.1145/3561278.3561297>
- [26] Turdialiev, M.A. (2022) The Legal Issues of the Metaverse and Perspectives of Establishment of International Financial Center in Metaverse. *Oriental Renaissance: Innovative, Educational, Natural and Social Sciences*, **2**, 239-249.
- [27] Bourlakis, M., Papagiannidis, S. and Li, F. (2009) Retail Spatial Evolution: Paving the Way from Traditional to Metaverse Retailing. *Electronic Commerce Research*, **9**, 135-148. <https://doi.org/10.1007/s10660-009-9030-8>
- [28] Hackl, C. (2020) The Metaverse Is Coming and It's a Very Big Deal. *Forbes*. <https://www.forbes.com/sites/cathyhackl/2020/07/05/the-metaverse-is-coming--its-a-very-big-deal/?sh=1f4c347a440f>
- [29] Rospigliosi, P.A. (2022) Metaverse or Simulacra? Roblox, Minecraft, Meta and the Turn to Virtual Reality for Education, Socialisation and Work. *Interactive Learning Environments*, **30**, 1-3. <https://doi.org/10.1080/10494820.2022.2022899>
- [30] Strobel, J. and Hawkins, C. (2022) Designing in Second Life: Identity Construction and Learning in a Virtual Informal Environment. *Journal of Online Engineering Education*, **1**, Article 2.
- [31] Fernandes, A. and Chatterjee, S. (2022) Possibilities of Metaverse: The Second Life. *International Journal of Engineering and Management Research*, **12**, 79-82.
- [32] Harris, K., Harris, R. and Baron, S. (2001) Customer Participation in Retail Service: Lessons from Brecht. *International Journal of Retail and Distribution Management*, **29**, 359-369. <https://doi.org/10.1108/09590550110396845>
- [33] Papagiannidis, S. and Bourlakis, M.A. (2010) Staging the New Retail Drama: At a Metaverse near You! *Journal of Virtual Worlds Research*, **2**, 425-446. <https://doi.org/10.4101/jvwr.v2i5.808>
- [34] Haig, M. (2001) Talking to the Teen Generation. In: *Brand Strategy*, Henry Stewart Publications, London, 30.
- [35] Ahn, S.J., Kim, J. and Kim, J. (2022) The Bifold Triadic Relationships Framework: A Theoretical Primer for Advertising Research in the Metaverse. *Journal of Advertising*, **51**, 592-607. <https://doi.org/10.1080/00913367.2022.2111729>
- [36] Popescu, G.H., Valaskova, K. and Horak, J. (2022) Augmented Reality Shopping Experiences, Retail Business Analytics, and Machine Vision Algorithms in the Virtual Economy of the Metaverse. *Journal of Self-Governance & Management Economics*, **10**, 67-81. <https://doi.org/10.22381/jsme10220225>
- [37] Jha, S.K. and Kumar, S.S. (2022) Cybersecurity in the Age of the Internet of Things: An Assessment of the Users' Privacy and Data Security. In: Jeena Jacob, I., Gonzalez-Longatt, F.M., Kolandapalayam Shanmugam, S. and Izonin, I., Eds., *Expert*

- Clouds and Applications. Lecture Notes in Networks and Systems*, Vol. 209, Springer, Singapore, 49-56. https://doi.org/10.1007/978-981-16-2126-0_5
- [38] Dwivedi, Y.K., Hughes, L., Baabdullah, A.M., Ribeiro-Navarrete, S., Giannakis, M., Al-Debei, M.M., et al. (2022) Metaverse beyond the Hype: Multidisciplinary Perspectives on Emerging Challenges, Opportunities, and Agenda for Research, Practice and Policy. *International Journal of Information Management*, **66**, Article ID: 102542. <https://doi.org/10.1016/j.ijinfomgt.2022.102542>
