

Formation of Modern Approaches for Regulating Intellectual Property Rights in the Sector of Information and Communication Technologies

ANDRIY YEREMENKO¹

ABSTRACT. The rapid development of information and communication technologies (ICT), in particular the introduction of artificial intelligence (AI), Big Data and distributed ledger technologies (blockchain, NFTs), has created a significant regulatory gap between the territorial foundations of traditional intellectual property law and the global, transformative nature of digital innovations. This necessitates a critical analysis of international practice to develop effective legal mechanisms. The article systematises and conducts a comparative analysis of the key approaches applied by leading jurisdictions (the US, the EU, China) and international organisations to adapt the IP regime to the realities of the ICT environment. The study focuses on three fundamental areas of regulation. Firstly, it analyses conflicts in patent law relating to the patentability of software, where jurisdictions demonstrate significant differences in criteria (for example, between the Alice/Mayo framework in the US and the technical solution criterion in China and the EU). Particular attention is paid to standard-essential patents (SEPs) and the FRAND licensing obligation, where the lack of unified methodologies leads to an escalation of cross-border disputes and the use of aggressive procedural tools, such as anti-suit injunctions. Secondly, the transformation of copyright in the digital space is examined, particularly the liability of online intermediaries. A comparative analysis is conducted between the 'safe harbour' model of the US Digital Millennium Copyright Act (DMCA) and the proactive duty of authorisation and prevention of infringements introduced by Article 17 of the EU Directive on Copyright in the Digital Single Market (DSM). Thirdly, the latest challenges posed by generative AI and Big Data are examined. Uncertainty regarding the authorship of AI-generated content is prompting proposals for the introduction of sui generis rights. Furthermore, the regulatory imperative to create exceptions for Text and Data Mining (TDM) is analysed, with a view to avoiding the 'tragedy of anti-commons' and ensuring access to data for innovation. The paper also argues for the need to transition to flexible, proactive regulatory approaches that encourage collective licensing and cross-border cooperation, whilst ensuring the protection of the rights of creators and users.

KEYWORDS: intellectual property, information and communication technologies, artificial intelligence, copyright, patent law, software, Big Data, blockchain, NFT, World Intellectual Property Organisation, Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS Agreement).

¹ **Andriy Yeremenko** — PhD, Associate Professor at the Department of European Economics and Business, Kyiv National Economic University named after Vadym Hetman (Kyiv, Ukraine). Research interests: international economic relations, international capital flows, intellectual property, European integration, European economy, global economy, international business, analysis of world economies. Email: yeremenko.andriy@kneu.edu.ua. ORCID: <https://orcid.org/0009-0005-6177-838X>

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Introduction

The aim of this article is to conduct a comparative legal analysis of key international models for regulating IP in the ICT sector, to identify the reasons for their divergence and, based on an analysis of recent academic publications and law enforcement practice, to propose promising solutions to existing regulatory problems, including suggestions for the introduction of new legal institutions.

The modern ICT sector is the main driver of global economic growth and innovation. However, it is precisely the dynamism of this sector that poses the most complex challenges to the IP system. Traditional IP institutions, based on the territorial principles of the Berne and Paris Conventions, have proved insufficiently flexible to effectively regulate the global and rapidly changing digital environment, leading to the formation of a significant regulatory gap.²

The problem lies in the mismatch: the pace of technological change in ICT, particularly the emergence of generative artificial intelligence (AI), big data processing and blockchain technology, far outstrips the ability of national and international legal systems to adapt. This legal uncertainty directly threatens both the incentives for innovators and the rights of creators.

From a practical point of view, the uncertainty of the legal regime has direct economic consequences. For example, the lack of clarity regarding who is the author of content created using AI³, or the absence of scalable Big Data licensing models for training algorithms⁴, provokes legal instability and cross-border legal disputes. There is a real risk of a so-called 'Tragedy of the Anticommons', where the fragmentation and multiplicity of IP rights over key technological resources (e.g. patents in the field of standards or unstructured data) lead to their underutilisation, hindering further innovation and the diffusion of technologies.⁵

Accordingly, international practice in IP regulation is not a unified system, but rather a complex of different national solutions (US, EU, Asia). The systematisation and comparative analysis of these disparate approaches is a critically important task both for academic doctrine and for the formulation of international policy.

² OMPI. "Management of academic intellectual property and early stage innovation in countries in transition." WIPO, 2010. <https://www.wipo.int/publications/es/details.jsp?id=4117&plang=EN>

³ Mackenzie Caldwell. What Is an "Author"? — Copyright Authorship of AI Art Through a Philosophical Lens | Published in Houston Law Review. <https://houstonlawreview.org/article/92132-what-is-an-author-copyright-authorship-of-ai-art-through-a-philosophical-lens>

⁴ Copyright and Artificial Intelligence, Part 3: Generative AI Training Pre-Publication Version. <https://www.copyright.gov/ai/Copyright-and-Artificial-Intelligence-Part-3-Generative-AI-Training-Report-Pre-Publication-Version.pdf>

⁵ Heller M.A., Eisenberg R.S. Can patents deter innovation? The anticommons in biomedical research — Pub-Med. <https://pubmed.ncbi.nlm.nih.gov/9563938/>

Despite the efforts of international organisations, in particular WIPO⁶, and the ongoing modernisation of national legislation, a number of fundamental issues in the field of ICT remain unresolved:

1. At the international level, there is no single consensus on the legal status of AI-generated works. The question of whether AI systems can be inventors or authors, and whose property rights arise in their 'output'⁷, remains the subject of heated debate.

