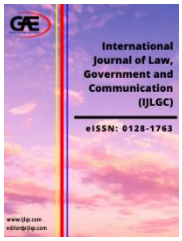
International Journal of Law, Government and Communication
EISSN : 0128-1763
Volume 10 Issue 41 (September 2025) PP. 385-396
DOI 10.35631/IJLGC.1041025



INTERNATIONAL JOURNAL OF LAW, GOVERNMENT AND COMMUNICATION (IJLGC)
www.ijlgc.com

REDEFINING OWNERSHIP: DIGITAL ASSETS, INTELLECTUAL PROPERTY, AND EMERGING TECHNOLOGIES

Siti Khadijah Abdullah Sanek[1*], Irma Kamarudin[2], Arina Kamarudin[3]

[1] Department of Law, Universiti Teknologi MARA Kedah Branch, Malaysia
Email: khadijah016@uitm.edu.my
[2] Department of Law, Universiti Teknologi MARA Kedah Branch, Malaysia
Email: irma@uitm.edu.my
[3] School of Law, NMUC (Netherlands Maritime University College), Malaysia
Email: arina@nmuc.edu.my
[*] Corresponding Author

Article Info:

Article history:
Received date: 28.06.2025
Revised date: 22.07.2025
Accepted date: 10.08.2025
Published date: 11.09.2025

To cite this document:

Sanek, S. K. A., Kamarudin, I., & Kamarudin, A. (2025). Redefining Ownership: Digital Assets, Intellectual Property, and Emerging Technologies. *International Journal of Law, Government and Communication, 10* (41), 385-396.

DOI: 10.35631/IJLGC.1041025

Abstract:

This article examines the evolving relationship between digital assets, intellectual property (IP), and emerging technologies, with a particular focus on legal implications under European Union (EU) law. Innovations such as digital assets, such as cryptocurrencies, non-fungible tokens (NFTs), and artificial intelligence (AI) generated works, are reshaping concepts of ownership and intellectual property (IP). The article adopts a threefold methodological approach. To assess the adequacy of current legal frameworks, a systematic review highlights key limitations in applying traditional property law to intangible assets like cryptocurrencies and NFTs. The second element analyses the effects of emerging technologies on IP rights and regulatory compliance through an interdisciplinary synthesis of recent research. Lastly, a comparative legal analysis draws on EU and international case studies to identify regulatory gaps and propose policy responses. The findings suggest that while digital assets promote innovation, their decentralised and intangible nature poses challenges to core legal concepts such as exclusivity, attribution, and enforceability. Despite progress in EU digital regulation, inconsistencies persist across jurisdictions. The article concludes that a more harmonised legal framework supported by clearer definitions, the integration of smart contracts, and effective cross-border dispute mechanisms is necessary to ensure that IP law remains effective in the digital economy.

Keywords:

AI - Blockchain – Copyrights – Innovation – IP – NFTs

International Journal of Law, Government and Communication
EISSN : 0128-1763
Volume 10 Issue 41 (September 2025) PP. 385-396
DOI 10.35631/IJLGC.1041025

Introduction

The digital revolution has greatly transformed traditional notions of ownership and intellectual property (IP), driven by the rise of blockchain technology, non-fungible tokens (NFTs), and other forms of intangible digital assets. These innovations challenge conventional legal definitions of property, authorship, and enforcement by decentralising control and introducing novel forms of scarcity and value (Erlank, 2024; Napolitano, 2024). At the intersection of digital assets and emerging technologies such as generative AI and medical 3D printing, legal frameworks, particularly within the European Union (EU), are struggling to maintain relevance, clarity, and enforceability (Lam & Lee, 2025; Chen & Friedmann, 2023). Current laws are often ill-equipped to address issues like decentralised authorship, blockchain-based rights attribution, and the cross-border nature of digital ownership (López, 2024; Terras et al., 2024).

Previous scholarship has significantly advanced the comprehension of specific elements of digital technologies and intellectual property (IP) law such as blockchain governance (De Filippi & Wright, 2018), AI-generated content (Hilty & Henning, 2022), and regulatory frameworks for crypto-assets (European Commission, 2020) yet a substantial gap persists in comprehensive legal analysis that investigates the interplay between digital assets and IP rights within the wider context of property law, especially across various EU jurisdictions. Ncube (2021) notes that national property doctrines within the EU exhibit considerable variation in their acknowledgement of digital ownership, resulting in legal fragmentation that hinders cross-border transactions and enforcement. This issue is exacerbated in the realm of NFTs and tokenised assets, where the differentiation between ownership of a digital token and the associated intellectual property rights is unclear (Craig & de la Mare, 2022). In response, this study aims to provide a comprehensive legal analysis of digital assets and IP in the context of emerging technologies, using a multidisciplinary methodology that includes a systematic review, comparative legal analysis, and real-world case studies.

