

International Harmonization of AI and IP Law: Challenges and Prospects under WIPO and TRIPS

Surya Viswanadha¹, T.Ramesh², K.S.Murali Mohan³, M. Siva Kumar⁴,
R. Naga Malleswari⁵

^{1,2,3,4}Research Scholar, YBN University, Ranchi, Jharkhand State, India

⁵Research Scholar, Dr. B.R. Ambedkar College of Law, Andhra University, Visakhapatnam, Andhra Pradesh State, India

Abstract:

Artificial Intelligence (AI) transforms the production and distribution of inventions, creative works and inventive processes. This technological shift poses profound questions for intellectual property (IP) systems—particularly regarding authorship, inventorship, patentable subject matter, disclosure obligations, and the allocation of rights when machine-generated outputs play a central role. The twin international institutions most relevant to harmonization are the World Intellectual Property Organization (WIPO) — with its policy work, guidance, and norm-making role — and the World Trade Organization’s TRIPS Agreement, which establishes minimum standards and disciplines for IP protection among WTO Members. This article examines the doctrinal, institutional and practical frictions that complicate harmonization of AI-relevant IP rules at the international level, evaluates recent institutional responses and policy options, and proposes a pragmatic roadmap to reconcile innovation incentives with legal certainty, equity and human oversight.

Keywords: Artificial Intelligence, Intellectual Property, WIPO, TRIPS, patentability, authorship, disclosure of origin, harmonization, policy reform, etc.

Introduction

The rapid diffusion of machine learning and generative AI systems into research, design, creative industries and commercial practice raises urgent legal questions: when is an output sufficiently human-mediated to qualify for copyright protection? How should patent office’s treat inventions discovered, suggested or refined by AI? Should there be disclosure obligations about the use of AI in claiming inventorship or authorship? How can international IP norms be harmonized so that cross-border commerce and technology transfer do not founder on divergent national approaches?

International harmonization matters because IP law is transactional and cross-border: patents and copyrights are enforced across jurisdictions; multinational R&D and cross-licensing are routine; and global markets value predictability. Two institutions shape much of the global landscape: **WIPO**, which conducts research, convenes member states and advises on best practice and treaties related to IP, and the **WTO** under the **TRIPS Agreement**, which establishes binding minimum standards for patent and

copyright protection among WTO Members. The interaction between these bodies, national legislatures, courts and industry practice creates both opportunities and obstacles to harmonized AI-IP rules.

This article proceeds in five parts. Part 2 sets out the technological features of AI that stress IP law. Part 3 analyzes doctrinal tensions in copyright and patent law exposed by AI. Part 4 examines WIPO's and TRIPS' institutional responses, limits and leverage in harmonization. Part 5 proposes a practical, multi-track roadmap for international harmonization that preserves normative flexibility while reducing harmful fragmentation. A short conclusion reflects on the normative balance between incentives, fairness and legal certainty.

2. Why AI Stresses Intellectual Property Law: Key Features

AI challenges IP law because of several interrelated technical and socio-economic features:

2.1. Machine-generated outputs and human agency spectrum

AI systems can generate outputs with varying degrees of human intervention — from fully autonomous discovery (e.g., molecules suggested by an algorithm), to human-curated or extensively edited AI-assisted creations. Legal outcomes hinge on where an output falls on this **human-agency spectrum**.

2.2. Scale, speed and combinatorial creativity

AI enables combinatorial exploration at scale — exploring millions of permutations far beyond human capacity. The novelty and non-obviousness inquiries in patent law and originality inquiries in copyright are strained by this scale: what counts as an inventive step when AI can rapidly produce many technically viable variations?

2.3. Training data and provenance externalities

Large models are trained on enormous datasets that may include copyrighted material, patented methods, or proprietary trade secrets. Questions on lawful use, attribution, and derivative infringement arise — and copyright doctrines (e.g., fair use/fair dealing) may be tested in novel ways.