2. There is a fundamental discrepancy between the models for regulating the liability of online intermediaries. The DMCA's 'safe harbour' model in the US contrasts sharply with the model of proactive liability introduced by Article 17 of the DSM Directive in the EU.⁸ This imbalance creates different conditions for conducting digital business and raises questions about copyright protection standards on a global scale.

3. This problem is *most* evident in the highly competitive field of Standard Essential Patents (SEPs). The lack of uniform rules for resolving conflicts of jurisdiction, particularly in cases of parallel litigation, forces courts to resort to procedural instruments such as anti-suit injunctions⁹, which may undermine international comity.

The issue of international regulation of IP rights, particularly in the context of ICT and new technologies, is explored in the works of scholars such as Androshchuk G.¹⁰, Dubnyak M.¹¹, Zayarnoy O.¹², Kasich A. et al.¹³, Kuzmenko O.¹⁴, Tymoshenko E.¹⁵, Tyuria Y.¹⁶,

⁶ Current issues of intellectual property in the information sector. https://nbuviap.gov.ua/images/informaciyni_vidanya/akt_problem_intelekt_vlasnosti/2024_Aktualni_problemu_no02.pdf

⁷ Gaidartzi Anthi, Stamatoudi Irini. Authorship and Ownership Issues Raised by AI-Generated Works: A Comparative Analysis. URL: <https://www.mdpi.com/2075-471X/14/4/57>

⁸ Peguera Miguel. The DMCA Safe Harbors and Their European Counterparts: A Comparative Analysis of Some Common Problems — ResearchGate. https://www.researchgate.net/publication/228172639_The_DMCA_Safe_Harbors_and_Their_European_Counterparts_A_Comparative_Analysis_of_Some_Common_Problems

⁹ Tsilikas Haris. Anti-suit injunctions for standard-essential patents: the emerging gap in international patent enforcement. *Journal of Intellectual Property Law & Practice*. Oxford Academic. <https://academic.oup.com/jiplp/article/16/7/729/6291432>

¹⁰ Androshchuk, G. Intellectual Property and Artificial Intelligence: Who Is the Author? DOI: <https://doi.org/10.15407/jai2022.01.166>

¹¹ Dubnyak, M. Legal approaches in EU legislation on artificial intelligence: lessons for Ukraine. *Information and Law*. 2024, No. 2 (49), pp. 102–118. DOI: [https://doi.org/10.37750/2616-6798.2024.3\(50\).311600](https://doi.org/10.37750/2616-6798.2024.3(50).311600)

¹² Zayarnoy O.A. Legislative framework for the development and application of artificial intelligence technologies in the context of war and Ukraine's European integration. DOI <https://doi.org/10.30525/978-9934-26-559-4-12>

¹³ Kasych A.O., Yakovenko Y.Y., Klyus Y.M., Dinko I.Y. 'Artificial intelligence and intellectual property in the creative industry: opportunities and challenges'. *Bulletin of the National Technical University 'Kharkiv Polytechnic Institute'*, 2023. <https://doi.org/10.20998/2519-4461.2023.6.77>.

¹⁴ Kuzmenko O., Chorna V., Ostrovskiy S. Legal regulation of the introduction and use of artificial intelligence. *Kyiv Law Journal*. (1). 2024. 173–177. DOI <https://doi.org/10.32782/klj/2024.1.23>

¹⁵ Tymoshenko, Ye. A. The legal nature of artificial intelligence: problems and prospects. *Legal Scientific Electronic Journal*. 2023. No. 4. pp. 424–425. DOI: <https://doi.org/10.32782/2524-0374/2023-4/104>

¹⁶ Tyuria, Yu. Definition of the concept of administrative and legal regulation of activities related to the creation, implementation and use of artificial intelligence in Ukraine. *Scientific journal 'Juris Europensis Scientia'*. 3/2022. 72–78. DOI <https://doi.org/10.32782/chem.v3.2022.14>

Shevchenko A.¹⁷ and other researchers. However, despite the extent to which this issue has been explored, the topic remains open and requires further study.

International practice in regulating IP in the ICT sector

Recent academic publications and international reports in the field of IP focus strongly on the legal challenges arising from rapid digital transformation and the development of AI.

WIPO's 'World Intellectual Property Report 2024' highlights the need to develop innovative policies based on fostering innovation and economic growth. In 2024, WIPO introduced a new data-driven methodology to assist policymakers in making informed decisions regarding innovation and industrial policy. This underscores the global shift towards evidence-based policy in the field of IP.

Leading legal publications and think tanks in 2023–2024 are focusing on the legal issues that AI poses for the IP system. The main debates revolve around:

- The requirement that an 'inventor' must be a natural person contradicts the reality of inventions created or largely generated by AI. The question arises as to whether an invention generated by AI should be eligible for patent protection.
- Similar questions arise in the field of copyright, where the granting of protection to works entirely created by AI is also contested. This requires an expansion of current guidelines on inventorship and authorship to ensure the protection of IP in the modern context.