While previous research has offered useful insights into particular technologies or legal matters, there is still a gap in a comprehensive analysis of how these elements function together within the larger property law framework, particularly in EU countries. This study addresses that gap by delivering an in-depth legal examination of digital assets and IP concerning emerging technologies. It employs a multidisciplinary approach that combines a systematic review, comparative legal analysis, and case studies from real-world scenarios. The study evaluates the adequacy of current EU legal frameworks, assesses the regulatory challenges posed by rapidly evolving digital tools, and proposes actionable policy recommendations to enhance legal certainty and innovation. By addressing this critical research gap, the article contributes to a more coherent understanding of digital ownership, offering a unified framework for legislators, regulators, and legal scholars engaged in reforming law for the digital age.

Methodology

This study employs a systematic review approach, utilising Scopus AI as the primary research tool to identify, analyse, and synthesise relevant literature. Scopus was selected given its status as one of the most comprehensive bibliographic databases for peer-reviewed publications, offering extensive coverage across law, social sciences, and interdisciplinary studies (Falagas et al., 2008). The review was conducted on 24th April 2025, ensuring that the most up-to-date and relevant scholarship was incorporated into the analysis.

International Journal of Law, Government and Communication
EISSN : 0128-1763
Volume 10 Issue 41 (September 2025) PP. 385-396
DOI 10.35631/IJLGC.1041025

The methodological approach is designed to systematically address the stated objectives through a comprehensive review and analysis of existing literature, legal frameworks, and real-world case studies. To achieve Objective (a), which involves reviewing the adequacy of current legal frameworks in addressing the complexities of digital ownership, the study employs a systematic review methodology. This process entails querying databases such as Scopus to identify peer-reviewed articles, books, and legal documents that discuss the intersection of digital assets, intellectual property (IP), and property law. For instance, works by Erlank (2024) and Napolitano (2024) provide foundational insights into the inadequacies of traditional property laws in accommodating intangible assets like cryptocurrencies and NFTs. These sources are critically analysed to identify gaps in legal frameworks, particularly within the context of EU law, which serves as a benchmark for regulatory harmonisation.

To address Objective (b), which focuses on the implications of emerging technologies for IP rights and regulatory compliance, the study synthesises findings from multidisciplinary research. This includes examining the role of blockchain technology in securing digital asset ownership, as discussed by Lam and Lee (2025), and evaluating the challenges posed by generative AI and medical 3D printing, as highlighted by López (2024). The study also explores the alignment of NFTs with desired IP rights, drawing on insights from Chen and Friedmann (2023) and Terras et al. (2024). By integrating these perspectives, the research identifies key areas where technological advancements outpace regulatory frameworks, creating uncertainties in IP protection and enforcement.

Finally, to achieve Objective (c), which involves analysing regulatory gaps and proposing actionable recommendations, the study adopts a comparative legal analysis approach. This involves contrasting the strengths and weaknesses of existing frameworks across jurisdictions, with a particular focus on EU regulations. Real-world case studies, such as those documented by Trequattrini et al. (2022), are used to illustrate the practical challenges faced by businesses and policymakers in adapting to digital transformation. Based on these analyses, the study proposes policy recommendations aimed at enhancing legal clarity and fostering innovation. These recommendations include updating IP laws to accommodate digital assets, establishing guidelines for the ethical use of AI, and promoting international collaboration to standardise regulations. By leveraging the extensive body of knowledge indexed in Scopus, this study ensures that its findings are grounded in robust evidence and aligned with the latest advancements in the field.

The figure below illustrates the threefold methodological approach underpinning the comprehensive study on digital ownership. The first component is a Legal Framework Review, which evaluates the adequacy of existing laws in addressing digital assets. The second focuses on Emerging Technologies Implications, analysing how innovations such as blockchain, NFTs, and AI impact intellectual property rights. The third component identifies Regulatory Gaps and Recommendations**,** proposing policy reforms to address challenges and enhance legal clarity. Together, these interlinked elements form a structured methodology aimed at assessing and reshaping the legal foundations of digital ownership. It enables the study to bridge theoretical gaps, identify practical challenges, and propose evidence-based policy reforms.

