

Prospects and Legal Challenges Regarding Intellectual Property Rights in Metaverse Operations in Nigeria



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Abstract

The Metaverse concept is regarded as a virtual reality where the lines between imagination and reality interact and blend with ease. However, the Metaverse concept tends to seem promising not just a digital revolution but an entire universe of immersive encounters. However, despite the relevance and potential, there are challenges and potential conflicts arising from integrating Metaverse technologies with the traditional legal frameworks governing intellectual property in Nigeria. Concerning this, the study examines the rising prominence of the Metaverse and the need for a comprehensive examination of its potential on intellectual property rights in Nigerian legal framework. The study adopts a hybrid method of study, and 348 questionnaires were sent to respondents residing in Nigeria. The results generated were analyzed using a descriptive and analytical method. Findings reveal the complicated connection between Metaverse technologies and established intellectual property norms. The study also elucidates other challenges, such as virtual property rights and the replication of real-world intellectual property in virtual environments, emphasizing the necessity for adaptive legal frameworks in Nigeria. The study therefore concludes and recommends there is a need for adaptive legal frameworks and formulation of specialized regulations for intellectual property within the Metaverse, and proactive measures to anticipate and address emerging challenges.

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1. Introduction

The evolution of the metaverse from being a mere fictional idea to becoming a real platform that creates a virtual space for people to interact with digital things and acquire intriguing digital experiences by making use of virtual reality and the internet has proven to be an intriguing achievement in the digital world. Many countries including Nigeria have begun developing plans for how to integrate the metaverse concept into the different aspects of the economy.¹ This development poses several enticing possibilities as well as challenges for Nigeria as well as other countries. It seems like Nigeria has reached a juncture at which

¹ Jooyoung Kim, 'Advertising in the Metaverse: Research Agenda', *Journal of Interactive Advertising*, 21.3 (2021), pp. 141–44, doi:10.1080/15252019.2021.2001273.

point it must determine how to deal with the dynamic and evolving digital world. Hence, introducing the metaverse concept into the different facets of the Nigerian economy is one that requires careful planning because although the idea brings with it immense potential, one cannot help but also consider carefully the risks, dangers, and complexities that will be posed by it to Nigeria as a nation.²

It is important to note that as Nigeria navigates the virtual realms of the metaverse, one important aspect that requires significant consideration is the issue of intellectual property rights. Incorporating the metaverse in our ways of doing things in Nigeria transcends identifying and harnessing the numerous potentials and possibilities within the digital world ; it includes recognizing the need for and developing well-defined laws and legal frameworks to regulate this new aspect. These frameworks are essential for determining ownership, protecting new ideas, and ensuring the security of innovations in Nigeria. The dynamic and evolving nature of the metaverse introduces challenges that have never been encountered or dealt with in Nigeria thus creating the need to reassess the Nigerian legal position as it relates to intellectual property.³

This shift prompted this study to delve deeper into the legal foundations governing digital assets and virtual creations, as the traditional understanding may no longer suffice. It is therefore apparent that adapting the current Nigerian legal system to suit the new development is necessary to adequately safeguard the interest of those that will be engaged in any activity whether economic or otherwise that will be carried out within this novel digital realm and this further exposes the complexities embedded in the transformative landscape of the metaverse. In this regard, the need for the adjustment of the current Nigerian legal system becomes more apparent as it cannot be denied that Nigeria needs to establish a robust framework that will help address and curb the inherent challenges and complexities involved in this evolving digital frontier. The need for adopting a nuanced approach to intellectual property rights is evident and this does not only pertain to a legal evolution but also a cultural and systemic shift to ensure the comprehensive protection of creators' and investors' rights in this new digital era.⁴

In addition, it suffices to state that at the core of this discourse is the fact that a comprehensive understanding of the possibilities and legal issues surrounding Intellectual Property Rights in the Metaverse concept is nonnegotiable for Nigeria's seamless and sustainable integration into the digital realm. By examining the prospects and challenges

² Hilmi Tunahan Akkus and others, 'Metaverse and Metaverse Cryptocurrencies (Meta Coins): Bubbles or Future', *Pressacademia*, published online March 2022, doi:10.17261/Pressacademia.2022.1542.

³ Alanah Davis and others, 'Avatars, People, and Virtual Worlds: Foundations for Research in Metaverses', *Journal of the Association for Information Systems*, 10.2 (2009), pp. 90–117, doi:10.17705/1jais.00183.

⁴ Safari Kasiyanto and Mustafa R. Kilinc, 'Legal Conundrums of the Metaverse', *Journal of Central Banking Law and Institutions*, 1.2 (2022), pp. 299–322, doi:10.21098/jcli.v1i2.25.

existing in this digital landscape, it aims for a legal framework that not only protects the rights of innovators, investors, and users but also fosters a conducive environment for developing and thriving technological advancement within the Nigerian Metaverse. This profound comprehension forms the foundation upon which strategic planning, adaptable legal frameworks, cultural shifts, and collaborative efforts can be built to ensure that the inclusion of the Metaverse into Nigeria's socio-economic ecosystem brings about a positive transformation within the Nigerian economy and technological landscape.⁵

However, it suffices to state that several study has contributed to the concept of metaverse, in this regard, it will be relevant examine some of this literatures as concern this study. Providing an overview of its evolution, applications, and challenges concerning various fields, literature on the metaverse. Huang et al. serve as a groundwork to an understanding of the metaverse by mapping the birth, essential elements, and technologies under it. The authors argue that the metaverse is a giant jump in the evolution of the internet, where virtual reality, cryptocurrencies, and social media come under the same umbrella. The study notes that there is a need for industrial investment, regulatory frameworks, and technological progress towards realizing the full potential of the metaverse.⁶

Likewise, Koohang et al. describe a multidisciplinary view of how the metaverse features in various industries, including marketing, healthcare, education, and human resource management. Their work accentuates the transforming potential for the scenario created by the metaverse while also raising some concerns, such as limitations in technology and regulatory aspects involved. In an extensive survey, Wang et al. identified the types of technology converging to form the metaverse, its viability as a social platform, and its transcendence of spatial and temporal limitations. Transportation provides a detailed analysis of governmental policies and organizational strategies further establishing the metaverse as an emerging digital ecosystem with significant socio-economic implications. The general metaverse applications are extending to specific areas, such as agriculture and urban development.⁷

Chen et al. are working on an agricultural metaverse that reflects the discussion on enhancing some farming practices using features such as blockchain, AI, and digital twins. This includes applications such as virtual farming, agricultural education, and product traceability, but notes the technical and infrastructural problems in implementing it.

⁵ Thorsten J Gorny, 'AML Regulations and the Metaverse', Sanctions.Io., 2022, p. 1.

⁶ Russell Belk, Mariam Humayun, and Myriam Brouard, 'Money, Possessions, and Ownership in the Metaverse: NFTs, Cryptocurrencies, Web3 and Wild Markets', *Journal of Business Research*, 153.August (2022), pp. 198–205, doi:10.1016/j.jbusres.2022.08.031.