At the national level, in line with international trends, mechanisms for protecting rights in the digital environment are being improved. This includes compiling a national list of websites that infringe IP rights, as well as assessing the potential of blockchain technology for protecting IP rights, particularly for establishing authorship. The results of research into digital transformation in the regions of Ukraine for 2024 show growth in institutional capacity and the development of the Internet as key indicators in the ICT sector.

The regulation of IP rights in the ICT sector takes place at several levels: international treaties, national legislation and institutional policies, including licensing agreements, R&D cooperation and consortia. International treaties, such as the TRIPS Agreement, establish minimum standards of protection but leave considerable discretion to national jurisdictions on matters relating to ICT, particularly algorithms and data.

¹⁷ Strategy for the Development of Artificial Intelligence in Ukraine: monograph / A. I. Shevchenko, S. V. Baranovskyi, O. V. Bilokobylskyi et al. Edited by A. I. Shevchenko. — Kyiv: Institute of Artificial Intelligence Problems, 2023. — 305 pp. DOI: 10.15407/development_strategy_2023

Current research focusing on the evolution of IP in the digital age highlights the urgent need to modernise legislation and strengthen cross-border cooperation.¹⁸ WIPO is actively working on these issues, for example through initiatives linking IP to the Sustainable Development Goals (SDGs). In addition, WIPO is focusing on building institutional capacity by establishing IP training institutes (IPTIs) and training trainers to disseminate knowledge on IP protection worldwide.

The role of IP in the ICT sector is largely realised through licensing. IP licensing has become a key form of trade and the primary channel for the diffusion of innovation, knowledge and information. It enables companies to access technologies they do not own, thereby lowering barriers to market entry. At the same time, licensing creates incentives for R&D, allowing innovators to recoup the investments required for the successful development of new technologies. Licensing agreements, particularly voluntary licences, are recognised as the most effective means of transferring the necessary know-how and implementing technologies.¹⁹

One of the key but often overlooked factors influencing the ICT innovation ecosystem is the protection of trade secrets (know-how). The 2025 Global Intellectual Property Index revealed that trade secret protection remains one of the weakest links globally. The average score in this category is just 48.97%, which is the lowest in the entire Index.²⁰ This has far-reaching consequences. In the ICT sector, where many valuable assets (algorithms, non-patentable know-how, Big Data) are protected precisely as trade secrets, a low level of protection directly increases the risks associated with international technology transfer, R&D cooperation and the formation of consortia. Increased risk leads to a decline in trust and a rise in licensing costs, which slows the diffusion of critically important, albeit unpatentable, ICT innovations.

Patent law in the field of information technology and algorithms

The legal regime for software patenting is one of the most divergent and complex areas of international IP regulation. Despite the common goal of stimulating innovation, jurisdictions apply fundamentally different criteria

¹⁸ Racheal Adams. The Evolution of Intellectual Property Rights in the Digital Age — ResearchGate. https://www.researchgate.net/publication/376196784_The_Evolution_of_Intellectual_Property_Rights_in_the_Digital_Age

¹⁹ Joy Y. Xiang. Intellectual Property, Antitrust, and Access to Essential Technologies — Lewis & Clark Law School Digital Commons. <https://lawcommons.lclark.edu/cgi/viewcontent.cgi?article=1076&context=lclr>

²⁰ Current issues in intellectual property in the information sector — Centre for Social Communication Research. https://nbuviap.gov.ua/images/informaciyni_vidanya/akt_problem_intelekt_vlasnosti/2025/2025_Aktualni_problemu_no08.pdf

to distinguish patentable technical inventions from non-patentable abstract ideas or business methods.

The United States of America (USA). The starting point and the main obstacle for software developers in the USA is the need to prove that a solution is not merely an ‘abstract idea’. This approach is based on case law, in particular the decisions in *Mayo Collaborative Services v. Prometheus Laboratories, Inc.* (2012) and *Alice Corp. v. CLS Bank International* (2014), which formed the so-called Alice/Mayo framework. This two-step test is an algorithm used by the US Patent and Trademark Office (USPTO) to examine applications, requiring that an invention contain ‘something more’ than just an abstract idea in order to be protected.²¹ The rationale is to prevent the dangerous monopolisation of broad swathes of abstract mathematical or economic knowledge.

European Union (EU). European practice has historically required that an invention be of a ‘technical nature’. Since June 2023, the mechanisms of the Unitary Patent and the Unified Patent Court (UPC) have come into force in the EU. These institutions allow applicants who have obtained a European patent to request a unitary effect, which provides automatic protection in many participating countries (currently 17) at once. This simplifies the protection of software inventions, but at the same time creates a symmetrical risk of centralised patent revocation by a single decision of the UPC. The requirements for software patenting remain focused on demonstrating the technical contribution of the invention.

People’s Republic of China (PRC). The Chinese approach (via the China National Intellectual Property Administration, CNIPA) also excludes algorithms and business methods from patentability unless they possess additional technical features. The key question is whether the application describes a ‘technical solution’. A technical solution is defined as the application of the laws of nature to solve a technical problem and achieve a technical effect. Although the Chinese standard has become more favourable to AI and software inventions over the past decade than it was previously, in practice there is inconsistency in the application of criteria by CNIPA examiners, which makes the predictability of obtaining patents difficult.²² The following table summarises the main differences in approaches to the patentability of software.