International Journal of Law, Government and Communication
EISSN : 0128-1763
Volume 10 Issue 41 (September 2025) PP. 385-396
DOI 10.35631/IJLGC.1041025

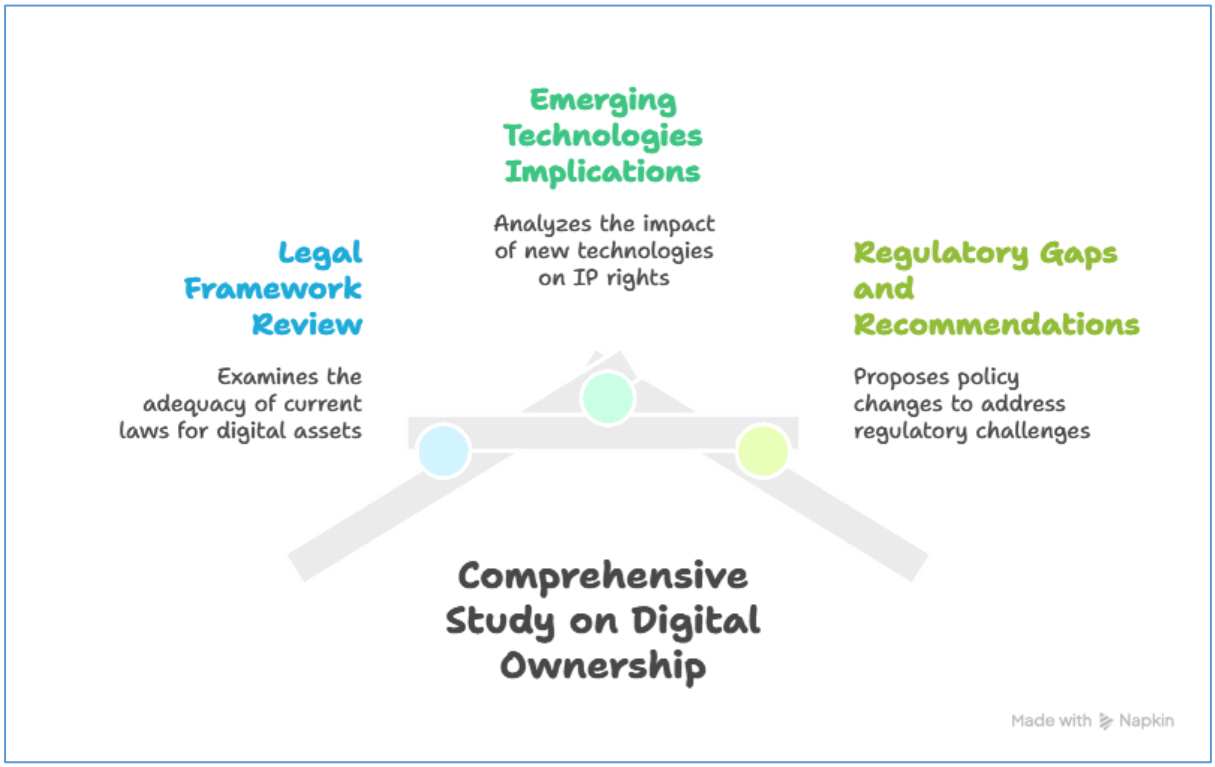


Figure 1: Integrated Methodology for Examining Digital Ownership

Results and Discussion

The adequacy of existing legal frameworks to govern digital ownership has become a growing concern amid the proliferation of intangible assets such as non-fungible tokens (NFTs), digital art, cryptocurrencies, and proprietary data. Traditional property law, which is rooted in the regulation of tangible and corporeal assets, is ill-equipped to manage claims over digital representations of value. Erlank (2024) points out that digital property lacks a consistent legal foundation, leaving courts and policymakers uncertain about how to define, transfer, and enforce rights over such assets. Ownership is often dictated by the terms of service of digital platforms rather than formal legal recognition, resulting in fragmented, privately governed systems that challenge the coherence and predictability of property law.

This misalignment is further complicated by the unique characteristics of digital assets, which are inherently intangible, easily replicable, and globally accessible, contrasting sharply with the territorially bound and time-limited nature of traditional intellectual property (IP) rights. As Wyczik (2024) explains, digital ownership destabilises core legal concepts such as possession, exclusivity, and control. For instance, NFTs convey ownership of a blockchain-verified token but not necessarily the underlying content or copyright, leading to confusion about what legal rights are transferred to buyers (Chen & Friedmann, 2023). Blockchain technology, while offering transparency and immutability, also introduces jurisdictional and interoperability challenges. Kumar and Suthar (2025) argue that there is still no uniform legal standard for recognising blockchain-registered ownership in traditional legal systems, leaving the enforceability of such rights vulnerable to inconsistent judicial interpretations.