⁷ Sascha Kraus and others, 'Facebook and the Creation of the Metaverse: Radical Business Model Innovation or Incremental Transformation?', *International Journal of Entrepreneurial Behavior & Research*, 28.9 (2022), pp. 52–77, doi:10.1108/IJEBR-12-2021-0984.

Similarly, Allam et al. interrogate the role of the metaverse in smart cities and how it will change urban planning and service provision.⁸ Opportunities arise, such as better urban efficiency and sustainability, in these topics, as well as challenges, such as ethical issues and societal implications. Taken together, these studies show that although the metaverse affords a broad scope for innovation, its execution will involve major technical, regulatory, and ethical barriers across sectors. In this regard, it suffices to state that none of the authors delve into intellectual property rights in the metaverse, which is the crux of this study. It is with due regard to the above, that this study seeks to embark on a hybrid method of study in appraising the prospect and legal challenges as it relates to the issue of intellectual property rights arising from the operation of the Metaverse in Nigeria.

2. Research Method

In undertaking an appraisal of the prospect and legal challenges as it relates to the issue of intellectual property rights arising from the operation of the metaverse in Nigeria, a methodological approach is adopted to ensure a comprehensive and ethical exploration. To adequately consider the multiple facets of this study, a hybrid research method is embraced, incorporating both doctrinal and non-doctrinal methodologies.⁹ This hybrid research methodology enables an all-encompassing investigation into the existing legal framework while also taking into cognizance the interests of stakeholders within the Metaverse system. The doctrinal approach involves a thorough analysis of primary legal sources pertinent to Intellectual Property Rights in Metaverse operations. This includes an in-depth examination of existing laws, regulations, and judicial precedents related to virtual assets and intellectual property in Nigeria. Additionally, the works of several authors which borders on the operation of the Metaverse is reviewed to gain insights into the evolving legal issues and challenges intertwined with the Metaverse-related intellectual property issues.

The non-doctrinal approach on the other hand is employed to gather firsthand experience and opinions from relevant stakeholders. An online questionnaire survey, facilitated through Google Forms, serves as a tool for data collection. This method is designed to capture the sentiments, experiences, and perspectives of individuals actively involved in or affected by Metaverse operations in Nigeria, including creators, investors, legal experts, entrepreneurs, and other users or consumers. The data generated from the survey will then be analyzed through a descriptive and systematic method to identify the existing prospects and legal issues faced by stakeholders in the realm of Intellectual Property Rights within the Metaverse. This systematic method ensures a structured evaluation of responses, identifying trends, concerns, and potential remedies while sifting and distilling meaningless trends or

⁸ Richard Marley, 'METAVERSE AND MONEY LAUNDERING – HOW SHUFTI PRO'S AML SCREENING HELPS', Shufti Pro., 2022, p. 1.

⁹ Amirudin and Zainal Asikin, *Pengantar Metode Penelitian Hukum*, Cetakan ke (Rajawali Press, 2018).

opinions about the metaverse operations.¹⁰ The non-doctrinal method seeks to highlight the practical and real-world implications of intellectual property issues within the Metaverse. It aims to provide a working understanding of the risks and challenges faced by innovators, investors, legal practitioners, entrepreneurs, and users while also proffering possible solutions to these problems and ways to enhance the legal framework governing Metaverse operations in Nigeria.

The findings drawn from the doctrinal and non-doctrinal research methods form the basis for informed conclusions and recommendations. This comprehensive approach ensures a thorough comprehension of the prospect and legal intricacies as it relates to the issue of intellectual property rights arising from the operation of the Metaverse in Nigeria.

3. Results and Discussion

The Concept and complexities surrounding intellectual property rights in the Metaverse in Nigeria

The metaverse being an interconnection of physical and virtual reality creates a realm of digital experiences, innovations, and virtual assets . Within this digital realm, the concept of intellectual property rights takes on a more dynamic and intricate role thus necessitating the need for a comprehensive understanding of the operation of the Metaverse to easily navigate through the complexities surrounding virtual property, digital creations, and innovation within the realm . Within the Metaverse, the ownership and protection of intellectual creations exceed the traditional boundaries obtainable in the physical realm . In this regard, the Metaverse demands a vast comprehension of the concept of Intellectual Property Rights to protect and promote creativity . The metaverse introduces new facets of IPR as digital creation, virtual assets, digital currencies, etc. become integral components of the new landscape . Furthermore, the traditional framework governing intellectual property may not adequately meet the demands of this virtual realm as the Metaverse requires a sophisticated approach to legal and ethical considerations surrounding IPR to create a balance between fostering innovation and safeguarding the rights and interests of creators, innovators, and users within the Metaverse.¹¹

In Nigeria, Intellectual Property Rights encompass various forms such as copyrights, trademarks, and patents . In this virtual domain, creators and innovators contribute to a diverse range of unique digital content, spanning from virtual goods and designs to immersive experiences that redefine the boundaries of creativity . Amongst these rights,

¹⁰ Jonaedi Efendi and Jonhny Ibrahim, *Metode Penelitian Hukum Normatif Dan Empiris*, cetakan ke (Kencana, 2020).

¹¹ Hanita Mayasari, 'A Examination on Personal Data Protection in Metaverse Technology in Indonesia : A Human Rights Perspective', *Journal of Law, Environmental and Justice*, 1.1 (2023), pp. 64–85, doi:10.62264/jlej.v1i1.4.

copyright emerges as a vital facet of protecting intellectual creations within this digital realm. In the Metaverse copyrights play a crucial role in giving creators and innovators within this digital world exclusive rights over their creations . This exclusivity includes the right to control the reproduction, distribution, and display of their digital works to prevent the unlawful exploitation of a person's intellectual work by others . Also, copyrights create an avenue for creators and innovators within the Nigerian Metaverse to assert ownership over their virtual creations and also derive economic benefits from their intellectual works . This recognition and protection of digital intellectual property rights create a conducive environment for sustained innovation, encouraging creators to contribute meaningfully to the evolving digital landscape while fostering a balance between creativity and legal safeguards.¹²

However, there are some complexities surrounding Intellectual Property Rights in the Metaverse, so it will be relevant to briefly examine them: First, Virtual Property and Ownership: The concept of ownership within the Metaverse does not only pertain to physical assets but it also relates to virtual property . Questions relating to the ownership and transfer of virtual real estate, digital goods, virtual assets, and other intangible assets are constantly arising. Thus, establishing a clear framework for the ownership and transfer of intangible assets within the Metaverse is imperative to protect and promote the interests of creators and innovators. Secondly, Digital Identity and Trademarks: The metaverse is not only a platform for making creative content but it is also a space for social interactions between persons irrespective of geographical location and it allows users to create a unique digital identity or personas for themselves as well as digital trademarks such as unique symbols , logos, or avatars may serve as representations of individuals or entities thus blurring the line between the reality and virtual existence and creating the need to ensure the protection of these digital identities and trademarks.¹³

Thirdly, Emergence of AI-Generated Content: The functionality of the Metaverse depends largely on Artificial Intelligence which is used to shape the content within the Metaverse . Within the virtual environment, questions about the authorship and ownership of AI-generated artworks and designs are constantly arising thus necessitating the need to review and adapt the existing copyright laws in Nigeria to be able to determine the rightful owner of contents generated by the AI algorithms. Fourthly, Cross-Border Legalities: Within the Metaverse, the limitation of geographical location is eliminated as users can interact and

¹² Gwo-Jen Hwang and Shu-Yun Chien, 'Definition, Roles, and Potential Research Issues of the Metaverse in Education: An Artificial Intelligence Perspective', *Computers and Education: Artificial Intelligence*, 3 (2022), p. 100082, doi:10.1016/j.caeai.2022.100082.