- [39] Koos, S. (2021) Artificial Intelligence as Disruption Factor in the Civil Law: Impact of the Use of Artificial Intelligence in Liability, Contracting, Competition Law and Consumer Protection with Particular Reference to the German and Indonesian Legal Situation. *Yuridika*, **36**, 235-262. <https://doi.org/10.20473/ydk.v36i1.24033>
- [40] Greenstein, S. (2022) Preserving the Rule of Law in the Era of Artificial Intelligence (AI). *Artificial Intelligence and Law*, **30**, 291-323. <https://doi.org/10.1007/s10506-021-09294-4>
- [41] Belk, R., Humayun, M. and Brouard, M. (2022) Money, Possessions, and Ownership in the Metaverse: NFTs, Cryptocurrencies, Web3 and Wild Markets. *Journal of Business Research*, **153**, 198-205. <https://doi.org/10.1016/j.jbusres.2022.08.031>
- [42] Parloff, R. (2006) Anshe Chung: First virtual Millionaire. *Fortune*. <https://fortune.com/2006/11/27/anshe-chung-first-virtual-millionaire/>
- [43] Johnson, M.L. (2022) Where in the World Are These Worlds? In: *Social Virtual Worlds and Their Places*, Palgrave Macmillan, Singapore, 55-123. https://doi.org/10.1007/978-981-16-8626-9_2
- [44] Demchenko, O. (2022) Electronic Commerce in the Gaming Industry. The Applicability of Consumer Protection Framework and Legal Challenges. University of Pécs, Pécs.
- [45] Kılınç, Ü. (2022) Metaverse üzerinden arsa satılan platformlar. <https://www.webtekno.com/metaverse-evreninden-arsa-satin-alabileceginiz-platformlar-h119400.html>
- [46] Eryılmaz, H. (2021) Metaverse Arsa Alma Gerçek Oluyor—Bloktopia Arsa Satışlarına Başlıyor. Bitcoin Yorum. <https://bitcoinyorum.com/2021/10/14/metaverse-arsa-alma-gercek-oluyor-bloktopia-arsa-satislarina-basliyor/>
- [47] Türk, T. (2022) The Concept of Metaverse, Its Future and Its Relationship with Spatial Information. *Advanced Geomatics*, **2**, 17-22.
- [48] Christodoulou, K., Katelaris, L., Themistocleous, M., Christodoulou, P. and Iosif, E. (2022) NFTs and the Metaverse Revolution: Research Perspectives and Open Challenges. In: Lacity, M.C. and Treiblmaier, H., Eds., *Blockchains and the Token Economy. Technology, Work and Globalization*, Palgrave Macmillan, Cham, 139-178. https://doi.org/10.1007/978-3-030-95108-5_6
- [49] Au, A. (2022) Cryptocurrencies and the Promise of Individual Economic Sovereignty in an Age of Digitalization: A Critical Appraisal. *The Sociological Review*. <https://doi.org/10.1177/00380261221127858>
- [50] Obar, J. and Oeldorf-Hirsch, A. (2020) The Biggest Lie on the Internet: Ignoring the Privacy Policies and Terms of Service Policies of Social Networking Services. *Information, Communication & Society*, **23**, 128-147. <https://doi.org/10.1080/1369118X.2018.1486870>
- [51] Marinotti, J. (2020), Tangibility as Technology. 37(3) Georgia State University Law Review 671 (2021), Indiana Legal Studies Research Paper No. 445, 671-738. <https://doi.org/10.2139/ssrn.3682090>

- [52] Rustad, M.L. and Onufrio, M.V. (2011) Reconceptualizing Consumer Terms of Use for a Globalized Knowledge Economy. *University of Pennsylvania Journal of Business Law*, **14**, 1085-1190.