Standardisation plays a critically important role in the ICT industry (e.g. mobile technologies such as LTE, 4G, 5G, IoT), as it ensures interop-

²¹ Korogod I. Software Patenting: How Do the EU and the US View It? — Sayenko Kharenko. <https://sk.ua/uk/patentuvannja-programnogo-zabezpechennja-jak-ce-bachat-ies-ta-ssha/>

²² Portnov Michael. AI Patent Eligibility: Observations and Lessons for the U.S. and China — Fish & Richardson. <https://www.fr.com/insights/thought-leadership/articles/ai-patent-eligibility-observations-and-lessons-for-the-us-and-china/>

erability between devices and different manufacturers.²³ To ensure such interoperability, certain patents must be included in the standard – these are known as standard-essential patents (SEPs).

Table 1

COMPARISON OF SOFTWARE PATENTABILITY CRITERIA IN KEY JURISDICTIONS

Criterion	USA (USPTO, Alice/Mayo Framework)	EU (EPO/EPO)	China (CNIPA)
Main Exclusion	Abstract Idea	Non-technical invention	Algorithms and business methods without a technical solution
Focus of analysis	Two-step test: is the invention an abstract idea, and does it contain 'something more'	Technical nature, technical problem and technical effect	Presence of technical features and achievement of a technical effect
General trend	Case law (Mayo/Alice) remains restrictive	Centralisation of protection through the Unitary Patent	Relaxation of criteria, but inconsistent application

Source: developed by the author based on data^{20, 21}

To prevent abuse of the monopoly position that arises for the SEP holder following its inclusion in the standard, standardisation organisations require SEP holders to commit to licensing them on fair, reasonable and non-discriminatory terms (FRAND). This mechanism aims to balance incentives for innovators (ensuring remuneration) with the protection of users from 'patent hold-up'.²⁴

Courts around the world (in the US, the EU, China and India) are actively developing methodologies for calculating FRAND rates. These methodologies take into account complex economic factors such as the risks of 'royalty stacking' (where the total sum of royalties for the use of all necessary SEPs becomes excessive) and the need to apply the 'incremental value' rule (determining the value of an SEP independently of the cost of the standard).

The inconsistency of patentability criteria for software and algorithms across jurisdictions directly leads to an escalation of cross-border disputes concerning SEPs. As IP standards remain national, innovators have an incentive to seek the most favourable court (forum shopping) for conducting proceedings, leading to an accumulation of parallel proceedings in highly competitive sectors (5G, IoT).

²³ Dornis, Tim. Standard-Essential Patents and FRAND Licensing — At the Crossroads of Economic Theory and Legal Practice. Request PDF — ResearchGate. URL: https://www.researchgate.net/publication/345242367_Standard-Essential_Patents_and_FRAND_Licensing-At_the_Crossroads_of_Economic_Theory_and_Legal_Practice

²⁴ Chryssoula Pentheroudakis, Justus A. Baron. Licensing Terms of Standard Essential Patents — JRC Publications Repository. DOI: <https://doi.org/10.2791/32230>

In response to this jurisdictional uncertainty, courts are resorting to aggressive procedural tools such as anti-suit injunctions (ASIs). An ASI is a court order that prohibits a party from continuing or initiating parallel legal proceedings in a foreign jurisdiction. For example, in *Microsoft Corp. v. Motorola, Inc.*, the court applied an ASI to block the enforcement of SEPs in Germany.²⁵ Although ASIs are effective for controlling litigation strategy and ensuring procedural efficiency, their use is seen as a challenge to international comity. Thus, IP regulation in the field of SEPs is shifting from the harmonisation of rights to the control of jurisdiction.

A particular problem arises in the Internet of Things (IoT) sector. Experts argue that if SEP licensing is widely implemented at the device level (device-level licensing), this could have a negative impact on innovation and entrepreneurship in the IoT sector. This highlights the need to simplify licensing processes to prevent the development of new market segments from being stifled.

Copyright regulation in the digital environment and the liability of intermediaries

Copyright in the digital environment is regulated by the WIPO Internet Treaties and supranational acts. A key challenge is the nature of the Internet as a medium that allows for the instantaneous and mass dissemination of content, often in breach of rights. A central figure in this regulation is the internet intermediary (platform, ISP), which, whilst not a direct infringer, provides the infrastructure for the hosting of illegal content.²⁶

The US model (DMCA Safe Harbor). The US Digital Millennium Copyright Act (DMCA, 1998) was one of the first pieces of legislation in the world to regulate copyright relations in the digital environment. The DMCA introduced the concept of 'safe harbour', under which an online service provider is exempt from liability for hosting infringing content, provided that it responds promptly to a formal notice of infringement by removing or disabling access to such content (Notice-and-Takedown).²⁷ This approach is reactive and is based on the passive role of the intermediary.