¹³ Hayder Albayati, Noor Alistarbadi, and Jae Jeung Rho, 'Assessing Engagement Decisions in NFT Metaverse Based on the Theory of Planned Behavior (TPB)', *Telematics and Informatics Reports*, 10.December 2022 (2023), p. 100045, doi:10.1016/j.teler.2023.100045.

interface with anyone anywhere in the world thus transcending national borders. The fact that the Metaverse operates on a global scale creates a complexity in enforcing Intellectual Property Rights as the legal framework varies across jurisdictions. Hence, it becomes imperative to establish international standards for the protection of virtual assets and property to ensure a cohesive and effective legal environment. Fively, Dynamic Nature of Virtual Innovations: Virtual creations and innovations within the Metaverse are highly dynamic as opposed to the traditional forms of intellectual property. Those within the Metaverse involve continuous updates, modifications, and collaborations which challenge the traditional concepts of static ownership thereby creating the challenge of creating a legal framework that is encompassing and flexible to accommodate the constantly changing and collaborative nature of virtual creations within the Metaverse.¹⁴

Concerning the above, it suffices to say that as Nigeria ventures into the operation of the Metaverse within the socio-economic facets of its economy, there are several complexities and challenges surrounding Intellectual property Rights that require proactive measures to resolve them . These complexities ranging from the issue of determining the ownership of virtual assets and property down to the need to ensure the protection of digital identities and trademarks against identity theft and malicious hackers increase the need for a well-crafted legal framework that acknowledges the intricacies of virtual intellectual property. Also, Collaboration between legal experts, technology innovators, and policymakers becomes pivotal to ensure a balance between fostering innovation and protecting the rights of creators within the dynamic landscape of the Metaverse in Nigeria .

Regulatory Framework Concerning Intellectual Property Rights in the Nigerian Metaverse

A new era of digital interaction, creativity, and commerce, challenging existing legal frameworks, especially those as they relate to Intellectual Property Rights (IPR) has been ushered in following the advent of the Metaverse . In Nigeria, the introduction Metaverse concept has brought on several complexities particularly in the ownership, infringement, and enforcement of Intellectual Property Rights thereby creating the need for a meticulous examination of the regulatory framework. In addressing the issue of intellectual property rights infringement in Nigeria and providing remedies, the National Assembly, utilizing its authority outlined in section 315 and the second schedule of the exclusive list to the Nigeria Constitution, enacted legislation about intellectual property rights to establish a legal protections for creators of intellectual works in Nigeria, prevent unlawful exploitation of intellectual creations of the mind and protecting the virtual innovations and creations

¹⁴ Dewi Sulistianingsih and others, 'Tata Kelola Perlindungan Data Pribadi Di Era Metaverse (Telaah Yuridis Undang-Undang Perlindungan Data Pribadi)', *Masalah-Masalah Hukum*, 52.1 (2023), pp. 97-106, doi:10.14710/mmh.52.1.2023.97-106.

itself.¹⁵

Intellectual property law as earlier stated encompasses copyright, patent, and trademark, and primarily, it is the law that grants the owner of an intangible intellectual creation exclusive control over their work or creation permitting them to authorize or prohibit the doing of certain things or use of their work in a particular manner. However, it is pertinent to examine these intellectual property laws to determine their applicability to intellectual property within the Metaverse. This will be considered under the following headings:

In Nigeria, for an intellectual work to qualify for protection under any of the intellectual property law there are certain conditions and criteria that it must satisfy. One such condition involves meeting the eligibility and qualification requirements for Copyright protection in Nigeria. In Nigeria, copyright law is embedded in the Copyright Act No. 8, 2022. Under the Act, by section 3, copyright protection can only be granted to individuals who are citizens of Nigeria or domiciled in the country and corporate entities, incorporated under Nigerian laws, provided they engage in creating specified subject matter outlined in section 2 of the Act. Section 2 of the Act provides for the list of works that shall be eligible for copyright protection in Nigeria however, subject to this same section, for these works to be eligible they must satisfy two condition precedents which is that the author must have invested sufficient effort in giving the work its original character, and the work must be expressed in a tangible medium that can be perceived, reproduced, or communicated directly or indirectly using any machine or mechanical device.¹⁶

A closer examination of section 2(1) of the Act shows that the category outlined therein for copyright eligibility in Nigeria is exhaustive. Section 2 explicitly states that the following works are eligible for copyright: Works of Literary, Musical works, Works of Artistic, Audiovisual works, Sound recordings and Broadcasts Nevertheless, according to section 6 of the Act, copyright is granted to works falling under the following conditions: Firstly, Literary, musical, or artistic work, or an audio visual work that is initially published in Nigeria. Secondly, Sound recording made in Nigeria that has not been subject to any copyright conferred by section 2 of this Act. Thirdly, Broadcast transmitted from Nigeria or by a broadcasting organization with its headquarters situated in Nigeria.

It is important to note that while section 1(1) of the Patent and Design Act of Nigeria does not explicitly define the term "patent," and there are no statutory, widely accepted definitions of patent in Nigerian laws, the Patent and Design Act outlines specific steps or

¹⁵ Joshua Fairfield, 'Tokenized: The Law of Non-Fungible Tokens and Unique Digital Property', *Indiana Law Journal*, 97.4 (2022), pp. 1261–313.

¹⁶ Kathleen Bridget Wilson, Adam Karg, and Hadi Ghaderi, 'Prospecting Non-Fungible Tokens in the Digital Economy: Stakeholders and Ecosystem, Risk and Opportunity', *Business Horizons*, 65.5 (2022), pp. 657–70, doi:10.1016/j.bushor.2021.10.007.

conditions that must be met for an invention to be patentable. These conditions include: Firstly, The invention is new, stemming from an inventive process, and possesses industrial application relevance. Secondly, The invention comprises an improvement of a patented invention, and such improvement is new, results from an inventive step, and holds industrial application value.¹⁷

To determine what constitutes a new invention, section 1(2) of the Patent and Design Act states that an invention is considered new if it does not form part of the state of the art or field of knowledge already known to the public. Additionally, section 1(2) of the Patent and Design Act specifies that an invention is deemed capable of industrial application if it can be manufactured, reproduced, and used in any kind of industry. In the context of a trademark in Nigeria, it is important to note that compliance with the legal requirements is crucial. Section 9(1) of the Trade Mark Act outlines the conditions for a trademark to be eligible for legal protection. To be registrable in Part A of the register, a trademark must include or consist of at least one of the specified essential particulars: First, The designation of a business entity, individual, or enterprise, portrayed in a distinct or particular fashion. Second, The autograph of the party applying for registration or a forerunner in their commercial endeavors. Third, A newly coined term or set of terms. Four, Terms that do not explicitly convey the attributes or excellence of the products and do not, in their standard sense, constitute a geographical identifier or a family name. Five, Any additional unique and recognizable symbol or identifier.¹⁸