2.4. Attribution, transparency and accountability gaps

AI systems are often opaque, especially deep neural networks. Determining authorship, inventorship and causal contribution becomes difficult without transparency or provenance metadata. This opacity creates legal uncertainty for IP offices and courts.

2.5. Economic dislocation and new incentive structures

AI lowers marginal costs for creating works and exploring inventive spaces. Policymakers must weigh whether to deepen exclusive rights to incentivize further investment or to create alternative reward mechanisms (prizes, data-access payments, public funding) to avoid over-monopolization of machine-generated knowledge.

These features show why applying pre-AI IP doctrines directly can produce unsatisfactory outcomes — either denying protection where socially valuable incentives are needed, or granting protection that produces undue monopolies and hinders follow-on innovation.

3. Doctrinal Tensions: Copyright and Patent Law Under AI

3.1. Copyright: authorship, fixation and creative contribution

Copyright traditionally protects human authorship and requires fixation and originality. AI introduces three pressures:

1. **Non-human authorship problem:** If an output is generated autonomously, doctrinal systems (and most jurisdictions) decline to recognize non-human authors. The doctrinal question is whether to insist

on a substantial human creative contribution as a threshold for protection, and how to operationalize that threshold.

2. **Thin vs. thick originality:** Courts must distinguish mere mechanical output from human artistic choices. Some jurisdictions already focus on whether a human provided creative input beyond simple prompts; others require demonstrable creative control.
3. **Derivative works and training data:** If an AI model produces a work substantially similar to copyrighted inputs, infringement questions arise. The degree to which training constitutes lawful copying (or transforms the original) is contested.

An international harmonization strategy for copyright must therefore clarify: (a) the standard of human involvement required; (b) treatment of outputs where humans meaningfully select, edit or curate machine output; and (c) rules for training data use and downstream liability.

3.2. Patents: inventorship, disclosure and inventive step

Patents raise distinct but related problems:

1. **Inventorship and the “natural person” requirement:** Many patent regimes (and patent offices) assume inventors are natural persons. High-profile cases have rejected listing AI as an inventor, insisting on natural-person inventorship. That raises the question: when AI contributes materially to the inventive concept, who is the inventor? The operator? The trainer? The owner? Existing doctrines of conception and reduction to practice are awkward in AI contexts.
2. **Patentable subject matter and method claims:** AI-assisted processes often involve algorithms and data; some jurisdictions exclude “pure algorithms” yet consider computer-implemented inventions patentable depending on local practice. Harmonization would require clarity on whether AI models, model training processes, and AI-designed artifacts (e.g., drug candidates) are patentable and under what conditions.
3. **Inventive step / non-obviousness:** AI’s ability to generate numerous variations complicates assessment of inventive step. Should the ‘person having ordinary skill in the art’ (PHOSITA) test be reformulated to account for AI-assisted capabilities?
4. **Disclosure and enablement:** Patent law requires a disclosure enabling the skilled person to practice the invention. Where inventions result from opaque AI processes, fulfilling enablement can be challenging. Conversely, applicants may be tempted to claim broadly while withholding training data or model details, undermining the disclosure bargain.
5. **Data provenance and prior art:** AI training datasets may contain prior art that could invalidate a claimed invention; examiners need access to comprehensive prior art but lack visibility into proprietary datasets used to generate outputs.

Taken together, these tensions show why a purely domestic or piecemeal approach will create cross-border uncertainty. Patent harmonization under TRIPS and coordinated WIPO guidance are therefore important.

4. Institutional Responses: WIPO and TRIPS (WTO)4.1. WIPO’s role: research, guidance, and multi-stakeholder convening

WIPO has positioned itself as the primary technical and normative convener on AI-and-IP issues. WIPO’s work spans:

- **Research and analytics:** WIPO has published extensive studies on AI inventions, generative AI and IP policy, including empirical patent analytics that document explosive growth in AI-related filings

and highlight jurisdictional trends. These resources help policymakers understand the scale and shape of AI innovation.