²⁵ Jeffrey A. Berkowitz, Frank A. DeCosta. Strategic Considerations for Defending Litigation over Standard-Essential Patents. Articles. <https://www.finnegan.com/en/insights/articles/strategic-considerations-for-defending-litigation-over-standard-essential-patents.html>

²⁶ Seckin Yasemin. The Role of Intermediary Liability in Balancing Copyright Law in the Digital World. February 2023. https://www.researchgate.net/publication/368661081_The_Role_of_Intermediary_Liability_in_Balancing_Copyright_Law_in_the_Digital_World

²⁷ Kochyna O.S. International legal experience in the protection of copyright on the global internet and prospects for its application in Ukraine. <https://ir.stu.cn.ua/bitstreams/a4848338-e7bb-45b4-bc47-8119b0dc18c6/download>

The EU model (Directive 2019/79/EU, Art. 17). The EU Directive on Copyright in the Digital Single Market (DSM Directive) introduced a significantly stricter regime for Online Content-Sharing Service Providers (OCSSPs), such as YouTube. Article 17 of the Directive provides for the possibility of holding platforms liable for the public provision of content uploaded by users.

This is an ‘unprecedented shift’, as it imposes a proactive obligation on OCSSPs. A platform can avoid liability in only two cases: if it (1) has made ‘best efforts’ to obtain authorisation or a licence for the content from rights holders; or (2) in the absence of a licence, has made ‘best efforts’ to prevent the uploading of ‘earmarked content’.²⁸

The key difference between the models lies in their focus: the DMCA favours a passive intermediary role and prompt removal following notification, whereas Article 17 of the DSM requires proactive risk management, which often necessitates the use of automated content filtering technologies. For rights holders, this approach is attractive because it is easier for them to hold a large intermediary liable than millions of anonymous end-users.

Table 2

COMPARATIVE ANALYSIS OF LIABILITY REGIMES FOR INTERNET INTERMEDIARIES

Characteristic	USA (DMCA Safe Harbor)	EU (DSM Directive, Art. 17)
Basic principle	Passive liability (‘Safe harbour’)	Active liability / Authorisation/licensing obligation
Protection mechanism	Notice-and-Takedown	Best Efforts regarding the obtaining of licences and Prevention regarding ‘specified content’
Legal rationale	Protecting internet innovation by minimising risks for ISPs	Ensuring fair remuneration for creators in the Digital Single Market
Effectiveness assessment	Criticism for insufficient protection of rights in Web 2.0	Criticism regarding the risk of ‘over-blocking’ and the threat to freedom of expression

Source: compiled by the author based on data from^{29, 30, 31}

²⁸ Blackwell Lucas. The death of Article 17: how the CJEU in Poland v. Parliament created a framework which prevents holding YouTube liable for copyright infringement — Southwestern Law School. <https://www.swlaw.edu/sites/default/files/2024-06/9%20-%20Blackwell.pdf>

²⁹ EU Commission finally publishes Guidance on Article 17 of the DSM Copyright Directive. <https://www.hoganlovells.com/en/publications/eu-commission-finally-publishes-guidance-on-article-17-dsm-copyright-directive>

³⁰ The implementation challenge of Article 17 of the DSM Copyright Directive: an “institutional” option? — Latest blog articles — Maastricht University. <https://www.maastrichtuniversity.nl/blog/2021/05/implementation-challenge-art-17-cdsm-directive-%E2%80%9Cinstitutional%E2%80%9D-option>

³¹ Teresa Nobre. The Post-DSM Copyright Report: Article 17 — COMMUNIA Association. <https://communia-association.org/2024/05/13/the-post-dsm-copyright-report-article-17/>

The EU's shift to proactive liability (Article 17) is a direct response to the failure of the passive model (DMCA) to effectively control mass copyright infringement in Web 2.0. However, this decision has led to the emergence of a new, no less acute conflict: between the strengthened protection of rights holders' rights and the need to protect users' fundamental rights, in particular freedom of expression and the right to information.

To mitigate the risks of so-called 'over-blocking' (the removal of lawful content, such as quotations, parodies or content falling under exceptions), the European legislator has established a number of ex-ante and ex-post mechanisms to protect users' rights (Articles 17(7)-(9)). For example, platforms must ensure that filtering measures do not block lawful use.

The challenge of implementation lies in the fact that the national laws of EU Member States have implemented these safeguards in different ways. Some countries have introduced detailed rules requiring platforms to apply substantive ex-ante measures to protect users' rights upon upload. Others, however, have limited themselves to a simple repetition of the Directive's text, effectively leaving it to platforms to decide which measures to take and to courts to interpret whether these measures were 'balanced'. Such inconsistent implementation confirms that even an attempt at harmonisation at EU level faces structural problems, where strengthening one right (copyright protection) inevitably creates tension in another (freedom of expression).

Intellectual property and emerging technologies (AI, Big Data, blockchain)

The growing use of AI, particularly generative models capable of creating content (texts, music, images) and making inventions, calls into question the very foundation of IP law — the principle of 'human authorship'. The central issue being discussed by WIPO is whether AI-generated content is eligible for protection, and if so, who is the rights holder.³²

Legal doctrine has identified three possible 'authors' or rights holders for AI-generated content: (1) the AI developer; (2) the AI system itself; (3) the end-user who provides the initial prompt.

Current international practice, including in the US and most European countries, adheres to the principle of 'strict human authorship'. However, this principle is under increasing pressure due to the transformative potential of technology. High-profile court cases, such as attempts to patent inventions created by the DABUS system (*Thaler v. Perlmutter*), have highlighted the difficulties in adapting traditional patent and copyright law, as courts refuse to recognise AI as an inventor or author.