It is important to emphasize that a name, signature, or word/words falling outside the categories mentioned in paragraphs (a) to (d) will only be registrable under paragraph (e) if there is evidence of its distinctiveness. In other words, for a trademark to be eligible for registration, it must fulfill the specified criteria outlined in Section 9(1) of the Trade Mark Act, ensuring compliance with the legal provisions governing trademark protection in Nigeria. However, upon a careful examination of the provisions of Section 2 of the Copyright Act, Section 9 of the Trade Mark Act, and section 1 of the Patent and Design Act respectively it is clear that these sections did not contemplate the conditions of eligibility and qualification for copyright protection of author works and patentable inventions that exist in virtual reality such as the metaverse concept. Furthermore, section 6 of the Copyright Act further complicated the issue of copyright work subject to protection to include only work published in Nigeria thereby negating works published and existing in virtual reality form.

¹⁷ Dewi Sulistianingsih and Apriliana Khomsa Kinanti, 'Hak Karya Cipta Non-Fungible Token (NFT) Dalam Sudut Pandang Hukum Hak Kekayaan Intelektual', *Krtha Bhayangkara*, 16.1 (2022), pp. 197–206, doi:10.31599/krtha.v16i1.1077.

¹⁸ Pujiyono Suwadi and Rian Saputra, 'Non-Fungible Tokens and the Metaverse Using Cryptocurrency in Indonesia: Money Laundering Potential and Challenges', *Indonesian Journal of Crime and Criminal Justice*, 1.1 (2025), pp. 109–31, doi:10.62264/ijccj.v1i1.120.

In other words, the Copyright Act never contemplated work that exists in virtual reality form.

Ownership and authorship of copyright represent distinct and pivotal aspects of Nigerian copyright law, and they may be allocated to different individuals. Primarily, according to section 28(1) of the Copyright Act, initial copyright ownership flows from authorship, and the ownership of copyright vests automatically on the author of such work upon completion, acknowledging their pivotal role in creating the work. This principle holds even when compensation is involved, whether through employment contracts or commissioned projects by employers or lecturers. Similarly, if a work is commissioned by a non-employer or if a work is created during the author's employment, the author remains the primary copyright owner unless a written agreement states otherwise. Additionally, section 28(3) of the Copyright Act specifies that if an author produces a literary, artistic, or musical work during their employment by the proprietor of a newspaper, magazine, or similar periodical under a contract of service for publication in said periodicals, the proprietor becomes the initial owner of the copyright, unless a written agreement states otherwise. This arrangement specifically applies to works related to the publication in periodicals, such as magazines or newspapers, or reproductions of the work for publication. In all other circumstances, the author retains primary ownership of the copyright in the work.¹⁹

By the Patent and Design Act the individuals recognized by law as having the rights to a patent concerning an invention as outlined in sections 2(1), (2), and (3) of the Patent and Designs Act, are vested in the statutory inventor, that is to say, the person who, whether or not he is the true inventor, is the first to file, or validly to claim a foreign priority for, a patent application in respect of the invention. However, the true inventor is entitled to be named as such in the patent, whether or not he is also the statutory inventor, and, the entitlement in question shall not be modifiable by contract. Should an applicant obtain essential elements of a patent application from another person's invention without consent, all rights derived from the patent certificate issuance are considered transferred to the true inventor. Furthermore, section 2(4) of the Patent and Designs Act provides that where an invention is made in the course of employment or in the execution of a contract for the performance of specified work, the right to a patent in the invention is vested in the employer or, as the case may be, in the person who commissioned the work (contracting party).²⁰

However, it is important to note that where an individual is employed or contracted to perform a specific task that does not involve inventive activities, any invention made by such

¹⁹ Yosafat Caesar Sinurat, Ika Riswanti Putranti, and Marten Hanura, 'The Deception of Art : Analisis Potensi Ancaman NFTs (Non-Fungible Tokens) Terhadap Keamanan Nasional Indonesia', *Journal of International Relations*, 8 (2022), pp. 280–88.

²⁰ Tarek Gaber and others, 'Metaverse-IDS: Deep Learning-Based Intrusion Detection System for Metaverse-IoT Networks', *Internet of Things*, 24 (2023), p. 100977, doi:<https://doi.org/10.1016/j.iot.2023.100977>.

employee during the execution of its duties using means belonging to the employer, will be entitled to a fair remuneration but the ownership of such invention will vest in the employer or contracting party and the right to obtain a patent for the invention remains with the employer or the contracting party. The legal principles outlined have received judicial recognition in the case of *Uwemedimo V. M.P. (Nig.) Unltd* (2001) 4 N.W.L.R (PT 1236) P. 80.²¹

In this instance, the respondent, who had engaged the appellant to devise a solution preventing rusting in their pipeline, could have been deemed the owner of the invention. However, as they denied contracting the appellant, they forfeited the right to secure a patent for the invention. In addition, section 2(5) of the Patents and Designs Act is to the effect that a person is not an inventor for this section if he has merely assisted in doing work connected with the development of an invention without contributing any inventive activity that is without making any valuable contribution to the said invention. Under Nigerian law, a person to whom a license is granted or assigned, by sections 10(1) and 24(1) of the Patent and Design Act has the right to exploit and use an invention by the owner, the licensee or assignee has a legitimate claim to the invention however, to enforce this right, section 10(3) and 24(2) and (3) of the Patent and Design Act mandate that the license or assigned right must be in writing, signed by the parties, and registered upon payment of prescribed fees and failure to comply means that the licensee or assignee may lack enforceable rights against a third party infringing on the invention. In the case of *Arewa Textiles PLC and Ors. V. Finetex Limited* (2003) 7 N.W.L.R. 322, the trial court ruled in favor of the respondent based on the substantiated claim that the invention's right had been assigned to them, even though the assignment was not registered. However, the Court of Appeal overturned the judgment, citing the absence of registration as grounds for the respondent lacking enforceable rights against the appellant or any third party infringing on the patented invention.