International Journal of Law, Government and Communication
EISSN : 0128-1763
Volume 10 Issue 41 (September 2025) PP. 385-396
DOI 10.35631/IJLGC.1041025

Additionally, data ownership, a critical aspect of many digital assets, remains legally ambiguous. Although certain categories of data are protected under privacy or trade secret laws, most jurisdictions have yet to develop a coherent property regime for data, despite its centrality to the digital economy. López (2024) critiques this gap, noting that the absence of clear rules around ownership, access, and monetisation of data hinders innovation, promotes regulatory fragmentation, and raises ethical concerns. Nonetheless, some developments signal a gradual evolution toward more adaptive frameworks. Technologies such as smart contracts and decentralised autonomous organisations (DAOs) are prompting regulators to explore new legal models of accountability and ownership. Terras, Schafer, and Favreau (2024) call for a reimagining of property rights that better reflect the digital creative economy, focusing on attribution, control, and fair compensation rather than static models of ownership. Interdisciplinary collaborations are also emerging to propose hybrid regulatory frameworks that can accommodate technological complexity while preserving legal certainty (Loseva, Fedotova, & Abdikeev, 2023). However, meaningful reform remains contingent on international coordination and the willingness of lawmakers to adapt to ongoing technological change.

Emerging technologies such as blockchain, artificial intelligence (AI), and the Semantic Web are transforming the landscape of intellectual property (IP) rights management by introducing advanced methods for registration, licensing, and enforcement. Blockchain enables the creation of immutable ledgers that authenticate originality, establish provenance, and automate licensing via smart contracts (Kumar & Suthar, 2025). These functionalities have significant implications for copyright and patent systems, especially in sectors reliant on digital content like creative industries and software development. However, legal inconsistencies remain due to the varied recognition of blockchain-generated records across jurisdictions, resulting in regulatory uncertainty. AI and machine learning are increasingly deployed in digital rights management (DRM) systems to detect IP infringements and streamline enforcement (Lasisi & Tembe, 2024). While these technologies enhance monitoring and automation, they also raise concerns about algorithmic bias, false positives, and transparency in enforcement. Moreover, the production of AI-generated content challenges traditional notions of authorship and complicates the legal attribution of creative works (Terras et al., 2024).

In parallel, blockchain's decentralisation of control complicates conventional regulatory mechanisms. While it supports transparency and peer verification, it disrupts centralised IP registration systems, making it difficult for jurisdictions to oversee asset transfers and enforce rights without institutional involvement (Bashir & Warraich, 2022). Cross-border enforcement becomes especially problematic in the absence of global standards. Additionally, data privacy frameworks like the GDPR pose compliance challenges; for instance, blockchain's immutability can conflict with the right to erasure, while public ledgers may expose personal data (López, 2024). Semantic Web technologies, though valuable for enhancing data interoperability, also risk IP violations through improper attribution or unlicensed reuse. These multifaceted challenges underscore the urgent need for harmonised, adaptive legal models that reflect the hybrid nature of digital assets, blending personal data, creativity, and commercial value. As technological innovation continues to outpace regulatory reform, a multi-stakeholder approach involving legal experts, technologists, and policymakers is essential to ensure a balanced, future-ready IP regime.

International Journal of Law, Government and Communication
EISSN : 0128-1763
Volume 10 Issue 41 (September 2025) PP. 385-396
DOI 10.35631/IJLGC.1041025

A key finding from the analysis is the urgent need for legal clarity in defining digital ownership, particularly for emerging asset classes like non-fungible tokens (NFTs) and tokenised data. The lack of alignment between traditional property doctrines and the decentralised, intangible nature of digital assets has created significant ambiguity. For instance, while NFTs provide a unique digital signature linked to ownership, they do not inherently confer copyright or other intellectual property (IP) rights unless this is explicitly stated (Chen & Friedmann, 2023). To address this issue, legislators should introduce statutory definitions that distinguish between ownership of the digital token, the associated IP, and any commercial exploitation rights. This legal differentiation is vital to minimise disputes, ensure the enforceability of digital transactions, and support sustainable market development (Wyczik, 2024).

The analysis further reveals that existing IP frameworks are not well-suited to the realities of digital creation and dissemination. Many copyright laws remain bound to outdated models of physical reproduction and distribution, which do not reflect current practices such as streaming, remixing, and algorithmically generated content. To promote innovation, adaptive licensing mechanisms like those embedded in smart contracts and enabled by blockchain should be formally recognised. These tools allow creators to automate rights enforcement and royalty management (Kumar & Suthar, 2025). Moreover, the establishment of regulatory sandboxes would enable policymakers to pilot such innovations in controlled environments, fostering legal adaptation without compromising stakeholder protection. The study also supports the development of interoperable, blockchain-based digital IP registries, which could facilitate cross-border licensing, reduce transaction costs, and build consumer trust (Bashir & Warraich, 2022). However, such systems must be designed with robust privacy and cybersecurity safeguards.

Lastly, the study highlights the growing importance of recognising data as a strategic intangible asset that warrants legal protection, even if it does not fit neatly within existing property or IP categories. Legal regimes could draw on trade secret protections, licensing arrangements, or introduce sui generis rights to safeguard structured and monetised data assets (López, 2024). At the same time, open data policies for non-sensitive information could drive innovation across sectors such as AI, education, and public health. Crucially, multi-stakeholder engagement must be embedded in the policymaking process to ensure that new legal frameworks are inclusive, forward-looking, and ethically grounded. As Terras, Schafer, and Favreau (2024) argue, ownership in the digital age is not merely legal or economic; it is cultural and relational. Legal clarity, therefore, should serve to foster trust, innovation, and equitable participation in digital economies.