³² Kelvin L. Nkai. AI-generated content and IP rights: Challenges and policy considerations — *Diplo.* <https://www.diplomacy.edu/blog/ai-generated-content-and-ip-rights-challenges-and-policy-considerations/>

At the international level, active discussions are ongoing regarding the need for legal reforms. WIPO is actively discussing the ‘output problem’, including issues of protecting the AI models themselves and the interconnection between input data and the intellectual property of the output.³³ There are proposals to introduce a two-tier legal mechanism: granting sui generis rights for works created by AI but with significant human input, whilst content created entirely autonomously should be placed in the public domain without copyright.³⁴ This model aims to protect the moral rights of traditional human creators whilst encouraging investment in the development of AI tools.³⁵

Initial national steps are already being taken. For example, legislation in Arkansas (USA) proposes that the owner of AI-generated content be the person who provides the data for training the model, or the employer if the content is created in the course of employment, emphasising that the generated content must not infringe existing intellectual property rights.³⁶

Table 3

**REGULATORY PROPOSALS ON DETERMINING
 THE RIGHTS HOLDER OF AI-GENERATED CONTENT**

Model of Authorship / Invention	Description	Rationale	Status (Practice / Proposal)
Strictly human authorship	Rights belong solely to the individual (the developer or the user)	Preserving the integrity of traditional IP systems and moral rights	Prevailing international practice
Sui generis rights	Creation of a new, limited right for the AI operator / developer	Encouraging investment in the development of AI tools where human input is significant	Currently under active discussion at WIPO. Proposed for works involving significant human input
AI as a tool (Rights to the owner)	Rights to the output belong to the AI owner	Consistent with general principles of ownership of the tool	Implemented in some national laws (e.g., Arkansas, USA)

Source: developed by the author based on data ^{34, 35, 37}

³³ Artificial Intelligence and Intellectual Property — WIPO. <https://www.wipo.int/en/web/frontier-technologies/artificial-intelligence/index>

³⁴ Haochen Sun. Redesigning Copyright Protection in the Era of Artificial Intelligence | Iowa Law Review. <https://ilr.law.uiowa.edu/sites/ilr.law.uiowa.edu/files/2022-11/Redesigning%20Copyright%20Protection%20in%20the%20Era%20of%20Artificial%20Intelligence.pdf>

³⁵ Ryan Abbott. The Artificial Inventor Project — WIPO. https://www.wipo.int/wipo_magazine/en/2019/06/article_0002.html

³⁶ Artificial Intelligence 2025 Legislation — National Conference of State Legislatures. <https://www.ncsl.org/technology-and-communication/artificial-intelligence-2025-legislation>

³⁷ Hayleigh Boshier. WIPO Impact of Artificial Intelligence on IP Policy Response from Brunel University London, Law School & Centre for Artificial Intelligence. URL: https://www.wipo.int/documents/d/frontier-technologies/docs-en-artificial-intelligence-call-for-comments-org_brunel.pdf

The processing and use of Big Data sets form the economic basis for most ICT innovations, including AI. However, the legal protection of the data itself is extremely complex. Copyright traditionally protects the form of expression, not the information itself. Protection may extend to the structure of a database (via the *sui generis* right in the EU), but does not apply to unstructured data (NoSQL), which is typical of Big Data. In view of this, trade secrets remain one of the most important mechanisms for protecting both the data corpora themselves and the correlations and conclusions generated by AI systems.³⁸

The use of Big Data to train generative AI models requires the mass copying and analysis of existing works, a process known as Text and Data Mining (TDM). Regulators have recognised that absolute control by rights holders over this process would stifle technological progress. This has led to the need to introduce copyright exceptions for TDM.³⁹

Such exceptions are already in place in a number of legal systems. For example, the DSM Directive in the EU and Japanese legislation permit TDM for non-commercial scientific research and computer analysis.⁴⁰ The introduction of broad exceptions for TDM sends a clear policy signal: promoting innovation (the development of AI) takes precedence over absolute control by copyright holders when their works are used as training data rather than as a work in the traditional sense. This is a regulatory mechanism aimed at avoiding the ‘tragedy of anti-commons’ that would arise from the need to obtain individual licences for billions of pieces of content.

However, the issue of commercial TDM remains contentious. In the US, an intense dispute is ongoing between AI developers and rights holders. Developers argue that the requirement for individual licensing is ‘too expensive and cumbersome’ and ‘would stifle transformative technology’.⁴¹ Rights holders, on the other hand, insist that the use of their content is ‘the cost of doing business’. The US Copyright Office (USCO) has spoken out against the introduction of compulsory licensing with fixed royalties, recommending instead the development of a market for voluntary or collective licensing.