About trade mark, section 5(1) of the Act mandates that, barring the stipulations of this section and sections 7 and 8, registering an individual in Part A of the register as the owner of a trademark (excluding a certification trade mark) for specific goods shall, when valid, confer upon or be considered to have conferred upon that individual the exclusive right to utilize the said trade mark concerning those goods. Similarly, Section 6(1) of the Act outlines that, with the exception provided in subsection (2) of this section, registering an individual in Part B of the register as the proprietor of a trademark for certain goods, whether before or after the commencement of this Act, shall, when valid, grant or be deemed to have granted that individual similar rights in connection with those goods as if the registration had occurred in Part A of the register. Moreover, the provisions specified in Section 5(2) to (4) of

²¹ Mousa Al-kfairy, Soha Ahmed, and Ashraf Khalil, 'Factors Impacting Users' Willingness to Adopt and Utilize the Metaverse in Education: A Systematic Review', *Computers in Human Behavior Reports*, 15 (2024), p. 100459, doi:<https://doi.org/10.1016/j.chbr.2024.100459>.

this Act shall apply to a trademark registered in Part B accordingly.²²

A comprehensive outline of all the acts that will constitute copyright infringement is contained in Section 36 of the Copyright Act emphasizing the unauthorized use or reproduction of a copyrighted work. It specifies that infringement occurs when an individual, without the owner's permission, engages in actions that violate the exclusive rights granted under the Act. Such actions include performing acts that constitute a breach of the exclusive rights, importing infringing copies into Nigeria, selling or offering for sale works that infringe copyright, possessing equipment solely designed for making infringing copies, permitting places for public performances that infringe copyright, allowing the reproduction of copyrighted works on-premises, and performing works for trade or business purposes where copyright subsists. The section also asserts that these acts apply to the entire work or a substantial part of it, whether in its original form or a recognizable derivative. In essence, Section 36 serves as a comprehensive delineation of activities deemed as copyright infringement under the Copyright Act. It not only identifies specific actions but also highlights the importance of intent and awareness, emphasizing that infringement extends to both the original work and its significant derivatives.²³

This legal framework provides a protective umbrella for the rights of copyright owners protects their creative works from unlawful exploitation and discourages the unauthorized use or exploitation of intellectual works in Nigeria. Furthermore, section 38 of the Copyright Act empowers the court to issue an ex parte order upon receiving an application supported by an affidavit, indicating reasonable suspicion of the presence of infringing copies or equipment for making such copies in a house or premises. This order grants the applicant the authority to enter the identified location at any reasonable time, whether day or night, accompanied by a police officer or a Copyright Officer. The purpose of this entry is to seize, detain, and preserve any infringing copies or contrivances found on the premises. Additionally, the order allows the inspection of any relevant documents about the infringement action that are in the custody or under the control of the defendant. Essentially, this provision vests the court with the power and the means to take swift and effective action in response to suspected copyright infringement, providing a legal mechanism for the seizure of infringing materials and the examination of pertinent documents in the course of

²² Hassan Aideed and others, 'Beyond Reality: Harnessing the Metaverse for Transformative Education through UTAUT-2 and Task-Technology Synergy', *The International Journal of Management Education*, 23.2 (2025), p. 101169, doi:<https://doi.org/10.1016/j.ijme.2025.101169>.

²³ Akey Sungheetha and others, 'Chapter 11 - Adaptive Virtual Reality Exposure Therapy and Motor Rehabilitation from Hebbian Learning Rule in Metaverse: ΔijW for Psychoanalysis', in *Healthcare Frontiers in the Metaverse*, ed. by Shalli Rani (Academic Press, 2025), pp. 227–43, doi:<https://doi.org/10.1016/B978-0-443-32998-2.00017-2>.

legal proceedings.²⁴

With regards to patents, when a patentee is granted exclusive rights to an invention, it prohibits any other individual (excluding the patentee) from engaging in specific acts related to the invention, as outlined in section 6(1)(a) and (b) of the Patent and Design Act. These acts include: First, If the patent pertains to a product, the Patent and Design Act in Nigeria prohibits anyone, apart from the patentee, from engaging in activities such as reproducing, importing, exporting, stocking the product for sale, or selling the same. Second, If the patent concerns a process, the sole right to utilize the process and apply it in the making or production of a product is exclusively held by the patentee. In this context, it is specified by section 25 of the Act that the rights of a patentee or design owner are deemed to be violated when another individual, without the authorization of the patentee or design owner, engages in or causes the execution of any act that is prohibited under section 6 or 9 of this Act, as applicable. Section 25(2) of the Act provides that an infringement of the rights of a patentee or design owner shall be actionable at the suit of the patentee or design owner in question; and in any action for such an infringement all such relief by way of damages, injunction, accounts or otherwise shall be available to the plaintiff as is available in any corresponding proceedings in respect of the infringement of other proprietary rights.²⁵

As it relates to trade mark, section 5(2) of the Act specifies that, without diminishing the comprehensive right to use a trademark granted by such registration, the use of the trademark is considered infringed by any individual who, not being the proprietor of the trade mark or an authorized registered user, employs a mark identical to it or closely resembling it to the extent of causing confusion or deception in the course of trade regarding any goods for which it is registered. This use must be in a manner that makes it likely for the mark to be perceived either: first, as being utilized as a trade mark; or Second, in cases where the use is on the goods, in their physical connection, or an advertising circular or other public advertisement, as implying a connection to a person who holds the right either as the proprietor or as a registered user to use the trade mark or to goods associated with such a person in the course of trade.²⁶

Moreover, Section 6(2) of the Trade Mark Act further specifies that in any legal action for the infringement of the right to use a trademark granted by the registration in Part B of the

²⁴ Muhammad Tukur and others, 'The Metaverse Digital Environments: A Scoping Review of the Techniques, Technologies, and Applications', *Journal of King Saud University - Computer and Information Sciences*, 36.2 (2024), p. 101967, doi:<https://doi.org/10.1016/j.jksuci.2024.101967>.

²⁵ Aman Kumar and others, 'Metaverse Meetings: Fantasy or Sustainable Future of Work?', *International Journal of Manpower*, 46.4 (2025), pp. 770–91, doi:<https://doi.org/10.1108/IJM-11-2023-0662>.

²⁶ Bolaji David Oladokun and others, 'Perspectives of Librarians on the Integration of Metaverse into the Future Information Services in Higher Education Institutions', *The Journal of Academic Librarianship*, 51.5 (2025), p. 103103, doi:<https://doi.org/10.1016/j.acalib.2025.103103>.

register, the plaintiff shall not be entitled to an injunction or other remedies if the defendant convincingly proves to the court's satisfaction that the use objected to by the plaintiff is unlikely to deceive, cause confusion, or create a belief in a trade-related connection between the goods and an individual entitled either as the proprietor or as a registered user to use the trade mark.²⁷

Flowing from the above, it suffices to state that the Metaverse serves as a platform for a phenomenal digital experience and where users can generate a plethora of digital assets ranging from virtual designs to interactive experiences. However, with these phenomenal prospects comes the tendency of intellectual property infringement. A careful analysis of the existing laws relating to intellectual; property rights in Nigeria shows that these laws do not make provisions for virtual spaces like the Metaverse thus leaving the users without any effective protection of their intellectual rights and digital assets. Hence, it is expedient that these intellectual property laws be redefined and the scope increase to offer adequate protection to the users and creators that operate within the Metaverse and also to address challenges posed by user-generated content, and ensure that creators are adequately rewarded for their virtual innovations.