- **Policy forums and stakeholder dialogue:** WIPO’s “Conversation on IP and AI” brings together member states, IP offices, industry, and civil society to discuss best practices. WIPO provides non-binding guidance, model approaches and training for examiners.
- **Capacity building:** WIPO assists national IP offices to adapt examination practices for AI inventions, including how to identify and examine AI-related prior art, and how to treat AI-assisted inventive contributions.

WIPO’s comparative advantage is technical expertise and convening authority; its limitation is that it produces non-binding soft law unless member states negotiate treaties.

4.2. The TRIPS baseline and its constraints

The TRIPS Agreement establishes minimum IP standards among WTO Members, notably that patents must be available in “all fields of technology” subject to certain exceptions. TRIPS’ strength is its binding character and dispute settlement mechanism. Its limitations for AI harmonization include:

- **Textual rigidity:** TRIPS was negotiated before the AI era; its text does not explicitly contemplate machine inventors or generative AI outputs.
- **Minimum standards framework:** TRIPS sets floors, not uniform detailed rules; thus, variation among member states is permitted, and TRIPS alone cannot fully harmonize doctrine around AI specifics.
- **Political economy:** Any TRIPS amendment or interpretive clarification requires broad consensus among diverse WTO Members with differing innovation priorities and capacities — a high bar.

Yet TRIPS remains the pivotal instrument: unilateral divergence that conflicts with TRIPS minima could give rise to trade disputes. Therefore, WIPO’s soft guidance and national laws must remain mindful of TRIPS constraints and opportunities.

4.3. Recent institutional signals and data

WIPO data and reporting have shown a surge in AI-related patent filings globally, underscoring the urgency of harmonization. Major filing centers — China, US, EU, Korea, Japan — lead in patents for generative AI systems and AI applications, producing a dense, cross-jurisdictional web of claims that will strain inconsistent national doctrines.

This administrative and empirical reality creates institutional pressure: examiners and national courts increasingly face AI cases; inconsistency will raise costs for transnational enforcement and litigation.

5. Sources of Fragmentation and Why Harmonization Is Hard

5.1. Divergent substantive doctrines

Countries already differ on key doctrinal points:

- Some jurisdictions require a **human author/inventor** to grant copyright/patent rights; others emphasize control or economic ownership.
- National standards for patentable subject matter (software, algorithms, biotech) vary, so AI-related subject matter that is patentable in one country might be refused elsewhere.
- Data protection and copyright exceptions (fair use / fair dealing) differ, affecting how training datasets can be compiled and exploited.

This doctrinal pluralism produces forum-shopping incentives and transaction costs for global innovators.

5.2. Differing policy priorities and development levels

Developed countries with strong AI ecosystems may favor broader protection to incentivize investment, whereas developing countries may prioritize access to AI benefits, affordable medical innovations, and preventing monopolization of datasets. Harmonization must therefore accommodate development differentials.

5.3. Proprietary datasets and trade secrecy

Much AI innovation rests on proprietary training corpora. National laws that compel disclosure of training data or model parameters create competitive concerns. Harmonizing disclosure standards across jurisdictions will therefore be contested by commercial actors.

5.4. Enforcement asymmetries and litigation risks

A harmonized rule is only as effective as enforcement. Many national IP offices lack expertise to assess AI inventions; courts risk inconsistent rulings; cross-border enforcement of any harmonized standard will be complex and resource-intensive.

5.5. Normative tensions: incentives vs diffusion

At a normative level, harmonization must balance:

- **Incentives for investment:** Avoiding under-protection that disincentivizes costly AI development.
- **Diffusion and accessibility:** Avoiding over-protection that locks up knowledge and harms follow-on innovation and societal access.

This balancing act is politically fraught and technically complex.