The following graph provides a conceptual map generated from Scopus AI, offering insight into how these topics blend within current academic and policy discourse.

International Journal of Law, Government and Communication
EISSN : 0128-1763
Volume 10 Issue 41 (September 2025) PP. 385-396
DOI 10.35631/IJLGC.1041025

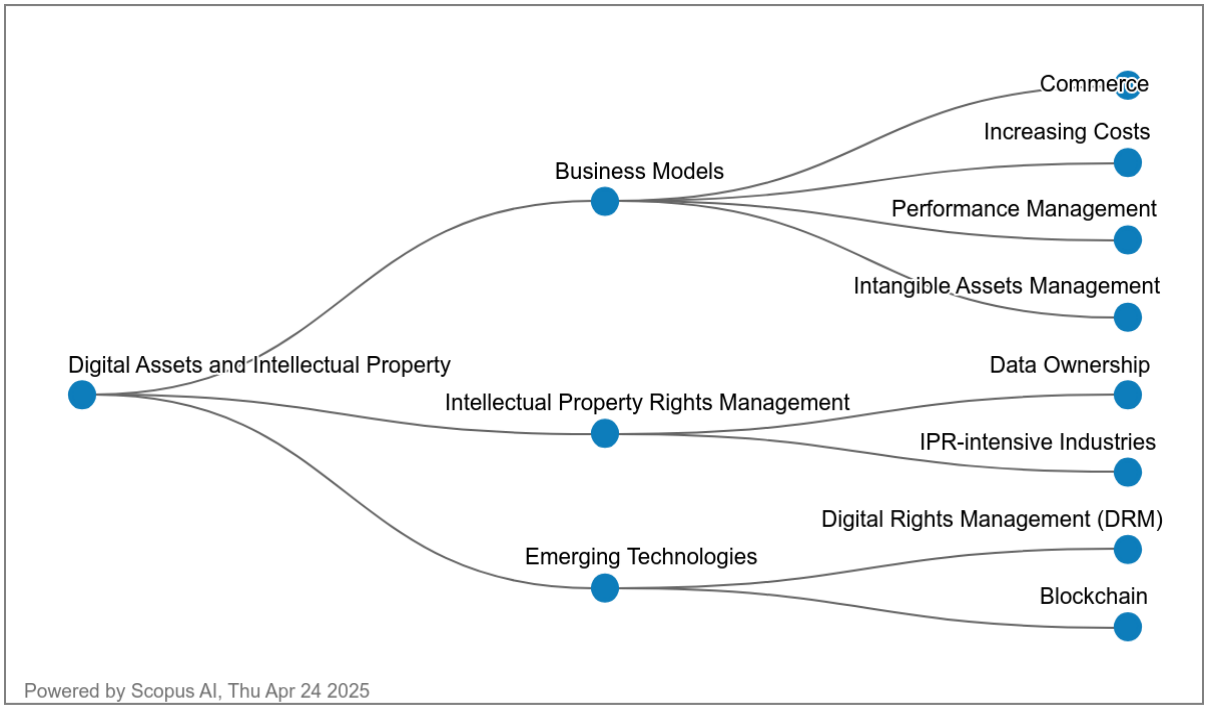


Figure 2: Scopus AI Knowledge Map on Digital Assets and Intellectual Property

The visualised concept map, generated using Scopus AI on April 24, 2025, presents a structured overview of the interrelated domains shaping the discourse on digital assets and intellectual property. The graph delineates three major thematic branches: Business Models, Intellectual Property Rights Management, and Emerging Technologies, each representing a crucial relationship in the evolving legal and commercial framework of digital ownership.

The Business Models connection reflects the economic implications of digital IP, highlighting key areas such as Commerce, Increasing Costs, Performance Management, and Intangible Assets Management. These areas illustrate how digital transformation affects cost structures, asset valuation, and strategic management, particularly in innovation-driven sectors.

The Intellectual Property Rights Management branch underscores the legal complexities of handling intangible assets in the digital era. It encompasses vital subdomains like Data Ownership and IPR-Intensive Industries, signifying the need for updated legal definitions, ownership models, and enforcement mechanisms that align with digital realities.

Finally, the Emerging Technologies branch, attached to Digital Rights Management (DRM) and Blockchain, emphasises the technical infrastructure transforming rights verification, licensing, and digital transactions. Blockchain, as a decentralised and secure ledger system, plays a pivotal role in enhancing transparency and efficiency in IP governance.