Election supervisory bodies as dispute resolvers in local elections: lessons from Brazil and Mexico

The existing legal framework that regulates intellectual property rights in Nigeria does not envisage virtual spaces and there are several legal Challenges in the regulation of intellectual Property Rights in the Nigerian Metaverse. Issues such as cross-border legalities, the emergence of AI-generated content, and the question of ownership in virtual spaces are the complexities and challenges that require careful consideration. These challenges are therefore examined as follows;

One of the legal challenges in the regulation of intellectual property rights in the Nigerian metaverse arises in the area of criteria of eligibility and qualification for protection. The existing intellectual property laws in Nigeria, including the Copyright Act, the Trade Mark Act, and the Patent and Design Act, have certain criteria and conditions that a work must satisfy to qualify for protection. However, these laws did not make any provisions to address the complexities associated with intellectual property in virtual reality, such as the metaverse concept. In the case of copyright protection, the Copyright Act in Nigeria specifies that works must meet certain criteria, including being created by a Nigerian citizen or someone domiciled in Nigeria. Corporate entities seeking protection must be incorporated

²⁷ Tugba Bas, Issam Malki, and Sheeja Sivaprasad, 'Connectedness between Central Bank Digital Currency Index, Financial Stability and Digital Assets', *Journal of International Financial Markets, Institutions and Money*, 92 (2024), p. 101981, doi:<https://doi.org/10.1016/j.intfin.2024.101981>.

under Nigerian laws, and the works must fall into specific categories outlined in Section 2 of the Copyright Act, such as literary works, musical works, and artistic works.²⁸

The Act went further to provide that the work must be published in Nigeria further complicating the matter, as it is clear that works existing in virtual reality or the metaverse, were not contemplated by the provisions of the Act. Similarly, the Patent and Design Act outlines conditions for inventions to be patentable, including novelty, inventive step, and industrial applicability. However, there is no clear provision addressing inventions in the metaverse or virtual reality. The definition of what constitutes a new invention includes the requirement that it does not form part of the existing state-of-the-art known to the public. The challenge however arises when determining the state of the art in a virtual environment, as traditional definitions may not adequately cover innovations in the metaverse. The Trade Mark Act sets forth conditions for trademark registration, including the representation of business entities, signatures, coined terms, and distinctive marks. However, these provisions do not explicitly address trademarks associated with virtual entities or assets within the metaverse. The criteria outlined in Section 9(1) may not fully capture the unique characteristics of trademarks within virtual environments.²⁹

The issue of intellectual property ownership within the Nigerian metaverse is a multifaceted challenge. The Copyright Act, vests initial ownership with authors, however, ownership becomes more intricate in the situation where works are created in employment or under commissioned contracts. Given the absence of a central system of control within the Metaverse, disputes may arise thus accentuating the need for clear agreements and registrations. The Patent and Design Act further complicates matters, recognizing the statutory inventor but entitling acknowledgment to the true inventor. Employment conditions further complicate the matter by delineating rights between employees and employers thereby making the need for written agreements and registration imperative, as illustrated in legal cases such as Arewa Textiles PLC and Finetex Limited, emphasizing the significance of registration in securing and defending patent rights within the evolving metaverse. In addition, trademark challenges in the metaverse involve Sections 5(1) and 6(1) of the Trade Mark Act, outlining exclusive rights upon registration in Parts A and B of the register. Meeting the requirements of Sections 5(2) to (4) becomes crucial for enforcing

²⁸ Junaid Rahman and others, 'Regulatory Landscape of Blockchain Assets: Analyzing the Drivers of NFT and Cryptocurrency Regulation', *BenchCouncil Transactions on Benchmarks, Standards and Evaluations*, 5.1 (2025), p. 100214, doi:<https://doi.org/10.1016/j.tbench.2025.100214>.

²⁹ Aswin Alora, Poonam Sahoo, and Aghila Sasidharan, 'Central Bank Digital Currency Adoption Challenges- The Case of an Emerging Nation', *Finance Research Letters*, 59 (2024), p. 104756, doi:<https://doi.org/10.1016/j.frl.2023.104756>.

trademark rights.³⁰

The dynamic nature of the Metaverse raises questions about the adaptability of existing trademark laws to effectively address the unique features of virtual entities and digital assets. Navigating these intricacies requires a thorough understanding of intellectual property laws, recommended changes to accommodate virtual environments, and a proactive approach to registration and contractual agreements to ensure robust protection within the Nigerian metaverse. Furthermore, a review of section 28 of the Copyright Act, sections 5 and 6, of the Trade Mark Act, and sections 2, 10, and 24 of the Patent and Design Act reveals that one of the central issues within the regulatory framework of the Nigerian Metaverse is the concept of virtual property. Unlike tangible assets, virtual property in the Metaverse encompasses a wide array of digital assets, including virtual real estate, in-game items, and unique digital creations, etc. In this regard, determining ownership rights for these intangible assets poses a significant challenge. This is concerning the fact that current intellectual property laws, primarily designed for physical assets, fall short of addressing the intricacies of virtual property.³¹

The legal framework that makes provisions for the infringement of intellectual property rights in the metaverse is highly deficient, particularly in the context of the Copyright Act and Patent and Design Act. The Copyright Act contains a comprehensive provision that outlines all the acts constituting infringement however, these provisions are not explicitly tailored for any virtual space like the metaverse. The criteria such as unauthorized reproduction, importation, and sale of copyrighted works apply to traditional forms but may not adequately cover the dynamic and virtual nature of creations in the metaverse. Additionally, the Patent and Design Act's restriction on reproducing or exporting patented products poses challenges when applied to virtual inventions, where the concept of physical reproduction may not be straightforward. The absence of specific metaverse-oriented provisions in these acts highlights the need for legal revisions that consider the unique aspects of virtual environments.³²

Furthermore, the Trade Mark Act, although addressing infringements involving marks identical or closely resembling registered trademarks, may fall short in scenarios specific to the metaverse. The act's emphasis on physical goods and the potential defense against

³⁰ Matthew Manning, Eray Arda Akartuna, and Shane Johnson, 'Opportunities to Future Crime: Scoping the Future of Money Laundering and Terrorist Financing through Cryptoassets', *Technological Forecasting and Social Change*, 210 (2025), p. 123894, doi:<https://doi.org/10.1016/j.techfore.2024.123894>.

³¹ Zih-Ying Lin, 'The Effect of Culture on Global NFT Investor Attention', *Pacific-Basin Finance Journal*, 90 (2025), p. 102696, doi:<https://doi.org/10.1016/j.pacfin.2025.102696>.