Blockchain technology and non-fungible tokens (NFTs) are an example of how ICT can offer new tools for managing IP. An NFT is a unique identifier recorded on a blockchain and used to verify ownership or the authen-

³⁸ Daniel Gervais. Exploring the Interfaces Between Big Data and Intellectual Property Law | JIPITEC. <https://www.jipitec.eu/jipitec/article/view/242>

³⁹ Sean Flynn. Research Exceptions in Comparative Copyright Law — Wolters Kluwer. <https://legalblogs.wolterskluwer.com/copyright-blog/research-exceptions-in-comparative-copyright-law/>

⁴⁰ Juan-Carlos Fernandez-Molina and Fernando Esteban de la Rosa. Copyright and Text and Data Mining: Is the Current Legislation Sufficient and Adequate? — Preprint. https://preprint.press.jhu.edu/portal/sites/default/files/12_24.3fernandez.pdf

⁴¹ Stuart D. Levi, Mana Ghaemmaghami. Copyright Office Weighs In on AI Training and Fair Use | Skadden, Arps, Slate, Meagher & Flom LLP. <https://www.skadden.com/insights/publications/2025/05/copyright-office-report>

ticity of a digital work.⁴² From a legal perspective, an NFT is metadata, not an independent object of copyright. Use of a work associated with an NFT is only possible with the rights holder's permission.⁴³

Monetising IP through the sale of NFTs does not usually entail the automatic transfer of IP rights to the underlying asset (e.g. an image or video). The purchaser of an NFT generally receives only a licence to use the work, unless otherwise explicitly stated in the terms of sale or in the smart contract facilitating the transaction. This makes it critically important to clearly formulate the legal terms of sale and licensing to prevent IP infringement (e.g., the minting of unauthorised NFTs).⁴⁴

The expansion of digital assets and the development of a blockchain-based metaverse create new challenges for dispute resolution.⁴⁵ Although proponents of smart contracts believe that this technology can create a 'transaction-free environment', it cannot fully replace traditional courts. Smart contracts lack the mechanisms for consistent legal interpretation required to resolve complex IP disputes.⁴⁶ Therefore, new methods of alternative dispute resolution (ADR, ODR), including decentralised arbitration, are being actively explored to resolve disputes in the NFT and metaverse sectors.

Cross-border enforcement and dispute resolution

The global nature of ICT and the Internet makes IP infringements inherently cross-border in nature. This creates enormous challenges for law enforcement. Key challenges include determining which country's laws apply (conflicts of law), differences in legal standards between jurisdictions, and, most importantly, ensuring the enforcement of court decisions abroad.⁴⁷

In copyright infringement cases, courts may assume jurisdiction on various grounds: the defendant's place of residence or domicile (for example, in the UK) or the place where the damage occurred (the US, 'long-arm' jurisdiction). This often leads to situations where rights holders are forced to litigate in unfamiliar foreign jurisdictions, despite the high costs and the

⁴² Gutyj B.V. Blockchain and intellectual property protection: implementation prospects. Scientific Notes of V.I. Vernadsky Ternopil National University. Series: Legal Sciences. http://www.juris.vernadskyjournals.in.ua/journals/2025/1_2025/11.pdf

⁴³ Maidanik L. NFTs: A private law perspective through the lens of copyright. Theory and Practice of Intellectual Property No. 1/2022. DOI: <https://doi.org/10.33731/12022.258183>

⁴⁴ Farah Mukaddam. NFTs and Intellectual Property Rights | Germany | Global law firm | Norton Rose Fulbright. <https://www.nortonrosefulbright.com/de-de/wissen/publications/1a1abb9f/nfts-and-intellectual-property-rights>

⁴⁵ Gioia Arnone, Marco Giacalone. Redefining Dispute Resolution Mechanisms for Digital Assets in the Metaverse: Exploring the Role of Blockchain and Emerging Technologies. <https://ejlt.org/index.php/ejlt/article/view/1108>

⁴⁶ Jeremy M. Sklaroff. Smart Contracts and the Cost of Inflexibility — Penn Carey Law: Legal Scholarship Repository. https://scholarship.law.upenn.edu/cgi/viewcontent.cgi?article=1009&context=prize_papers

⁴⁷ Analyzing Jurisdictional Challenges in Cross-Border IP Theft Cases Under Federal Law. — Leppard Law. Federal criminal lawyers. <https://federal-criminal.com/computer-crimes/analyzing-jurisdictional-challenges-in-cross-border-ip-theft-cases-under-federal-law-2/#:~:text=Common%20jurisdictional%20challenges%20in%20cross,and%20cooperation%20between%20legal%20systems>

need to engage local lawyers.⁴⁸ An example of this complexity is a situation where courts (for example, in Virginia) may decline jurisdiction over global communications, even if a local ISP is involved in the infringement. Despite the efforts of international bodies, notably the Hague Conference on Private International Law, to establish uniform rules of jurisdiction in copyright cases, no significant progress has been made.⁴⁹

In the highly competitive field of Standard Essential Patents (SEPs), cross-border disputes are the norm. Companies accused of infringement often file counterclaims or initiate parallel proceedings in several countries in an attempt to gain an advantage (forum shopping).

To combat this procedural tactic, courts use Anti-Suit Injunctions (ASIs). ASIs are court orders prohibiting a party from initiating or continuing legal proceedings in foreign jurisdictions. Although ASIs are an effective tool for centralising and controlling proceedings, as was the case in *Microsoft v. Motorola*, they are viewed as a potential challenge to international comity and the sovereign rights of foreign courts.

The use of ASIs indicates that, in the absence of globally harmonised rules on jurisdiction, national courts are using their sovereign powers to protect domestic economic interests and ensure efficiency, even if this leads to conflicts with international comity. This highlights the structural inadequacy of existing dispute resolution mechanisms in the ICT sector.