Collectively, the graph illustrates a multidimensional ecosystem where legal, technological, and economic factors intersect. This mapping serves as a conceptual framework for analysing how traditional notions of ownership and property are being redefined in response to the proliferation of digital assets and the advancement of supporting technologies. The intersection of digital assets and intellectual property (IP) with business models represents a foundational

International Journal of Law, Government and Communication
EISSN : 0128-1763
Volume 10 Issue 41 (September 2025) PP. 385-396
DOI 10.35631/IJLGC.1041025

relationship in the digital economy. As intangible assets like data, software, and digital art become economically valuable, businesses are compelled to design innovative models that can effectively monetise and manage these assets. Digital assets challenge traditional property norms because they are non-rivalrous and easily replicable, necessitating stronger IP frameworks to enforce exclusivity (Wyczik, 2024; Erlank, 2024). Consequently, the development of sustainable digital business models requires a nuanced understanding of legal protections afforded by IP laws and how they can be embedded within organisational strategies.

These digital business models directly influence commerce, particularly in how goods and services are exchanged in digital marketplaces. For instance, NFTs and blockchain-based platforms facilitate peer-to-peer transactions, eliminating intermediaries and creating new channels for value exchange (Chen & Friedmann, 2023). E-commerce platforms increasingly rely on digital assets to enhance customer engagement and deliver personalised experiences, which are themselves built upon protected IP elements such as proprietary algorithms, design patents, or copyrighted content. Thus, digital IP serves as both an input and output in modern commerce, forming a feedback loop that reshapes how businesses generate value.

However, these innovations often lead to increasing costs in terms of infrastructure, compliance, and security. Implementing digital asset management systems, ensuring legal compliance with cross-border IP laws, and securing intangible assets against piracy or unauthorised use require significant financial investment (Lasisi & Tembe, 2024). Furthermore, as digital IP grows in value, legal disputes over ownership and infringement become more frequent and costly. Businesses must invest in sophisticated legal and technological infrastructures, including blockchain and smart contracts, to mitigate these risks and reduce transaction costs in IP management (Kumar & Suthar, 2025).

To address these cost implications and maximise efficiency, organisations turn to performance management frameworks. These systems help track and evaluate the contribution of digital IP to business performance, ensuring that strategic goals align with the monetisation of intangible assets. For example, licensing revenues from IP or metrics like user engagement with digital platforms can serve as key performance indicators. These insights inform investment decisions and highlight areas where innovation can lead to competitive advantages (Trequattrini et al., 2022). Proper performance tracking allows firms to optimise the return on investment (ROI) from their digital assets and adjust strategies in real time.

Lastly, intangible assets management forms the backbone of this entire ecosystem. Unlike physical assets, intangible assets like patents, copyrights, trademarks, and trade secrets require unique identification, valuation, and protection mechanisms (Loseva et al., 2023). In the digital era, the management of these assets must also accommodate new variables such as digital scarcity (e.g., NFTs), decentralised control (e.g., DAOs), and interoperability across platforms. Effective intangible asset management enhances transparency, reduces duplication, and facilitates better commercialisation strategies. It ensures that digital business models are scalable, sustainable, and legally robust, thus solidifying the link between innovation and economic performance.

The growing prevalence of digital assets and intellectual property in the modern economy has redefined how value is created, stored, and exchanged. Digital assets, such as software, digital art, algorithms, and databases, derive their economic worth primarily from their intangible

International Journal of Law, Government and Communication
EISSN : 0128-1763
Volume 10 Issue 41 (September 2025) PP. 385-396
DOI 10.35631/IJLGC.1041025

nature and scalability. As these assets proliferate, the need for robust intellectual property rights management becomes imperative to ensure legal protection, exclusivity, and monetisation. IPR management involves identifying, securing, and enforcing rights associated with intangible creations, enabling asset holders to prevent unauthorised use while fostering innovation through licensing and commercialisation (Wyczik, 2024; Erlank, 2024). The effectiveness of this framework determines the extent to which digital assets can be leveraged as economic tools in both traditional and emerging industries.

An integral component of this framework is data ownership, which forms a core variable in the digital asset-IPR interface. In the digital economy, data is often co-created across multiple actors, raising complex questions about legal ownership and control. As data increasingly underpins products and services from AI algorithms to personalised consumer experiences, determining who owns and controls data becomes critical for asserting intellectual property rights and ensuring ethical use (Chen & Friedmann, 2023). Without clear ownership, enforcing rights or attributing responsibility becomes legally challenging. Inadequate data governance can result in IP leakage or misuse, undermining the rights of original creators or organisations. Thus, a coherent legal and regulatory environment that delineates ownership and usage rights is essential to support secure and sustainable data-driven innovation.