³² David Iheke Okorie, Elie Bouri, and Mieszko Mazur, 'NFTs versus Conventional Cryptocurrencies: A Comparative Analysis of Market Efficiency around COVID-19 and the Russia-Ukraine Conflict', *The Quarterly Review of Economics and Finance*, 95 (2024), pp. 126–51, doi:<https://doi.org/10.1016/j.qref.2024.03.001>.

infringement by proving no likelihood to deceive or cause confusion may not fully capture the intricacies of virtual entities and assets. The ambiguity in applying trademark laws to virtual spaces underscores the necessity for legislative adaptations that encompass the distinct characteristics of the metaverse, ensuring robust protection against infringements and promoting legal clarity in this evolving digital landscape.³³

Concerning the above challenges, it suffices to state that the regulatory framework for Intellectual Property Rights in the Nigerian Metaverse is almost nonexistent and demands careful consideration as most of the laws protecting intellectual property rights in Nigeria relate to intellectual property within the physical realm and did not envisage regulating intellectual property within any virtual reality like the Metaverse. One of such challenges is the criteria of eligibility and qualification for the protection of intellectual works as existing laws were not designed to address the complexities associated with the metaverse. Copyright, patent, and trademark laws each struggle with the issues facing the conditions for the qualification and eligibility of intellectual creations from the Metaverse, and given the dynamic nature of virtual reality, the need for legislative revisions cannot be overlooked as there is an urgent need to create an all-encompassing legal framework that will resolve these challenges by taking into cognizance the unique characteristics of virtual environments.³⁴

Also, issues as to ownership of intellectual property within the Metaverse add another layer of challenges, especially when works are created in employment or under commissioned contracts. Disputes over intellectual property rights in the decentralized metaverse underscore the need for clear agreements and registrations. The absence of specific provisions for virtual property within the current legal framework raises significant challenges in determining ownership rights for intangible assets, such as virtual real estate and digital creations. Furthermore, the infringement of intellectual property rights in the metaverse also poses another layer of challenges and complexities as it reveals notable gaps in the Copyright Act, Patent and Design Act, and Trade Mark Act.³⁵ The criteria for infringement outlined in these acts do not fully cover the dynamic and virtual nature of creations in the metaverse, emphasizing the necessity for legislative revisions to ensure robust protection and legal clarity in this evolving digital landscape. Conclusively, addressing these challenges requires a thorough understanding of intellectual property laws, recommended changes to accommodate virtual environments, and a proactive approach to

³³ Elissar Toufaily, 'An Integrative Model of Trust toward Crypto-Tokens Applications: A Customer Perspective Approach', *Digital Business*, 2.2 (2022), p. 100041, doi:<https://doi.org/10.1016/j.digbus.2022.100041>.

³⁴ Catherine Flick, 'A Critical Professional Ethical Analysis of Non-Fungible Tokens (NFTs)', *Journal of Responsible Technology*, 12 (2022), p. 100054, doi:<https://doi.org/10.1016/j.jrt.2022.100054>.

³⁵ Oluwabunmi Adaramola, 'Assessing the Role of the Intergovernmental Action Group Against Money Laundering in West Africa (GIABA) in Light of Virtual Assets and Cross-Regional Cryptocurrency-Based Money Laundering in Nigeria', *Journal of Economic Criminology*, 7 (2025), p. 100129, doi:<https://doi.org/10.1016/j.jeconc.2025.100129>.

registration and contractual agreements to ensure robust protection within the Nigerian metaverse.

4. Conclusion

Concerning the above, it suffices to state that, the exploration of the Metaverse in Nigeria presents a captivating prospect for technological advancement and immersive experiences. However, as our study highlights, the integration of Metaverse technologies with existing intellectual property frameworks raises significant challenges that necessitate attention and proactive measures. The findings from our research underscore the complex interplay between Metaverse technologies and established intellectual property norms. Virtual property rights and the replication of real-world intellectual property within virtual environments emerge as focal points of concern, demanding a nuanced and adaptive legal response. The traditional legal frameworks governing intellectual property in Nigeria may prove inadequate in addressing the unique issues arising from the Metaverse. Therefore, we recommend the formulation of specialized regulations specifically tailored to address intellectual property issues within the Metaverse. These regulations should be developed through collaborative efforts between legal experts, technological stakeholders, and policymakers. The dynamic and evolving nature of Metaverse technologies requires a forward-thinking approach, with regulations that anticipate and adapt to emerging challenges. Additionally, proactive measures, such as ongoing dialogues and forums between legal and technological communities, should be established to foster a better understanding of the evolving landscape. This collaborative approach will help bridge the gap between the legal and technological spheres, ensuring that regulatory frameworks remain relevant and effective in the face of rapid technological advancements. In essence, the successful navigation of the Metaverse in Nigeria hinges on the establishment of a robust and adaptive legal framework for intellectual property. By taking these recommended steps, Nigeria can position itself at the forefront of Metaverse innovation while safeguarding the rights of intellectual property owners in this dynamic digital realm.

5. References

- Adaramola, Oluwabunmi, 'Assessing the Role of the Intergovernmental Action Group Against Money Laundering in West Africa (GIABA) in Light of Virtual Assets and Cross-Regional Cryptocurrency-Based Money Laundering in Nigeria', *Journal of Economic Criminology*, 7 (2025), p. 100129, doi:<https://doi.org/10.1016/j.jeconc.2025.100129>
- Aideed, Hassan, and others, 'Beyond Reality: Harnessing the Metaverse for Transformative Education through UTAUT-2 and Task-Technology Synergy', *The International Journal of Management Education*, 23.2 (2025), p. 101169,

doi:<https://doi.org/10.1016/j.ijme.2025.101169>

- Akkus, Hilmi Tunahan, and others, 'Metaverse and Metaverse Cryptocurrencies (Meta Coins): Bubbles or Future', *Pressacademia*, published online March 2022, doi:10.17261/Pressacademia.2022.1542
- Albayati, Hayder, Noor Alistarbadi, and Jae Jeung Rho, 'Assessing Engagement Decisions in NFT Metaverse Based on the Theory of Planned Behavior (TPB)', *Telematics and Informatics Reports*, 10.December 2022 (2023), p. 100045, doi:10.1016/j.teler.2023.100045
- Al-kfairy, Mousa, Soha Ahmed, and Ashraf Khalil, 'Factors Impacting Users' Willingness to Adopt and Utilize the Metaverse in Education: A Systematic Review', *Computers in Human Behavior Reports*, 15 (2024), p. 100459, doi:<https://doi.org/10.1016/j.chbr.2024.100459>
- Alora, Aswin, Poonam Sahoo, and Aghila Sasidharan, 'Central Bank Digital Currency Adoption Challenges- The Case of an Emerging Nation', *Finance Research Letters*, 59 (2024), p. 104756, doi:<https://doi.org/10.1016/j.frl.2023.104756>
- Amirudin, and Zainal Asikin, *Pengantar Metode Penelitian Hukum*, Cetakan ke (Rajawali Press, 2018)
- Bas, Tugba, Issam Malki, and Sheeja Sivaprasad, 'Connectedness between Central Bank Digital Currency Index, Financial Stability and Digital Assets', *Journal of International Financial Markets, Institutions and Money*, 92 (2024), p. 101981, doi:<https://doi.org/10.1016/j.intfin.2024.101981>
- Belk, Russell, Mariam Humayun, and Myriam Brouard, 'Money, Possessions, and Ownership in the Metaverse: NFTs, Cryptocurrencies, Web3 and Wild Markets', *Journal of Business Research*, 153.August (2022), pp. 198–205, doi:10.1016/j.jbusres.2022.08.031
- Davis, Alanah, and others, 'Avatars, People, and Virtual Worlds: Foundations for Research in Metaverses', *Journal of the Association for Information Systems*, 10.2 (2009), pp. 90–117, doi:10.17705/1jais.00183
- Efendi, Jonaedi, and Jonhny Ibrahim, *Metode Penelitian Hukum Normatif Dan Empiris*, cetakan ke (Kencana, 2020)
- Fairfield, Joshua, 'Tokenized: The Law of Non-Fungible Tokens and Unique Digital Property', *Indiana Law Journal*, 97.4 (2022), pp. 1261–313
- Flick, Catherine, 'A Critical Professional Ethical Analysis of Non-Fungible Tokens (NFTs)', *Journal of Responsible Technology*, 12 (2022), p. 100054, doi:<https://doi.org/10.1016/j.jrt.2022.100054>
- Gaber, Tarek, and others, 'Metaverse-IDS: Deep Learning-Based Intrusion Detection System

for Metaverse-IoT Networks', *Internet of Things*, 24 (2023), p. 100977, doi:<https://doi.org/10.1016/j.iot.2023.100977>