- [53] Osmani, M., El-Haddadeh, R., Hindi, N., Janssen, M. and Weerakkody, V. (2020) Blockchain for Next Generation Services in Banking and Finance: Cost, Benefit, Risk and Opportunity Analysis. *Journal of Enterprise Information Management*, **34**, 884-899. <https://doi.org/10.1108/JEIM-02-2020-0044>
- [54] Demirgüç-Kunt, A., Klapper, L., Singer, D. and Ansar, S. (2022) The Global Findex Database 2021: Financial Inclusion, Digital Payments, and Resilience in the Age of COVID-19. World Bank Publications, Washington DC. <https://doi.org/10.1596/978-1-4648-1897-4>
- [55] Agur, I., Ari, A. and Dell’Ariccia, G. (2022) Designing Central Bank Digital Currencies. *Journal of Monetary Economics*, **125**, 62-79. <https://doi.org/10.1016/j.jmoneco.2021.05.002>
- [56] Kshetri, N. (2021) Blockchain Technology for Improving Transparency and Citizen’s Trust. In: Arai, K., Ed., *Advances in Information and Communication. FICC 2021. Advances in Intelligent Systems and Computing*, Vol. 1363, Springer, Cham, 716-735. https://doi.org/10.1007/978-3-030-73100-7_52
- [57] Çubuk, E.B.S., Zeren, H.E. and Demirdöven, B. (2023) The Role of Data Governance in Cybersecurity for E-Municipal Services: Implications from the Case of Turkey. In: Saeed, S., Almuhaideb, A.M., Zaman, N. and Zikria, Y.D., Eds., *Handbook of Research on Cybersecurity Issues and Challenges for Business and FinTech Applications*, IGI Global, Pennsylvania, 410-425. <https://doi.org/10.4018/978-1-6684-5284-4.ch020>
- [58] Wiederhold, B.K. and Riva, G. (2021) Virtual Reality Therapy in the Metaverse: Merging VR for the Outside with VR for the Inside. *Annual Review of CyberTherapy and Telemedicine*, **19**, 3-9. https://vrphobia.com/wp-content/uploads/2022/06/ARCTT_2021.pdf#page=23
- [59] Tayal, S., Rajagopal, K. and Mahajan, V. (2022) Virtual Reality Based Metaverse of Gamification. 2022 6th International Conference on Computing Methodologies and Communication (ICCMC), Erode, 29-31 March 2022, 1597-1604. <https://doi.org/10.1109/ICCMC53470.2022.9753727>
- [60] Kshetri, N., Bhusal, C.S. and Chapagain, D. (2021) BCT-AA: A Survey of Blockchain Technology-Based Applications in Context with Agribusiness. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.3834004>
- [61] Sabry, S.S., Kaittan, N.M. and Majeed, I. (2019) The Road to the Blockchain Technology: Concept and Types. *Periodicals of Engineering and Natural Sciences*, **7**, 1821-1832. <https://doi.org/10.21533/pen.v7i4.935>
- [62] Kshetri, N. (2022) The Global Rise of Online Devices, Cyber Crime and Cyber Defense: Enhancing Ethical Actions, Counter Measures, Cyber Strategy, and Approaches. University of Missouri, St. Louis.
- [63] Moringiello, J.M. and Odinet, C.K. (2022) The Property Law of Tokens. 74 Florida Law Review 607, U Iowa Legal Studies Research Paper No. 2021-44, Widener Law Commonwealth Research Paper, 607-671. <https://doi.org/10.2139/ssrn.3928901>
- [64] Howcroft, E. (2022) NFT Sales Plunge in Q3, down by 60% from Q2. Reuters. <https://www.reuters.com/technology/nft-sales-plunge-q3-down-by-60-q2-2022-10-03/>
- [65] Bellusci, M. (2022) Visa Files Trademark Applications for Crypto Wallets, NFTs and the Metaverse. CoinDesk.

- <https://www.coindesk.com/business/2022/10/28/visa-files-trademark-applications-for-crypto-wallets-nfts-and-the-metaverse/>
- [66] Nelson, D. (2022) Apple Refuses to Exempt NFTs from App Store's 30% Fee. CoinDesk.
<https://www.coindesk.com/business/2022/10/24/apple-refuses-to-exempt-nfts-from-app-stores-30-fee/>
- [67] Allen, M. (2022) Can Switzerland Benefit from the FTX Crypto Crash? SWI.
<https://www.swissinfo.ch/eng/business/can-switzerland-benefit-from-the-ftx-crypto-crash-/48068900>