These dynamics are particularly prominent in IPR-intensive industries, such as pharmaceuticals, media, technology, and software development. These sectors rely heavily on the protection and strategic use of IP to maintain competitive advantages and recoup R&D investments. In such industries, digital assets are often at the core of their innovation cycles and revenue generation. Properly managed IPR frameworks not only incentivise continued innovation but also attract investment by reducing the risks of infringement or duplication (Trequattrini et al., 2022). Furthermore, as these industries adopt increasingly data-driven models, the overlap between data ownership, digital IP, and IPR management grows more intricate, necessitating integrated strategies to navigate legal, technological, and ethical boundaries effectively (Loseva et al., 2023). By aligning data governance and IPR practices, IPR-intensive industries can ensure legal clarity, bolster trust, and foster a culture of responsible innovation.

The link between digital assets and intellectual property (IP) is rapidly evolving as emerging technologies continue to reshape the way intangible assets are created, managed, and protected. Digital assets ranging from NFTs, tokenised music, and e-books to proprietary algorithms require effective IP frameworks to ensure creators' rights are safeguarded against unauthorised use or duplication. Emerging technologies such as AI, extended reality (XR), and quantum computing introduce new variables that challenge traditional notions of IP law, particularly regarding authorship, originality, and ownership (Chen & Friedmann, 2023). These technologies often involve layers of automated content creation or modification, which complicates enforcement and raises questions around legal liability, necessitating proactive and adaptive legal mechanisms.

A key technological solution in this domain is Digital Rights Management (DRM), a system that enables creators and rights holders to control access to and use of their digital content. DRM represents the operational variable that links digital assets to their enforceable usage conditions. Through encryption, watermarking, and license verification protocols, DRM tools help to restrict unauthorised copying, redistribution, and modification of digital intellectual

International Journal of Law, Government and Communication
EISSN : 0128-1763
Volume 10 Issue 41 (September 2025) PP. 385-396
DOI 10.35631/IJLGC.1041025

property (Loseva et al., 2023). While DRM systems can enhance enforcement, they must also balance accessibility and user rights to avoid overly rigid restrictions that hinder innovation. As digital content proliferates across streaming, gaming, and e-learning platforms, implementing robust and transparent DRM frameworks is increasingly vital for preserving the economic value of IP in a fair and scalable way.

Blockchain technology further reinforces these objectives by providing a decentralised and immutable infrastructure for tracking ownership, verifying authenticity, and automating licensing agreements through smart contracts. Blockchain acts as both a legal and technical variable in enhancing transparency, trust, and traceability of digital transactions. It facilitates real-time recordkeeping of IP transfers, royalties, and usage metrics, which supports creators' claims and reduces dependency on centralised authorities (Wyczik, 2024). Moreover, blockchain-integrated DRM systems can enable programmable access and revenue sharing, which is particularly useful for dynamic IP models in the creative and technology sectors. As emerging technologies continue to blur the boundaries of content creation and distribution, blockchain provides the foundational architecture to uphold IP integrity in a digital-first economy (Erlank, 2024).

Conclusion

The evolving interplay between digital assets and intellectual property necessitates the continuous adaptation of regulatory frameworks to ensure legal certainty and enforceability, particularly as blockchain and smart contracts redefine asset protection (Kumar & Suthar, 2025). While these technologies offer innovative mechanisms for securing intellectual property rights, their integration within existing legal structures remains inconsistent, underscoring the need for a harmonised approach that aligns established IP principles with emerging digital solutions. The analysis unequivocally achieved its objective of evaluating the adequacy of current frameworks, identifying the challenges posed by emerging technologies, and considering potential reforms. The finding shows that although digital assets encourage innovation, their decentralised and intangible nature undermines traditional legal concepts of attribution, exclusivity, and enforceability, while cross-jurisdictional inconsistencies continue to hinder harmonisation.

Notwithstanding that, the research is subject to certain limitations. It relies primarily on secondary literature and selected EU and international case studies, which, while sufficient to establish a conceptual and comparative basis, may not fully capture the diversity of global regulatory practice or the pace of technological innovation. Future research incorporating empirical evidence, broader jurisdictional analysis, and stakeholder perspectives would therefore provide a more comprehensive foundation for legal and policy reform. Concurrently, businesses must strategically address the financial sustainability of digital assets by optimising management strategies and performance evaluation frameworks to balance infrastructure, compliance, and security expenditures while leveraging digital IP for long-term economic viability (Lasisi & Tembe, 2024). The convergence of legal protections and technological advancements further highlights the authoritative for harmonious regulatory responses in digital commerce, particularly as NFTs, AI-generated content, and blockchain-driven platforms continue to reshape ownership constructs. As digital markets expand, policymakers must prioritise the development of regulatory standards that uphold fairness, strengthen enforceability, and enable businesses to maximise the economic potential of intangible assets (Chen & Friedmann, 2023).