Gorny, Thorsten J, 'AML Regulations and the Metaverse', *Sanctions.Io.*, 2022, p. 1

Hwang, Gwo-Jen, and Shu-Yun Chien, 'Definition, Roles, and Potential Research Issues of the Metaverse in Education: An Artificial Intelligence Perspective', *Computers and Education: Artificial Intelligence*, 3 (2022), p. 100082, doi:[10.1016/j.caeai.2022.100082](https://doi.org/10.1016/j.caeai.2022.100082)

Kasiyanto, Safari, and Mustafa R. Kilinc, 'Legal Conundrums of the Metaverse', *Journal of Central Banking Law and Institutions*, 1.2 (2022), pp. 299–322, doi:[10.21098/jcli.v1i2.25](https://doi.org/10.21098/jcli.v1i2.25)

Kim, Jooyoung, 'Advertising in the Metaverse: Research Agenda', *Journal of Interactive Advertising*, 21.3 (2021), pp. 141–44, doi:[10.1080/15252019.2021.2001273](https://doi.org/10.1080/15252019.2021.2001273)

Kraus, Sascha, and others, 'Facebook and the Creation of the Metaverse: Radical Business Model Innovation or Incremental Transformation?', *International Journal of Entrepreneurial Behavior & Research*, 28.9 (2022), pp. 52–77, doi:[10.1108/IJEBR-12-2021-0984](https://doi.org/10.1108/IJEBR-12-2021-0984)

Kumar, Aman, and others, 'Metaverse Meetings: Fantasy or Sustainable Future of Work?', *International Journal of Manpower*, 46.4 (2025), pp. 770–91, doi:<https://doi.org/10.1108/IJM-11-2023-0662>

Lin, Zih-Ying, 'The Effect of Culture on Global NFT Investor Attention', *Pacific-Basin Finance Journal*, 90 (2025), p. 102696, doi:<https://doi.org/10.1016/j.pacfin.2025.102696>

Manning, Matthew, Eray Arda Akartuna, and Shane Johnson, 'Opportunities to Future Crime: Scoping the Future of Money Laundering and Terrorist Financing through Cryptoassets', *Technological Forecasting and Social Change*, 210 (2025), p. 123894, doi:<https://doi.org/10.1016/j.techfore.2024.123894>

Marley, Richard, 'METAVERSE AND MONEY LAUNDERING – HOW SHUFTI PRO'S AML SCREENING HELPS', *Shufti Pro.*, 2022, p. 1

Mayasari, Hanita, 'A Examination on Personal Data Protection in Metaverse Technology in Indonesia : A Human Rights Perspective', *Journal of Law, Environmental and Justice*, 1.1 (2023), pp. 64–85, doi:[10.62264/jlej.v1i1.4](https://doi.org/10.62264/jlej.v1i1.4)

Okorie, David Iheke, Elie Bouri, and Mieszko Mazur, 'NFTs versus Conventional Cryptocurrencies: A Comparative Analysis of Market Efficiency around COVID-19 and the Russia-Ukraine Conflict', *The Quarterly Review of Economics and Finance*, 95 (2024), pp. 126–51, doi:<https://doi.org/10.1016/j.qref.2024.03.001>

Oladokun, Bolaji David, and others, 'Perspectives of Librarians on the Integration of Metaverse into the Future Information Services in Higher Education Institutions', *The Journal of Academic Librarianship*, 51.5 (2025), p. 103103,

doi:<https://doi.org/10.1016/j.acalib.2025.103103>

- Pujiyono Suwadi, and Rian Saputra, 'Non-Fungible Tokens and the Metaverse Using Cryptocurrency in Indonesia: Money Laundering Potential and Challenges', *Indonesian Journal of Crime and Criminal Justice*, 1.1 (2025), pp. 109–31, doi:10.62264/ijccj.v1i1.120
- Rahman, Junaid, and others, 'Regulatory Landscape of Blockchain Assets: Analyzing the Drivers of NFT and Cryptocurrency Regulation', *BenchCouncil Transactions on Benchmarks, Standards and Evaluations*, 5.1 (2025), p. 100214, doi:<https://doi.org/10.1016/j.tbench.2025.100214>
- Sinurat, Yosafat Caesar, Ika Riswanti Putranti, and Marten Hanura, 'The Deception of Art : Analisis Potensi Ancaman NFTs (Non-Fungible Tokens) Terhadap Keamanan Nasional Indonesia', *Journal of International Relations*, 8 (2022), pp. 280–88
- Sulistianingsih, Dewi, and others, 'Tata Kelola Perlindungan Data Pribadi Di Era Metaverse (Telaah Yuridis Undang-Undang Perlindungan Data Pribadi)', *Masalah-Masalah Hukum*, 52.1 (2023), pp. 97–106, doi:10.14710/mmh.52.1.2023.97-106
- , and Apriliana Khomsa Kinanti, 'Hak Karya Cipta Non-Fungible Token (NFT) Dalam Sudut Pandang Hukum Hak Kekayaan Intelektual', *Krtha Bhayangkara*, 16.1 (2022), pp. 197–206, doi:10.31599/krtha.v16i1.1077
- Sungheetha, Akey, and others, 'Chapter 11 - Adaptive Virtual Reality Exposure Therapy and Motor Rehabilitation from Hebbian Learning Rule in Metaverse: DijW for Psychoanalysis', in *Healthcare Frontiers in the Metaverse*, ed. by Shalli Rani (Academic Press, 2025), pp. 227–43, doi:<https://doi.org/10.1016/B978-0-443-32998-2.00017-2>
- Toufaily, Elissar, 'An Integrative Model of Trust toward Crypto-Tokens Applications: A Customer Perspective Approach', *Digital Business*, 2.2 (2022), p. 100041, doi:<https://doi.org/10.1016/j.digbus.2022.100041>
- Tukur, Muhammad, and others, 'The Metaverse Digital Environments: A Scoping Review of the Techniques, Technologies, and Applications', *Journal of King Saud University - Computer and Information Sciences*, 36.2 (2024), p. 101967, doi:<https://doi.org/10.1016/j.jksuci.2024.101967>
- Wilson, Kathleen Bridget, Adam Karg, and Hadi Ghaderi, 'Prospecting Non-Fungible Tokens in the Digital Economy: Stakeholders and Ecosystem, Risk and Opportunity', *Business Horizons*, 65.5 (2022), pp. 657–70, doi:10.1016/j.bushor.2021.10.007