Table 4

ECONOMIC AND LEGAL BALANCE IN SEP LICENSING (FRAND)

Challenge	Economic concept	International legal regulation (EU/US/PRC)	Control mechanism
Patent hold-up	Abuse of a monopoly position following the establishment of a standard	Establishment of a reasonable range of FRAND rates, taking into account incremental value	Antitrust legislation (Antitrust Policy)
Refusal to license (Hold-out)	Unfair delaying of negotiations by the licensee	Requirements for good-faith negotiation	Reserving injunctions solely for bad-faith licensees
Conflict of jurisdiction	Forum shopping	Procedural strategy to prevent parallel proceedings	Anti-Suit Injunctions

Source: developed by the author based on data from⁵⁰.

⁴⁸ International aspects of copyright — Squire Patton Boggs. <https://www.squirepattonboggs.com/~media/files/insights/publications/2012/10/international-aspects-of-copyright/files/international-aspects-of-copyright-practice%20note/fileattachment/international-aspects-of-copyright-practice-note.pdf>

⁴⁹ Raquel Xalabarder. Copyright: Choice of Law and Jurisdiction in the Digital Age. <https://digitalcommons.law.ggu.edu/cgi/viewcontent.cgi?article=1067&context=annlsurvey>

⁵⁰ Miadzvedskaya, L. Encouraging FRAND-ly Negotiations: A Comparison of the United States and European Approaches to Allowing Injunctive Relief In Cas — Washington University Open Scholarship. https://openscholarship.wustl.edu/cgi/viewcontent.cgi?article=1694&context=law_globalstudies

The complexity of cross-border law enforcement is also evident in new technologies. Although blockchain and smart contracts have the potential for decentralised dispute resolution, their effectiveness in complex IP disputes remains dependent on traditional legal interpretation. This means that, despite the speed of technology, the final resolution of disputes is still hampered by the slow and territorial nature of analogue law.

Conclusions

The analysis of international IP regulatory practices in the ICT sector confirms that global legal systems are undergoing a phase of profound transformation, but suffer from structural fragmentation and a lack of international consensus. The study revealed significant divergence in key IP institutions. Software patentability is determined on the basis of three different philosophical approaches (Alice/Mayo in the US, technical effect in the EU and technical solution in the PRC), creating an uneven playing field for international innovators. Similarly, in the field of copyright, the liability models for online intermediaries (passive DMCA versus proactive Article 17 DSM) differ significantly, leading to varying standards of rights protection in the global digital space.

IP regulation is shifting from a purely protective (retrospective) function to one of access management and licensing. This is a strategic move aimed at avoiding the ‘tragedy of anti-commons’. Global experience demonstrates this through the introduction of exceptions for Text and Data Mining (TDM), which allow protected content to be used as data for training AI, and through the debate on the Big Data collective licensing model.

The inability of traditional institutions, such as the principle of ‘human authorship’, to meet the challenges posed by AI is driving the development of new, hybrid legal instruments. These include proposals to introduce sui generis rights for AI-generated content created with human involvement, and the use of blockchain/NFT technologies as tools for rights management and authentication.

In the field of SEPs, where enforcement is most competitive, the lack of global harmonisation leads to the aggressive use by national courts of procedural measures such as anti-suit injunctions. This demonstrates that, given the structural weakness of cross-border enforcement, national interests and sovereign powers come to the fore, often disregarding international legal courtesy.

Certain regulatory steps are necessary to ensure the sustainable development of the ICT sector and the protection of IP rights at the international level. International organisations, in particular WIPO, should establish uniform, flexible guidelines regarding the legal status of AI-generated content. It is recommended that a two-tier system be introduced, which grants limited sui generis rights to AI operators for content created with

their significant involvement, whilst content generated entirely autonomously should be placed in the public domain.

There is also a need to harmonise exceptions for TDM at a global level, with a clear distinction between non-commercial scientific use (where broad exceptions apply) and commercial use. For commercial use, it is necessary to encourage the development of Digital Copyright Exchanges⁵¹, and collective licensing models for Big Data to reduce transaction costs and prevent ‘anti-commons’.

To ensure predictability and stability in standards-based sectors (5G, IoT), enhanced cooperation is required between competition authorities and courts in key jurisdictions (EU, US, PRC) to establish consistent methodologies for calculating FRAND rates that prevent both hold-up and hold-out. There is also a need to develop international mechanisms limiting the use of ASIs, or to establish specialised international forums for resolving SEP disputes.

Moreover, given the critical role of know-how and Big Data in ICT, as well as the low level of their international protection, it is necessary to strengthen cross-border mechanisms for the protection of trade secrets within the framework of trade and investment agreements.

Further research in the field of international IP regulation in ICT should focus on the following areas. A detailed analysis is required of the economic implications of various licensing models (voluntary, collective and, as a last resort, compulsory) for training generative AI, with particular attention to the financial sustainability of the creative industry. Equally important is a comprehensive study of the first UPC court decisions concerning the patentability of software and resolving SEP disputes, to assess their actual impact on the harmonisation of European patent practice. Further research into legal personality, jurisdiction and the applicability of alternative dispute resolution (ADR/ODR) in the metaverse and in relations related to NFTs is also necessary in the context of creating an adaptive legal framework capable of responding to technological challenges.

*This article was translated from its original in Ukrainian.

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⁵¹ Digital Opportunity: A review of Intellectual Property and Growth — GOV.UK. URL: <https://assets.publishing.service.gov.uk/media/5a796832ed915d07d35b53cd/ipreview-finalreport.pdf>

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