6. Practical Harmonization Approaches: Options and Trade-offs

Given the challenges, harmonization can be pursued on multiple tracks — incremental, modular, and pragmatic.

6.1. Soft-law convergence via WIPO guidance

WIPO can (and has) issue **model examination guidelines** and **interpretive notes** on handling AI-related patent and copyright questions. Benefits:

- **Speed and flexibility:** Soft law can be issued faster than treaties and updated as technology evolves.
- **Capacity building:** WIPO can train examiners and judges, promoting interpretive convergence.

Trade-off: Soft law lacks binding force; divergence may persist if national interests differ.

6.2. Harmonized minimum standards via TRIPS interpretive mechanisms

The WTO/TRIPS Council can adopt **interpretive communications** or clarifications on how TRIPS applies to AI-related inventions (for instance, on patentable subject matter or disclosure obligations).

Advantages:

- **Binding under WTO framework:** Interpretations by consensus carry strong normative weight.
- **Uniformity:** Members would have clearer expectations.

Trade-off: Achieving consensus among 160+ WTO Members is politically difficult; formal amendments are slow.

6.3. Targeted treaty or protocol (WIPO or WTO) focused on AI-IP interface

Negotiating a **targeted protocol** (to TRIPS) or a WIPO treaty could address specific issues: inventorship attribution, disclosure of AI involvement, data provenance, and an enablement standard for AI-derived inventions. Pros:

- **Specificity:** A focused treaty tackles precise problems without reworking whole IP regimes.
- **Binding obligations:** Provides legal certainty.

Trade-off: Treaty negotiation is time-consuming and politically contested. It risks becoming a lowest-common-denominator compromise.

6.4. Mutual recognition regimes and administrative cooperation

IP offices could pursue **mutual recognition** agreements or examiner cooperation (e.g., CASE/CASE+ frameworks), sharing prior art and examination reports on AI inventions. This builds practical harmonization while preserving national adjudicative autonomy.

6.5. Data governance and cross-border standards

Harmonization efforts must include **data governance standards**: provenance requirements, safe-harbors for lawful training uses, and metadata standards indicating human input. Interoperable standards reduce disputes over training data provenance and prior art.

7. A Pragmatic Roadmap for Harmonization

The article recommends a multi-track, pragmatic roadmap emphasizing experimentation, capacity building and preservation of policy space for development:

7.1. Immediate (0–2 years): WIPO-led soft convergence and capacity building

- WIPO should produce **Model Guidelines for AI-Related Copyright and Patent Examination** that define minimum evidentiary standards for human authorship/inventorship and practical examiner checklists for AI-assisted inventions.
- WIPO should expand examiner training and establish a **Global AI-IP Clearinghouse** for sharing prior art, training datasets (metadata only), and examination best practices.

7.2. Short term (2–5 years): TRIPS interpretive dialogue and pilot protocols

- The TRIPS Council should establish a **working group** to examine the implications of AI for TRIPS norms and consider non-binding interpretive statements clarifying how TRIPS minimums apply to AI inventions (e.g., on inventive step in AI contexts).
- Member states should pilot **disclosure of AI involvement** in national patent filings (metadata indicating whether AI materially contributed), coordinated through WIPO standards

7.3. Medium term (5–8 years): Targeted protocol and data governance framework

- Based on pilot outcomes, negotiators might pursue a **targeted TRIPS protocol** or a WIPO instrument addressing: inventorship attribution rules (recognizing human control as basis for rights), mandatory but proportionate **disclosure of AI involvement**, and **enablement standards** for AI-derived inventions.
- A **global metadata standard** for model training provenance should be developed (open, interoperable) to assist examiners and courts without forcing disclosure of proprietary datasets.

7.4. Long term (8–12 years): Evaluate, refine, and institutionalize

- Review outcomes, harmonize modifications into TRIPS interpretive instruments, and institutionalize examiner cooperation.
- Integrate harmonized norms into national laws with transitional measures for developing countries, including technical assistance and data-sharing safe-harbors.