International Journal of Law, Government and Communication
EISSN : 0128-1763
Volume 10 Issue 41 (September 2025) PP. 385-396
DOI 10.35631/IJLGC.1041025

Acknowledgements

The authors would like to sincerely thank the Kedah State Research Committee, UiTM Kedah Branch, for the generous funding provided under the Tabung Penyelidikan Am. This support was crucial in facilitating the research and ensuring the successful publication of this article.

References

Bashir, F., & Warraich, N. F. (2022). Prospects of Semantic Web and Blockchain Technologies in Libraries. *Studies in Big Data*. https://www.scopus.com/record/display.uri?eid=2-s2.0-85127860949&origin=scopusAI

Chen, J., & Friedmann, D. (2023). Jumping from mother monkey to bored ape: The value of NFTs from an artist's and intellectual property perspective. *Asia Pacific Law Review*. https://www.scopus.com/record/display.uri?eid=2-s2.0-85138274956&origin=scopusAI

Craig, A., & de la Mare, A. (2022). NFTs and intellectual property: A European perspective. Intellectual Property Quarterly, (2), 145–167.

De Filippi, P., & Wright, A. (2018). Blockchain and the law: The rule of code. Harvard University Press.

Erlank, W. (2024). Digital Property. In *Research Handbook on European Property Law*. https://www.scopus.com/record/display.uri?eid=2-s2.0-85217348676&origin=scopusAI

European Commission. (2020). *Digital finance strategy and retail central bank digital currency (CBDC) consultation*. https://ec.europa.eu/info/business-economy-euro/banking-and-finance/digital-finance_en

Hilty, R. M., & Henning, B. (Eds.). (2022). *Artificial intelligence and intellectual property* (MPI for Innovation and Competition Research Paper No. 22-02). Max Planck Institute for Innovation and Competition. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4068828

Falagas, M. E., Pitsouni, E. I., Malietzis, G. A., & Pappas, G. (2008). Comparison of PubMed, Scopus, Web of Science, and Google Scholar: Strengths and weaknesses. *The FASEB Journal, 22*(2), 338–342. https://doi.org/10.1096/fj.07-9492LSF

Kumar, D., & Suthar, N. (2025). Assessing the prospects and constraints of blockchain technology for intellectual property management. *Journal of World Intellectual Property*. https://www.scopus.com/record/display.uri?eid=2-s2.0-86000429038&origin=scopusAI

Lam, J. S. L., & Lee, K. W. (2025). Blockchain technology for digital asset ownership. In *Lecture Notes in Computer Science* (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics). https://doi.org/10.xxxx/lncs.2025.05.01

Lasisi, M., & Tembe, U. (2024). Digitisation and Intellectual Property Rights. In *Encyclopedia of Libraries, Librarianship, and Information Science*. https://www.scopus.com/record/display.uri?eid=2-s2.0-85218392130&origin=scopusAI

López, E. F. (2024). To Protect or Not to Protect: The Data Ownership Dilemma. *Revista Iberoamericana de la Propiedad Intelectual*. https://www.scopus.com/record/display.uri?eid=2-s2.0-85217522470&origin=scopusAI

Loseva, O. V., Fedotova, M. A., & Abdikeev, N. M. (2023). A Conceptual Model for Evaluating Digital Intellectual Assets. *Finance: Theory and Practice*.

International Journal of Law, Government and Communication
EISSN : 0128-1763
Volume 10 Issue 41 (September 2025) PP. 385-396
DOI 10.35631/IJLGC.1041025

https://www.scopus.com/record/display.uri?eid=2-s2.0-85173040522&origin=scopusAI

Napolitano, E. (2024). The new frontiers of trust: Bitcoins and cryptocurrencies. *Journal of Law, Market and Innovation*. https://www.scopus.com/record/display.uri?eid=2-s2.0-85208041451&origin=scopusAI

Ncube, M. (2021). Digital ownership in the EU: A comparative analysis of property law approaches to digital assets. European Property Law Journal, 10(2), 189–215. https://doi.org/10.1515/eplj-2021-0010

Terras, M., Schafer, B., & Favreau, A. (2024). Ownership and control in the creative economy: On new property rights for digital assets. In *Data-Driven Innovation in the Creative Industries*. https://www.scopus.com/record/display.uri?eid=2-s2.0-85194707755&origin=scopusAI

Trequattrini, R., Lardo, A., Cuozzo, B., & Manfredi, S. (2022). Intangible assets management and digital transformation: Evidence from intellectual property rights-intensive industries. *Meditari Accountancy Research*. https://www.scopus.com/record/display.uri?eid=2-s2.0-85126358213&origin=scopusAI

Wyczik, J. (2024). Ownership in the 21st century: Property law of digital assets. *Information and Communications Technology Law*. https://www.scopus.com/record/display.uri?eid=2-s2.0-85208041451&origin=scopusAI