This pragmatic path balances the need for legal certainty and international convergence while respecting national diversity and commercial confidentiality.

8. Specific Doctrinal Proposals (Operational Detail)

8.1. Copyright: Human-control threshold (bright-line + flexible test)

Adopt a two-tier approach:

- **Bright-line threshold:** No copyright in outputs where **no identifiable human directed, selected or edited** the output beyond a minimal prompt.
- **Flexible test:** Where an identifiable human performed **meaningful creative inputs** — iterative prompting that substantially shaped the output, substantial editing, selection and arrangement — courts should recognize authorship.

WIPO guidance can provide examples and checklists for examiners and judges.

8.2. Patents: Inventorship and attribution

Recognize **human inventorship** based on the doctrine of **conception/control**: an individual qualifies as an inventor if they conceived the inventive concept or exercised conceptual control over the AI such that the human contribution was the decisive inventive act. Require disclosure of AI involvement in the specification and list of contributors (not necessarily naming the machine as an inventor). Include **enablement** guidance: where AI-driven results are claimed, applicants must disclose sufficient information for a skilled practitioner to reproduce the invention without access to proprietary training sets; if such disclosure is commercially sensitive, provide secured confidential deposit mechanisms.

8.3. Disclosure standards

Mandate **metadata disclosure** about AI use in patent/copyright filings (e.g., model class, whether proprietary dataset used, extent of human editing). This preserves commercial secrecy while giving examiners context.

8.4. Prior art and model training

Encourage creation of **prior-art registries** and public metadata indices for model training corpora to help examiners assess novelty and inventive step. WIPO could host or federate such registries.

8.5. Transitional safeguards

Provide **safe-harbours** for small entities and researchers to avoid chilling innovation: limited duration protection for certain AI-generated outputs, exemptions for academic research and inter-operability, and subsidized access to patent filing support for developing countries.

9. Equity, Development and Human-Centred Considerations

Harmonization must not impose rules that unduly privilege incumbents or raise barriers for developing countries. Key equity measures:

- **Technical assistance:** WIPO/TTRIP member programs to fund national examiner training, legal drafting, and access to prior art databases.
- **Data access for public interest:** Foster public datasets for health, agriculture and basic science with licensing terms favouring public good.
- **Flexible implementation:** Allow transitional periods and implementation flexibilities for developing members to adopt new disclosure regimes.

10. Risks and Unintended Consequences

Be mindful of risks:

- **Overly broad protection** could hamper follow-on innovation and create monopolies over generative techniques or datasets.
- **Excessive disclosure** could harm trade secrets and deter investment.

- **Fragmented patchwork** of unilateral national rules will increase compliance costs and litigation.
- **Regulatory capture:** Powerful industry actors may capture harmonization processes to entrench advantages.

Mitigation requires careful treaty drafting, stakeholder pluralism, and sunset clauses for experimental norms.

11. Conclusion

AI compels rethinking core assumptions of IP law. Harmonization of AI-relevant IP rules is both necessary and difficult: necessary because global innovation and enforcement are inherently cross-border; difficult because doctrinal, commercial and developmental interests diverge. A pragmatic, stepwise approach — led by WIPO's technical guidance, supported by TRIPS interpretive work, and ultimately consolidated through targeted instruments and cooperative mechanisms — offers the best prospect for reconciling incentives, legal certainty and equity. Harmonization should not be an exercise in forced uniformity. Rather, it should aim for **convergence on minimum functional rules** — clear standards for human authorship and inventorship, proportionate disclosure requirements that respect trade secrets, interoperable metadata and prior-art sharing, and developmentally sensitive implementation. If international institutions act with technical competence, transparent governance and inclusive stakeholder processes, the global IP regime can adapt to AI while preserving its twin goals: rewarding innovation and enabling societal benefit.